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Development of type 2 diabetes mellitus in people with intermediate hyperglycaemia (Review)

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[Prognosis Review]

Development of type 2 diabetes mellitus in people with intermediate hyperglycaemia

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ABSTRACT

Background

Intermediate hyperglycaemia (IH) is characterised by one or more measurements of elevated blood glucose concentrations, such as impaired fasting glucose (IFG), impaired glucose tolerance (IGT) and elevated glycosylated haemoglobin A1c (HbA1c). These levels are higher than normal but below the diagnostic threshold for type 2 diabetes mellitus (T2DM). The reduced threshold of 5.6 mmol/L (100 mg/dL) fasting plasma glucose (FPG) for defining IFG, introduced by the American Diabetes Association (ADA) in 2003, substantially increased the prevalence of IFG. Likewise, the lowering of the HbA1c threshold from 6.0% to 5.7% by the ADA in 2010 could potentially have significant medical, public health and socioeconomic impacts.

Objectives

To assess the overall prognosis of people with IH for developing T2DM, regression from IH to normoglycaemia and the difference in T2DM incidence in people with IH versus people with normoglycaemia.

Search methods

We searched MEDLINE, Embase, ClincialTrials.gov and the International Clinical Trials Registry Platform (ICTRP) Search Portal up to December 2016 and updated the MEDLINE search in February 2018. We used several complementary search methods in addition to a Boolean search based on analytical text mining.

Selection criteria

We included prospective cohort studies investigating the development of T2DM in people with IH. We used standard definitions of IH as described by the ADA or World Health Organization (WHO). We excluded intervention trials and studies on cohorts with additional comorbidities at baseline, studies with missing data on the transition from IH to T2DM, and studies where T2DM incidence was evaluated by documents or self-report only.

Data collection and analysis

One review author extracted study characteristics, and a second author checked the extracted data. We used a tailored version of the Quality In Prognosis Studies (QUIPS) tool for assessing risk of bias. We pooled incidence and incidence rate ratios (IRR) using a random-effects model to account for between-study heterogeneity. To meta-analyse incidence data, we used a method for pooling proportions. For hazard ratios (HR) and odds ratios (OR) of IH versus normoglycaemia, reported with 95% confidence intervals (CI), we obtained standard errors from these CIs and performed random-effects meta-analyses using the generic inverse-variance method. We used multivariable HRs

and the model with the greatest number of covariates. We evaluated the certainty of the evidence with an adapted version of the GRADE framework.

Main results

We included 103 prospective cohort studies. The studies mainly defined IH by $IFG_{5.6}$ (FPG mmol/L 5.6 to 6.9 mmol/L or 100 mg/dL to 125 mg/dL), $IFG_{6.1}$ (FPG 6.1 mmol/L to 6.9 mmol/L or 110 mg/dL to 125 mg/dL), IGT (plasma glucose 7.8 mmol/L to 11.1 mmol/L or 140 mg/dL to 199 mg/dL two hours after a 75 g glucose load on the oral glucose tolerance test, combined IFG and IGT (IFG/IGT), and elevated HbA1c ($HbA1c_{5.7}$: HbA1c 5.7% to 6.4% or 39 mmol/mol to 46 mmol/mol; $HbA1c_{6.0}$: HbA1c 6.0% to 6.4% or 42 mmol/mol to 46 mmol/mol). The follow-up period ranged from 1 to 24 years. Ninety-three studies evaluated the overall prognosis of people with IH measured by cumulative T2DM incidence, and 52 studies evaluated glycaemic status as a prognostic factor for T2DM by comparing a cohort with IH to a cohort with normoglycaemia. Participants were of Australian, European or North American origin in 41 studies; Latin American in 7; Asian or Middle Eastern in 50; and Islanders or American Indians in 5. Six studies included children and/or adolescents.

Cumulative incidence of T2DM associated with $IFG_{5.6}$, $IFG_{6.1}$, IGT and the combination of IFG/IGT increased with length of follow-up. Cumulative incidence was highest with IFG/IGT, followed by IGT, $IFG_{6.1}$ and $IFG_{5.6}$. Limited data showed a higher T2DM incidence associated with $HbA1c_{6.0}$ compared to $HbA1c_{5.7}$. We rated the evidence for overall prognosis as of moderate certainty because of imprecision (wide CIs in most studies). In the 47 studies reporting restitution of normoglycaemia, regression ranged from 33% to 59% within one to five years follow-up, and from 17% to 42% for 6 to 11 years of follow-up (moderate-certainty evidence).

Studies evaluating the prognostic effect of IH versus normoglycaemia reported different effect measures (HRs, IRRs and ORs). Overall, the effect measures all indicated an elevated risk of T2DM at 1 to 24 years of follow-up. Taking into account the long-term follow-up of cohort studies, estimation of HRs for time-dependent events like T2DM incidence appeared most reliable. The pooled HR and the number of studies and participants for different IH definitions as compared to normoglycaemia were: $IFG_{5.6}$: HR 4.32 (95% CI 2.61 to 7.12), 8 studies, 9017 participants; $IFG_{6.1}$: HR 5.47 (95% CI 3.50 to 8.54), 9 studies, 2818 participants; IGT: HR 3.61 (95% CI 2.31 to 5.64), 5 studies, 4010 participants; IFG and IGT: HR 6.90 (95% CI 4.15 to 11.45), 5 studies, 1038 participants; $HbA1c_{5.7}$: HR 5.55 (95% CI 2.77 to 11.12), 4 studies, 5223 participants; $HbA1c_{6.0}$: HR 10.10 (95% CI 3.59 to 28.43), 6 studies, 4532 participants. In subgroup analyses, there was no clear pattern of differences between geographic regions. We downgraded the evidence for the prognostic effect of IH versus normoglycaemia to low-certainty evidence due to study limitations because many studies did not adequately adjust for confounders. Imprecision and inconsistency required further downgrading due to wide 95% CIs and wide 95% prediction intervals (sometimes ranging from negative to positive prognostic factor to outcome associations), respectively.

This evidence is up to date as of 26 February 2018.

Authors' conclusions

Overall prognosis of people with IH worsened over time. T2DM cumulative incidence generally increased over the course of follow-up but varied with IH definition. Regression from IH to normoglycaemia decreased over time but was observed even after 11 years of follow-up. The risk of developing T2DM when comparing IH with normoglycaemia at baseline varied by IH definition. Taking into consideration the uncertainty of the available evidence, as well as the fluctuating stages of normoglycaemia, IH and T2DM, which may transition from one stage to another in both directions even after years of follow-up, practitioners should be careful about the potential implications of any active intervention for people 'diagnosed' with IH.

PLAIN LANGUAGE SUMMARY

Development of type 2 diabetes mellitus in people with intermediate hyperglycaemia ('prediabetes')

Review question

We wanted to find out whether raised blood sugar ('prediabetes') increases the risk of developing type 2 diabetes and how many of these people return to having normal blood sugar levels (normoglycaemia). We also investigated the difference in type 2 diabetes development in people with prediabetes compared to people with normoglycaemia.

Background

Type 2 diabetes is often diagnosed by blood sugar measurements like fasting blood glucose or glucose measurements after an oral glucose tolerance test (drinking 75 g of glucose on an empty stomach) or by measuring glycosylated haemoglobin A1c (HbA1c), a long-term marker of blood glucose levels. Type 2 diabetes can have bad effects on health in the long term (diabetic complications), like severe eye or kidney disease or diabetic feet, eventually resulting in foot ulcers.

Raised blood glucose levels (hyperglycaemia), which are above normal ranges but below the limit of diagnosing type 2 diabetes, indicate prediabetes, or intermediate hyperglycaemia. The way prediabetes is defined has important effects on public health because some physicians treat people with prediabetes with medications that can be harmful. For example, reducing the threshold for defining impaired

fasting glucose (after an overnight fast) from 6.1 mmol/L or 110 mg/dL to 5.6 mmol/L or 100 mg/dL, as done by the American Diabetes Association (ADA), dramatically increased the number of people diagnosed with prediabetes worldwide.

Study characteristics

We searched for observational studies (studies where no intervention takes place but people are observed over prolonged periods of time) that investigated how many people with prediabetes at the beginning of the study developed type 2 diabetes. We also evaluated studies comparing people with prediabetes to people with normoglycaemia. Prediabetes was defined by different blood glucose measurements.

We found 103 studies, monitoring people over 1 to 24 years. More than 250,000 participants began the studies. In 41 studies the participants were of Australian, European or North American origin, in 7 studies participants were primarily of Latin American origin and in 50 studies participants were of Asian or Middle Eastern origin. Three studies had American Indians as participants, and one study each invited people from Mauritius and Nauru. Six studies included children, adolescents or both as participants.

This evidence is up to date as of 26 February 2018.

Key results

Generally, the development of new type 2 diabetes (diabetes incidence) in people with prediabetes increased over time. However, many participants also reverted from prediabetes back to normal blood glucose levels. Compared to people with normoglycaemia, those with prediabetes (any definition) showed an increased risk of developing type 2 diabetes, but results showed wide differences and depended on how prediabetes was measured. There were no clear differences with regard to several regions in the world or different populations. Because people with prediabetes may develop diabetes but may also change back to normoglycaemia almost any time, doctors should be careful about treating prediabetes because we are not sure whether this will result in more benefit than harm, especially when done on a global scale affecting many people worldwide.

Certainty of the evidence

The certainty of the evidence for overall prognosis was moderate because results varied widely. The certainty of evidence for studies comparing prediabetic with normoglycaemic people was low because the results were not precise and varied widely. In our included observational studies the researchers often did not investigate well enough whether factors like physical inactivity, age or increased body weight also influenced the development of type 2 diabetes, thus making the relationship between prediabetes and the development of type 2 diabetes less clear.

Summary of findings for the main comparison. Summary of findings: overall prognosis of people with intermediate hyperglycaemia for developing T2DM

Outcome: development of T2DM Prognosis of people with intermediate hyperglycaemia								
Follow-up (years)	**Cumulative T2DM incidence % (95% CI) [no of studies; no of participants with intermediate hyperglycaemia]**						**Regression from intermediate hyperglycaemia to normoglycaemia % (95% CI) [no of studies; no of participants with intermediate hyperglycaemia]**	**Overall certainty of the evidence (GRADE)[a]**
	$IFG_{5.6}$	**$IFG_{6.1}$**	**IGT**	**IFG + IGT**	**$HbA1c_{5.7}$**	**$HbA1c_{6.0}$**		
1	—	—	**13 (5–23)** [3; 671]	**29 (23–36)** [1; 207]	—	—	**59 (54–64)** [2; 375]	⊕⊕⊕⊖ **Moderate**[b]
2	**2 (1–2)** [1; 1335]	**11 (8–14)** [2; 549]	**16 (9–26)** [9; 1998]	—	—	—	**46 (36–55)** [9; 2852]	
3	**17 (6–32)** [3; 1091]	**9 (2–20)** [3; 927]	**22 (18–27)** [3; 417]	**34 (28–41)** [1; 209]—	—	**7 (5–10)** [1; 370]	**41 (24–69)** [7; 1356]	
4	**17 (13–22)** [3; 800]	**30 (17–44)** [2; 1567]	**22 (12–34)** [5; 1042]	—	**14 (7–23)** [3; 5352]	**44 (40–48)** [2; 627]	**33 (26–40)** [3; 807]	
5	**18 (10–27)** [7; 3530]	**26 (19–33)** [11; 3837]	**39 (25–53)** [12; 3444]	**50 (37–63)** [5; 478]	**25 (18–32)** [4; 3524]	**38 (26–51)** [3; 1462]	**34 (27–42)** [9; 2603]	
6	**22 (15–31)** [4; 738]	**37 (31–43)** [5; 279]	**29 (25–34)** [7; 775]	**58 (48–67)** [4; 106]	**17 (14–20)** [1; 675]	—	**23 (3–53)** [5; 1328]	
7	**18 (8–30)** [5; 980]	**15 (0–45)** [4; 434]	**19 (13–26)** [5; 835]	**32 (20–45)** [4; 753]	**21 (16–27)** [1; 207]	—	**41 (37–45)** [4; 679]	
8	**34 (27–40)**	**48 (31–66)**	**43 (37–49)**	**52 (47–57)**	—	—	**39 (33–44)**	

	[2; 1887]	[1;29]	[4; 1021]	[1; 356]			[2; 328]
9	**38 (10–70)** [3; 1356]	—	**53 (45–60)** [1; 163]	**84 (74–91)** [1; 69]	—	—	**17 (14–22)** [1; 299]
10	**23 (14–33)** [6; 1542]	**29 (17–43)** [6; 537]	**26 (17–37)** [6; 443]	**30 (17–44)** [2; 49]	**31 (29–33)** [2; 2854]	—	**42 (22–63)** [7; 894]
11	—	**38 (33–43)** [1; 402]	**46 (43–49)** [1; 1253]	—	—	—	**28 (17–39)** [2; 736]
12	**31 (19–34)** [3; 433]	**31 (28–33)** [1; 1382]	**41 (38–43)** [2; 1552]	**70 (63–76)** [2; 207]	—	—	—
15	—	—	—	—	—	**29 (19–40)** [1; 70]	—
20	—	—	**60 (5–68)** [1; 114]	—	—	—	—

CI: confidence interval; **HbA1c$_{5.7}$**: glycosylated haemoglobin A1c, 5.7% threshold; **HbA1c$_{6.0}$**: glycosylated haemoglobin A1c, 6.0% threshold; **IFG$_{5.6}$**: impaired fasting glucose, 5.6 mmol/L threshold; **IFG$_{6.1}$**: impaired fasting glucose, 6.1 mmol/L threshold; **IGT**: impaired glucose tolerance; **T2DM**: type 2 diabetes mellitus.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]With phase 2 explanatory studies aiming to confirm independent associations between the prognostic factor and the outcome, GRADE starts with 'high quality' (Huguet 2013). We assumed the GRADE factor publication bias was inherent with this type of research (phase 2 design), so we did not use it as a potential downgrading factor
[b]Downgraded by one level because of imprecision (wide CIs for most intermediate hyperglycaemia definitions and the association with T2DM incidence and regression from intermediate hyperglycaemia)

Summary of findings 2. Summary of findings: risk of intermediate hyperglycaemia (IFG$_{5.6}$ mmol/L definition) versus normoglycaemia for developing T2DM

Outcome: development of T2DM

Prognostic factor: intermediate hyperglycaemia versus normoglycaemia as measured by $IFG_{5.6}$				
No of studies	**No of participants with intermediate hyperglycaemia**	**Geographic region/special population**	**Estimated effect (95% CI) [95% prediction interval]**	**Overall certainty of the evidence (GRADE)[a]**
HR: 4	HR: 2385	Asia/Middle East	**HR: 5.07 (3.41–4.86)** [1.07–24.02]	⊕⊕⊝⊝ **Low**[b]
IRR: 6	IRR: 15,661		**IRR: 5.23 (3.77–7.25)** [1.72–15.89]	
OR: 10	OR: 6359		**OR: 2.94 (1.77–4.86)** [0.43–19.93]	
HR: 3	HR: 5685	Australia/Europe/North America	**HR: 4.15 (1.24–13.9)** [N/M]	
IRR: 3	IRR: 6322		**IRR: 4.96 (3.25–7.57)** [0.32–77.24]	
OR: 9	OR: 1949		**OR: 6.47 (3.81–11.00)** [0.99–42.32]	
HR: 0	HR: 0	Latin America	**HR: NA**	
IRR: 0	IRR: 0		**IRR**: **NA**	
OR: 1	OR: 65		**OR: 4.28 (3.21–5.71)**	
HR: 1	HR: 947	American Indians/Islands	**HR: 2.38 (1.85–3.06)**	
IRR: 1	IRR: 2374		**IRR: 2.74 (1.88–3.99)**	
OR: 1	OR: 947		**OR: 3.12 (2.31–4.21)**	
HR: 8	HR: 9017	Overall	**HR: 4.32 (2.61–7.12)** [0.75–25.0]	
IRR: 10	IRR: 24,357		**IRR: 4.81 (3.67–6.30)** [1.95–11.83]	
OR: 21	OR: 9320		**OR: 4.15 (2.75–6.28)** [0.53–32.4]	

CI: confidence interval; **HR**: hazard ratio;**$IFG_{5.6}$**: impaired fasting glucose 5.6 mmol/L threshold; **IRR**: incidence rate ratio; **NA**: not applicable; **N/M**: fewer than 3 studies or calculation of the 95% prediction interval did not provide a meaningful estimate; **OR**: odds ratio; **T2DM**: type 2 diabetes mellitus.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]With phase 2 explanatory studies aiming to confirm independent associations between the prognostic factor and the outcome, GRADE starts with 'high quality' (Huguet 2013). We assumed the GRADE factor publication bias was inherent with this type of research (phase 2 design), so we did not use it as a potential downgrading factor
[b]Downgraded by one level because of study limitations (many studies did not adequately adjust for confounders, if at all) and by one level because of imprecision (CIs were wide) and inconsistency (wide 95% prediction intervals sometimes ranging from negative to positive prognostic factor to outcome associations)

Summary of findings 3. Summary of findings: risk of intermediate hyperglycaemia ($IFG_{6.1}$ mmol/L definition) versus normoglycaemia for developing T2DM

Outcome: development of T2DM **Prognostic factor: intermediate hyperglycaemia as measured by $IFG_{6.1}$**				
No of studies	**No of participants with intermediate hyperglycaemia**	**Geographic region/special population**	**Estimated effect (95% CI) [95% prediction interval]**	**Overall certainty of the evidence (GRADE)[a]**
HR: 5	HR: 1054	Asia/Middle East	**HR: 10.55 (3.61–30.81)** [N/M]	⊕⊕⊖⊖ **Low**[b]
IRR: 2	IRR: 1677		**IRR: 3.62 (1.67–7.83)** [N/M]	
OR: 7	OR: 3317		**OR: 5.18 (2.32–11.53)** [0.29–91.37]	
HR: 4	HR: 1736	Australia/Europe/North America	**HR: 3.30 (2.32–4.67)** [0.84–12.99]	
IRR: 4	IRR: 3438		**IRR: 8.55 (6.37–11.48)** [4.37–16.73]	
OR: 7	OR: 1240		**OR: 8.69 (4.95–15.24)** [1.20–62.69]	
HR: 0	HR: 0	Latin America	**HR: NA**	
IRR: 0	IRR: 0		**IRR: NA**	
OR: 1	OR: 17		**OR: 3.73 (2.18–6.38)**	
HR: 0	HR: 0	American Indians/Islands	**HR: NA**	
IRR: 0	IRR: 0		**IRR: NA**	
OR: 0	OR: 0		**OR: NA**	
HR: 9	HR: 2818	Overall	**HR: 5.47 (3.50–8.54)** [1.09–27.56]	
IRR: 6	IRR: 5115		**IRR: 6.82 (4.53–10.25)** [2.03–22.87]	
OR: 15	OR: 4574		**OR: 6.60 (4.18–10.43)** [0.93–46.82]	

CI: confidence interval; **HR**: hazard ratio;**IFG$_{6.1}$**: impaired fasting glucose 6.1 mmol/L threshold; **IRR**: incidence rate ratio; **NA**: not applicable; **N/M**: fewer than 3 studies or calculation of the 95% prediction interval did not provide a meaningful estimate; **OR**: odds ratio; **T2DM**: type 2 diabetes mellitus.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]With phase 2 explanatory studies aiming to confirm independent associations between the prognostic factor and the outcome, GRADE starts with 'high quality' (Huguet 2013). We assumed the GRADE factor publication bias was inherent with this type of research (phase 2 design), so we did not use it as a potential downgrading factor
[b]Downgraded by one level because of study limitations (many studies did not adequately adjust for confounders, if at all) and by one level because of imprecision (CIs were wide) and inconsistency (wide 95% prediction intervals sometimes ranging from negative to positive prognostic factor to outcome associations)

Summary of findings 4. Summary of findings: risk of intermediate hyperglycaemia (IGT definition) versus normoglycaemia for developing T2DM

Outcome: development of T2DM Prognostic factor: intermediate hyperglycaemia as measured by IGT				
No of studies	**No of participants with intermediate hyperglycaemia**	**Geographic region/special population**	**Estimated effect (95% CI) [95% prediction interval]**	**Overall certainty of the evidence (GRADE)[a]**
HR: 3 IRR: 5 OR: 6	HR: 1780 IRR: 14,809 OR: 1226	Asia/Middle East	**HR: 4.48 (2.81–7.15)** [N/M] **IRR: 3.93 (3.03–5.10)** [1.71–9.02] **OR: 3.74 (2.83–4.94)** [1.70–8.21]	⊕⊕⊖⊖ **Low**[b]
HR: 2 IRR: 5 OR: 11	HR: 2230 IRR: 2572 OR: 1481	Australia/Europe/North America	**HR: 2.53 (1.52–4.19)** [N/M] **IRR: 5.93 (4.11–8.57)** [2.38–14.81] **OR: 5.20 (3.62–7.45)** [1.50–18.09]	
HR: 0 IRR: 0 OR: 2	HR: 0 IRR: 0 OR: 381	Latin America	**HR: NA** **IRR: NA** **OR: 4.94 (3.15–7.76)** [N/M]	
IRR: 2 OR: 1 HR: 0	IRR: 1087 OR: 51 HR: 0	American Indians/Islands	**IRR: 4.46 (3.12–6.38)** [N/M] **OR: 3.60 (1.40–9.26)**	

			HR: NA
HR: 5	HR: 4010	Overall	**HR: 3.61 (2.31–5.64)** [0.69–18.97]
IRR: 12	IRR: 18,468		**IRR: 4.48 (3.59–5.44)** [2.60–7.70]
OR: 20	OR: 3139		**OR: 4.61 (3.76–5.64)** [2.10–10.13]

CI: confidence interval; **HR**: hazard ratio;**IGT**: impaired glucose tolerance; **IRR**: incidence rate ratio; **NA**: not applicable; **N/M**: fewer than 3 studies or calculation of the 95% prediction interval did not provide a meaningful estimate; **T2DM**: type 2 diabetes mellitus.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]With phase 2 explanatory studies aiming to confirm independent associations between the prognostic factor and the outcome, GRADE starts with 'high quality' (Huguet 2013). We assumed the GRADE factor publication bias was inherent with this type of research (phase 2 design), so we did not use it as a potential downgrading factor
[b]Downgraded by one level because of study limitations (many studies did not adequately adjust for confounders, if at all) and by one level because of imprecision (CIs were wide) and inconsistency (wide 95% prediction intervals sometimes ranging from negative to positive prognostic factor to outcome associations)

Summary of findings 5. Summary of findings: risk of intermediate hyperglycaemia (combined IFG and IGT definition) versus normoglycaemia for developing T2DM

Outcome: development of T2DM **Prognostic factor: intermediate hyperglycaemia as measured by combined IFG and IGT**				
No of studies	**No of participants with intermediate hyperglycaemia**	**Geographic region/special population**	**Estimated effect (95% CI) [95% prediction interval]**	**Overall certainty of the evidence (GRADE)[a]**
HR: 3	HR: 461	Asia/Middle East	**HR: 10.20 (5.45–19.09)** [N/M]	⊕⊕⊖⊖ **Low**[b]
IRR: 4	IRR: 3166		**IRR: 11.20 (5.59–22.43)** [N/M]	
OR: 3	OR: 498		**OR: 6.99 (3.09–15.83)** [N/M]	
HR: 1	HR: 221	Australia/Europe/North America	**HR: 3.80 (2.30–6.28)** [N/M]	
IRR: 4	IRR: 699		**IRR: 13.92 (9.99–19.40)** [6.71–28.85]	
OR: 6	OR: 154		**OR: 20.95 (12.40–35.40)** [4.93–89.05]	
HR: 0	HR: 0	Latin America	**HR: NA**	

IRR: 0	IRR: 0		**IRR: NA**
OR: 0	OR: 0		**OR: NA**
HR: 1	HR: 356	American Indians/Islands	**HR: 4.06 (3.05–5.40)**
IRR: 1	IRR: 605		**IRR: 5.18 (3.42–7.83)**
OR: 0	OR: 0		**OR: NA**
HR: 5	HR: 1038	Overall	**HR: 6.90 (4.15–11.45)** [1.06–44.95]
IRR: 9	IRR: 4470		**IRR: 10.94 (7.22–16.58)** [2.58–46.46]
OR: 9	OR: 652		**OR: 13.14 (7.41–23.30)** [1.84–93.66]

CI: confidence interval; HR: hazard ratio;**IFG**: impaired fasting glucose; **IGT**: impaired glucose tolerance; **IRR**: incidence rate ratio; **NA**: not applicable; **N/M**: fewer than 3 studies or calculation of the 95% prediction interval did not provide a meaningful estimate; **OR**: odds ratio; **T2DM**: type 2 diabetes mellitus.

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Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
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[a]With phase 2 explanatory studies aiming to confirm independent associations between the prognostic factor and the outcome, GRADE starts with 'high quality' (Huguet 2013). We assumed the GRADE factor publication bias was inherent with this type of research (phase 2 design), so we did not use it as a potential downgrading factor
[b]Downgraded by one level because of study limitations (many studies did not adequately adjust for confounders, if at all) and by one level because of imprecision (CIs were wide) and inconsistency (wide 95% prediction intervals)

Summary of findings 6. Summary of findings: risk of intermediate hyperglycaemia ($HbA1c_{5.7}$ definition) versus normoglycaemia for developing T2DM

Outcome: development of T2DM
Prognostic factor: intermediate hyperglycaemia as measured by $HbA1c_{5.7}$

No of studies	No of participants with intermediate hyperglycaemia	Geographic region/special population	Estimated effect (95% CI) [95% prediction interval]	Overall certainty of the evidence (GRADE)[a]
HR: 3	HR: 3196	Asia/Middle East	**HR: 7.21 (5.14–10.11)** [0.81–64.52]	⊕⊕⊝⊝ **Low**[b]
IRR: 1	IRR: 1965		**IRR: 6.62 (4.18–10.49)** [N/M]	
OR: 1	OR: 675		**OR: 4.54 (2.65–7.78)** [N/M]	

HR: 1	HR: 2027	Australia/Europe/North America	**HR: 2.71 (2.48–2.96)** [N/M]
IRR: 0	IRR: 0		**IRR: NA**
OR: 2	OR: 231		**OR: 4.38 (1.36–14.15)** [N/M]
HR: 0	HR: 0	Latin America	**HR: NA**
IRR: 0	IRR: 0		**IRR: NA**
OR: 0	OR: 0		**OR: NA**
HR: 0	HR: 0	American Indians/Islands	**HR: NA**
IRR: 0	IRR: 0		**IRR: NA**
OR: 0	OR: 0		**OR: NA**
HR: 4	HR: 5223	Overall	**HR: 5.55 (2.77–11.12)** [0.23–141.18]
IRR: 1	IRR: 1965		**IRR: 6.62 (4.18–10.49)** [N/M]
OR: 3	OR: 906		**OR: 4.43 (2.20–8.88)** [N/M]

CI: confidence interval; **HbA1c$_{5.7}$**: glycosylated haemoglobin A1c 5.7% threshold; **HR**: hazard ratio;**IRR**: incidence rate ratio; **NA**: not applicable; **N/M**: fewer than 3 studies or calculation of the 95% prediction interval did not provide a meaningful estimate; **OR**: odds ratio; **T2DM**: type 2 diabetes mellitus.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]With phase 2 explanatory studies aiming to confirm independent associations between the prognostic factor and the outcome, GRADE starts with 'high quality' (Huguet 2013). We assumed the GRADE factor publication bias was inherent with this type of research (phase 2 design), so we did not use it as a potential downgrading factor
[b]Downgraded by one level because of study limitations (many studies did not adequately adjust for confounders, if at all) and by one level because of imprecision (CIs were wide) and inconsistency (95% prediction intervals sometimes ranging from negative to positive prognostic factor to outcome associations)

Summary of findings 7. Summary of findings: risk of intermediate hyperglycaemia (HbA1c$_{6.0}$ definition) versus normoglycaemia for developing T2DM

Outcome: development of T2DM
Prognostic factor: intermediate hyperglycaemia as measured by HbA1c$_{6.0}$

No of studies	No of participants with intermediate hyperglycaemia	Geographic region/special population	Estimated effect (95% CI) [95% prediction interval]	Overall certainty of the evidence (GRADE)[a]
HR: 2 IRR: 0 OR: 1	HR: 1040 IRR: 0 OR: 370	Australia/Europe/North America	**HR: 5.09 (1.69–15.37)** [N/M] **IRR: NA** **OR: 15.60 (6.90–35.27)** [N/M]	⊕⊕⊖⊖ **Low**[b]
HR: 4 IRR: 0 OR: 1	HR: 3492 IRR: 0 OR: 1103	Asia/Middle East	**HR: 13.12 (4.10–41.96)** [N/M] **IRR:** NA **OR: 23.20 (18.70–28.78)** [N/M]	
HR: 0 IRR: 0 OR: 0	HR: 0 IRR: 0 OR: 0	Latin America	**HR: NA** **IRR: NA** **OR: NA**	
IRR: 0 OR: 1 HR: 0	IRR: 0 OR: 121 HR: 0	American Indians/Islands	**IRR: NA** **OR: 5.89 (4.23–8.20)** [N/M] **HR: NA**	
HR: 6 IRR: 0 OR: 3	HR: 4532 IRR: 0 OR: 1594	Overall	**HR: 10.10 (3.59–28.43)** [N/M] **IRR: NA** **OR: 12.79 [4.56–35.85]** [N/M]	

CI: confidence interval; **HbA1c$_{6.0}$**: glycosylated haemoglobin A1c 6.0% threshold; **HR**: hazard ratio;**IRR**: incidence rate ratio; **NA**: not applicable; **N/M**: fewer than 3 studies or calculation of the 95% prediction interval did not provide a meaningful estimate; **OR**: odds ratio; **T2DM**: type 2 diabetes mellitus.

GRADE Working Group grades of evidence
High quality: further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: we are very uncertain about the estimate.

[a]With phase 2 explanatory studies aiming to confirm independent associations between the prognostic factor and the outcome, GRADE starts with 'high quality' (Huguet 2013). We assumed the GRADE factor publication bias was inherent with this type of research (phase 2 design), so we did not use it as a potential downgrading factor

bDowngraded by one level because of study limitations (many studies did not adequately adjust for confounders, if at all) and by one level because of imprecision (most CIs were wide)

BACKGROUND

For a glossary of terms please see Appendix 1.

'Prediabetes', 'borderline diabetes', 'prediabetic stage', 'high risk of diabetes', 'dysglycaemia' or 'intermediate hyperglycaemia' (IH) are terms used to characterise various measurements of elevated blood glucose concentrations, such as impaired fasting glucose (IFG), impaired glucose tolerance (IGT), elevated glycosylated haemoglobin A1c (HbA1c) or combinations of these conditions (WHO/IDF 2006). Elevated blood glucose levels that indicate hyperglycaemia are too high to be considered normal, but they are below the diagnostic threshold for type 2 diabetes mellitus (T2DM). Therefore, due to the continuous glycaemic spectrum from normal to the diabetic stage, a sound evidence base is needed to define glycaemic thresholds for people at high risk of T2DM, especially because dysglycaemia is commonly an asymptomatic condition, so naturally it often remains undiagnosed (CDC 2015). The various terms used to describe stages of hyperglycaemia may cause people to have marked emotional reactions. For example, the term prediabetes may imply (at least for non-experts) that diabetes is unavoidable, whereas (high) risk of diabetes gives people the impression that they can possibly avoid the disease altogether. In addition to the disputable construct of intermediate health states termed 'predisease' (Viera 2011), many people may associate the label 'prediabetes' with dire consequences. Alternatively, any diagnosis of prediabetes may be an opportunity to reassess, for example, eating habits and physical activity levels, thus enabling affected individuals to actively change their health-related behaviours.

Several institutional bodies like the American Diabetes Association (ADA) and the World Health Organization (WHO) have established commonly used criteria to define people who are at a high risk of developing T2DM.

- In 1979, the National Diabetes Data Group (NDDG) described glucose intolerance as an intermediate metabolic state between normoglycaemia and diabetes (NDDG 1979). NDDG defined this IGT as an elevated plasma glucose concentration (7.8 mmol/L to 11.1 mmol/L or 140 mg/dL to 199 mg/dL) two hours after a 75 g glucose load on the oral glucose tolerance test (OGTT).
- In 1997, the Expert Committe on the Diagnosis and Classification of Diabetes Mellitus and later the WHO defined two intermediate states of glucose regulation existing between regular glucose homeostasis and diabetes: IGT was diagnosed two hours after a 75 g OGTT by a plasma glucose level of 7.8 mmol/L to 11.1 mmol/L (140 mg/dL to 199 mg/dL) or by the concept of IFG (ADA 1997; WHO 1999). The initial definition of IFG was a fasting plasma glucose (FPG) level of 6.1 mmol/L to 6.9 mmol/L (110 mg/dL to 125 mg/dL). In 2003, the ADA reduced the lower threshold to 5.6 mmol/L (100 mg/dL) (ADA 2003). However, the WHO did not endorse this lower cut-off point for IFG (WHO/IDF 2006).
- More recently, an elevated HbA1c has been introduced to identify people at high risk of developing T2DM. In 2009, the International Expert Committee (IEC) proposed HbA1c measurements of 6.0% to 6.4% (42 mmol/mol to 46 mmol/mol) to identify people at a high risk of T2DM (IEC 2009). In 2010, the ADA re-defined this HbA1c level as 5.7% to 6.4% (39 mmol/mol to 46 mmol/mol) (ADA 2010), a decision not endorsed by WHO, IEC or other organisations.

The various glycaemic tests do not identify the same people at risk, as there is an imperfect overlap among the glycaemic modalities available to define IH (Cheng 2006; Gosmanov 2014; Morris 2013; Selvin 2011). Unlike IFG and IGT, HbA1c reflects longer-term glycaemic control, that is, how a person's blood glucose concentrations have been during the preceding two to three months (Inzucchi 2012). Compared with IFG and IGT measurements, HbA1c assessments have less intrapersonal variability when repeated. However, haemoglobin variants, genetic haemoglobinopathies, thalassemias and iron deficiency anaemia substantially influence HbA1c measurements (Mostafa 2011). The FPG thresholds of defining IFG and the question whether HbA1c is an adequate tool to diagnose IH are still a subject of debate (Buysschaert 2011; Buysschaert 2016). In studies investigating the risk of IH as measured by HbA1c, the association is probably underestimated if time-dependent effects are not taken into account (Lind 2009). On the other hand, some investigators question whether HbA1c as such is the right outcome measure for studies of diabetes (Lipska 2017).

Also, IFG and IGT differ in their age and sex distribution, and both increase with advancing age (Nathan 2007), as glucose tolerance deteriorates with age (Gale 2013). 'Ethnicity' and geography are additional important features: the prevalence of elevated HbA1c in black people is twice as high as in non-Hispanic white people, but the opposite is true for IGT (Selvin 2011; Ziemer 2010). The number of people with IH identified in South Asian compared with European cohorts and the associated cardiovascular disease (CVD) risk depend on how prediabetes is diagnosed (Eastwood 2016).

The increase in T2DM results from an interaction between genetic and environmental factors, reflecting behavioural changes over time such as decreased physical activity levels and increased body weight (DeFronzo 2011; Nathan 2007). Both IFG and IGT are insulin-resistant states, and insulin resistance is thought to be the core defect in T2DM: people with (isolated) IFG predominantly have β-cell dysfunction with impaired insulin secretion (DeFronzo 1989), plus moderate hepatic insulin resistance, but near-normal muscle insulin sensitivity. The consequence is excessive fasting hepatic glucose production followed by elevated FPG. During an OGTT the early insulin response (0 to 30/60 min) is impaired, resulting in an excessive early rise in postload glucose (PG). The late insulin response (60 min to 120 min) appears intact and the two-hour PG returns to its approximately starting FPG level (DeFronzo 2011; Nathan 2007). People with (isolated) IGT have normal to slightly reduced hepatic insulin sensitivity and moderate to severe muscle insulin resistance (Abdul-Ghani 2006; Jensen 2002). During an OGTT both the early and the late insulin response are impaired. Hyperglycaemia is progressive and prolonged after the glucose load, and the two-hour PG remains above its starting FPG level (DeFronzo 2011; Nathan 2007).

There are some known risk indicators for the development of T2DM, including a positive family history, gestational diabetes mellitus, obesity, 'ethnicity' (e.g. the risk of diabetes is thought to be higher among Asians, Hispanics, and 'black' people), polycystic ovarian syndrome, impaired insulin secretion and insulin resistance, abnormal coagulation factors and endothelial dysfunction. However, the evidence base for the weight of a single risk indicator and the interplay of various factors is still under investigation. Type 2 diabetes mellitus is a rather complex metabolic state and could be described as an asymptomatic risk

factor for a future disease (Yudkin 2016), and hence prediabetes a risk factor for another risk factor (Nathan 2007).

Diabetes is a category, whereas IFG and IGT reflect a continuous variable with more or less arbitrarily chosen cut-off points (Yudkin 1990; Yudkin 2014). The reduced lower threshold of 5.6 mmol/L (100 mg/dL) to define IFG by the ADA in 2003 substantially increased the prevalence of IFG with potentially significant public health and socioeconomic implications (Davidson 2003; Yudkin 2014; Yudkin 2016). Some authors have argued that substantial benefits might ensue even if it were only possible to delay the onset of diabetes by detecting and treating prediabetes (Cefalu 2016). Interestingly, some people with IH will not develop T2DM, and some people will return or 'regress' to normoglycaemia. In the Diabetes Prevention Program (DPP), the hazard ratio of developing T2DM was 0.44 (95% confidence interval 0.37 to 0.55) in people having at least one normal OGTT during the DPP compared with people who never regressed to normoglycaemia during the DPP (Perreault 2012; Perreault 2014). The ADA associated regression with remission and defined it as a partial or complete diabetes remission of glycaemic measurements for at least one year without pharmacological or surgical interventions (Buse 2009). This could have significant impact on "the therapeutic strategy from diabetes prevention and lifelong glucose-lowering treatment to induction of regression and monitoring for relapse" (Yakubovich 2012).

OBJECTIVES

Objective 1: to assess the overall prognosis of people with IH for the development of T2DM and to assess how many people with IH revert back to normoglycaemia (regression).

With regard to objective 1 we established the following 'Population, Intervention, Outcome, Timing, Setting' (PICOTS) table (adapted according to the PICOTS system presented in Debray 2017).

Item	Definition
Population	People with intermediate hyperglycaemia (defined by IFG, IGT or elevated HbA1c)
Intervention	None
Comparator	None
Outcome	Development of type 2 diabetes Regression to normoglycaemia
Timing	At least 1 year follow-up
Setting	Outpatients

IFG: impaired fasting glucose; **IGT**: impaired glucose tolerance; **HbA1c**: glycosylated haemoglobin A1c

Objective 2: to assess the difference in T2DM incidence in people with IH versus people with normoglycaemia.

With regard to objective 2 we established the following PICOTS table (adapted according to the PICOTS system presented in Debray 2017).

Item	Definition
Population	People with intermediate hyperglycaemia (defined by IFG, IGT or elevated HbA1c)
Intervention	Intermediate hyperglycaemia as a prognostic factor
Comparator	Normoglycaemia
Outcome	Development of type 2 diabetes
Timing	At least one year follow-up
Setting	Outpatients

IFG: impaired fasting glucose; **IGT**: impaired glucose tolerance; **HbA1c**: glycosylated haemoglobin A1c

METHODS

Criteria for considering studies for this review

Study design

Prospective cohort studies investigating either the overall prognosis of people with IH for developing T2DM or IH versus normoglycaemia as a prognostic factor for developing T2DM (Altman 2001).

Inclusion criteria

Types of participants

To study the overall prognosis of people with IH and regression from IH to normoglycaemia, we included cohort studies in people with IH at baseline, defined by impaired fasting glucose (IFG), impaired glucose tolerance (IGT), elevated glycosylated haemoglobin A1c (HbA1c) or any combination of these. IH had to be established by standard cut-off values for IFG, IGT or elevated HbA1c, as defined by ADA or WHO (ADA 1997; ADA 2003; ADA 2010; ICH 1997; IEC 2009; WHO 1998; WHO/IDF 2006).

To study whether IH compared to normoglycaemia is a prognostic factor for developing T2DM, we included cohort studies in people with IH and normoglycaemia at baseline.

Definition of IH

We defined IH according to ADA and WHO descriptions.

- $IFG_{5.6}$ threshold, usually defined as a fasting plasma glucose level between 5.6 mmol/L and 6.9 mmol/L at baseline.
- $IFG_{6.1}$ threshold, usually defined as a fasting plasma glucose level between 6.1 mmol/L and 6.9 mmol/L at baseline.
- IGT, usually defined as a plasma glucose level between 7.8 mmol/L and 11.1 mmol/L two hours after a 75 g OGTT at baseline.
- Isolated IFG was defined as $IFG_{5.6}$ or $IFG_{6.1}$ only (without IGT), and isolated IGT was defined as IGT only (without $IFG_{5.6}$ or $IFG_{6.1}$).
- $HbA1c_{5.7}$ threshold, usually defined as HbA1c measurement between 5.7% and 6.4% at baseline.
- $HbA1c_{6.0}$ threshold, usually defined as HbA1c measurement between 6.0% and 6.4% at baseline.

Types of outcome measures

Our outcome of primary interest was the diagnosis of newly developed T2DM (T2DM incidence). T2DM incidence should have been diagnosed by blood glucose measurements such as fasting plasma glucose (FPG), two-hour postload glucose (PG) or HbA1c. Diagnosis could have been combined with self-reported diabetes, physician-diagnosed diabetes or use of antihyperglycaemic medications such as oral hypoglycaemic drugs, insulin or both.

Exclusion criteria

- Intervention trials and study designs other than prospective cohort studies.
- People with comorbidities at baseline (e.g. people with coronary heart disease and IGT).
- Missing data on transition from IH to T2DM.
- Follow-up period after baseline assessment not specified (not possible to associate T2DM incidence with length of follow-up).
- T2DM incidence evaluated by documents (e.g. hospital records, retrospective use of registers) or self-report only.

Search methods for identification of studies

The fundamental challenge of this review question was to define the population of interest, that is, people with IH. We expected a great number of terms describing this population, such as people with prediabetes, mentions of IFG, IGT or HbA1c somewhere in the title or abstract of relevant publications, and terms like risk factors, predictors, prevalence, incidence and several other concepts which cannot be foreseen when developing a Boolean search strategy in a conceptual way.

One option to address this problem would have been to design a highly sensitive search strategy, which would have resulted in a yield of more than 15,000 references, which was unfeasible for fast human screening but could be addressed in the future with robust automated classification algorithms. Instead, we designed a more specific Boolean search approach based on text analysis and augmented by the following complementary search methods.

1. Identification of systematic reviews addressing our review question.
2. Careful checking of reference lists and Discussion sections of relevant studies.
3. A non-human skill dependent search method based on PubMed's 'similar articles' algorithm.

Boolean search

We developed the search strategy using analytical text mining of 44 relevant publications (range of publication years 2008 to 2015, from 31 journals) already known to review author BR. We used the tools PubReMiner, TerMine and AntConc and applied the prognosis filters by the Hedges Team (Wilczynski 2004; Wilczynski 2005).

We searched the following sources from database inception to the specified date.

- MEDLINE Ovid Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) (1946 to 15 December 2016 and then updated to 26 February 2018).
- Embase Ovid (1974 to 2016 Week 50, last searched 15 December 2016).
- ClinicalTrials.gov (searched 15 December 2016).
- WHO International Clinical Trials Registry Platform (ICTRP) Search Portal (apps.who.int/trialsearch; searched 15 December 2016).

Before publication, we updated the MEDLINE search as reflected above. We restricted the update to MEDLINE because 98% of the publications of included studies identified up to the point of updating (on 26 February 2018) were indexed in MEDLINE.

The search strategy consisted of two tiers.

1. Prediabetes as predictor for cardiovascular disease (CVD), mortality, stroke, cancer, micro- and macrovascular complications.
2. Prediabetes as predictor for diabetes incidence.

We combined both strategies with the conjunction 'OR' because it was likely that search results for prediabetes as a predictor for complications also contained data on diabetes incidence. For details of all search strategies see Appendix 2.

Study extraction of relevant systematic reviews

In addition, we extracted relevant publications from 16 identified systematic reviews (Echouffo-Tcheugui 2016; Erqou 2013; Ford 2010; Hope 2016; Huang 2014b; Huang 2014a; Huang 2016; Lee 2012; Morris 2013; Santos-Oliveira 2011; Sarwar 2010; Schottker 2016; Twito 2015; Xu 2015; Zhang 2012a; Zhong 2016).

Reference checking of included studies

We extracted relevant publications after handsearching the full texts of included studies (Methods section, Discussion section, reference lists).

'Similar articles'-based search method

On 15 March 2018 we ran PubMed's 'similar articles' algorithm with the 224 publications of included studies identified by our search methods so far ('seed publications' in Appendix 2). When using the 'similar articles' algorithm, search results in PubMed are retrieved and ranked according to pre-calculated similarities of the seed publications. We downloaded the first 500 results (of 24,124), deduplicated them against the already identified seed publications and screened the resulting set.

Selection of studies

Two review authors (BR and BH) independently scanned the title, abstract, or both, of every record retrieved in the literature searches to determine which studies to assess further. We investigated the full text of all potentially relevant articles, resolving discrepancies through consensus or by recourse to a third review author (MIM). We prepared a flow diagram of the number of studies identified and excluded at each stage in accordance with the PRISMA flow diagram of study selection (Liberati 2009).

Data extraction and management

For studies that fulfilled our inclusion criteria, one review author (BR) extracted key study characteristics, inclusion and exclusion criteria of study participants, stated aim of the study, definitions of prognosis, prognostic factor and outcome (normoglycaemia, intermediate glycaemia and T2DM incidence), baseline characteristics of study participants and data on transition from IH (as defined by IFG, IGT, elevated HbA1c or combinations thereof) to T2DM. Another author (MIM) checked these data extractions, and we resolved any disagreements by discussion or, if required, by consultation with a third review author (BH). We used parts of the checklist for critical appraisal and data extraction for systematic **r**eviews of prediction **m**odelling **s**tudies (CHARMS), which helps to evaluate prediction modelling studies (Moons 2014), and we established our own context-specific data extraction sheets after piloting data extraction for 15 studies.

Dealing with companion publications

In the event of companion publications or multiple reports of a prospective cohort study (e.g. because of different time points investigated) we focused on the analysis of the publication describing the longest follow-up from baseline and extracted data from shorter follow-ups in case some measures were not reported in the publication on the longest follow-up (e.g. the most recent paper might have described the association between elevated HbA1c and T2DM incidence, but an older publication might have described the association between IGT and T2DM incidence). Companion publications or multiple reports of a primary study were listed as secondary references under the primary reference of the included, ongoing or excluded study.

Assessment of risk of bias in included studies

One review author (BR) assessed the risk of bias of each included study and another review author (MIM) checked the accuracy of this assessment. We resolved any disagreements by consensus, or by consultation with a third review author (BH). We used a tailored version of the Quality In Prognosis Studies (QUIPS) tool for assessing risk of bias in studies of the prognostic factor IH versus normoglycaemia (Dretzke 2014; Hayden 2013; see Appendix 3). Our tool consisted of six risk of bias domains: study participation, study attrition, glycaemic status measurement, outcome measurement, study confounding; and statistical analysis and reporting. The study participation domain consisted of five items: description of the source population or population of interest, description of the baseline study sample, adequate description of the sampling frame and recruitment, adequate description of the period and place of recruitment, and adequate description of inclusion and exclusion criteria. The study attrition domain consisted of four items: description of attempts to collect information on participants who dropped out, reasons for loss to follow-up provided, adequate description of participants lost to follow-up, and no important differences between participants who completed the study and those who did not. The glycaemic status measurement domain consisted of four items: provision of clear definition or description of the glycaemic status, adequately valid and reliable method of measuring glycaemic status, reporting of continuous variables or use of appropriate cut points, and use of same method and setting of measurement of glycaemic status in all study participants. The outcome measurement domain consisted of three items: provision of clear definition of the outcome, use of adequately valid and reliable method of outcome measurement, and use of same method and setting of outcome measurement in all study participants. The study confounding domain consisted of the seven items: measurement of all important confounders, provision of clear definitions of the important confounders measured, adequately valid and reliable measurement of all important confounders, use of same method and setting of confounding measurement in all study participants, appropriate imputation methods used for missing confounders (if applicable), important potential confounders accounted for in the study design, and important potential confounders accounted for in the analysis. The statistical analysis and reporting domain consisted of two items: sufficient presentation of data to assess the adequacy of the analytic strategy, and adequate statistical model for the design of the study. There is no recommended tool for assessing risk of bias in studies of overall prognosis. Therefore, we applied the tailored QUIPS tool to these studies as well but without the domains for study confounding and statistical analysis and

reporting because these were not suitable to basic calculations of cumulative incidence. We planned to investigate the influence of low risk of bias (low risk of bias in all domains) versus unclear/high risk of bias (unclear or high risk of bias in at least one of these domains).

Measures of T2DM incidence and unit of analyses issues

If more than one group from the same cohort study was eligible for inclusion in the same meta-analysis, we included the groups only if separate information was available (e.g. data on T2DM incidence for female and male participants). If more than one time point of T2DM was available for a study (e.g. cumulative incidence data) we included data in the appropriate meta-analysis for each time point separately and did not pool data across different follow-up periods.

Data synthesis

Our primary aim for overall prognosis in people with IH was to provide a transparent overview of the whole data matrix describing a wide variety of possible associations between various isolated and combined definitions of IH and incident T2DM in dissimilar populations covering diverse time periods. We also evaluated whether IH compared to normoglycaemia is a prognostic factor for developing T2DM.

First, we grouped studies on IH definitions, i.e. isolated IFG 5.6 mmol/L to 6.9 mmol/L (**$IFG_{5.6}$ threshold**), isolated IFG 6.1 mmol/L to 6.9 mmol/L (**$IFG_{6.1}$ threshold**), isolated **IGT** (glucose concentration 7.8 mmol/L to 11.1 mmol/L two hours after a 75 g glucose load on the OGTT), **IFG and IGT** combined, HbA1c 6.0% to 6.4% (**$HbA1c_{6.0}$ threshold**), and HbA1c 5.7% to 6.4% (**$HbA1c_{5.7}$ threshold**). Then we evaluated subgroups of different geographic locations/'ethnicities' for each IH definition.

We expected the following outcome measures.

- Cases (cumulative incidence at follow-up; e.g. 20 new diabetes cases out of 400 people with IFG at baseline (5%)) and cumulative incidence rates (cases per 1000 person-years) for overall prognosis of people with IH.
- Odds ratios (ORs), incidence rate ratios (IRRs), and hazard ratios (HRs) for IH versus normoglycaemia as a prognostic factor for developing T2DM.

We pooled incidence and incidence rate ratios (IRR) using a random-effects model to account for between-study heterogeneity. For meta-analysis of incidence data, we used a method for pooling proportions which uses the Freeman-Tukey Double Arcsine Transformation to stabilise the variances (Freeman 1950). The meta-analysis was performed using the Stata software user written programme metaprop (Stata 2015). For the confidence intervals (CI) for individual studies shown on the forest plots for incidence, we used the Wilson approach (Newcombe 1998). For meta-analysis of IRRs, we first computed the log IRRs and their approximate standard errors and then used an inverse variance weighted random-effects model to pool the log IRRs (Hasselblad 1994; Higgins 2011b). We exponentiated the pooled log IRR to obtain the pooled IRR. The meta-analysis of log IRRs was performed using the Stata user written programme metan.

If publications reported HRs with associated 95% CIs, we obtained standard errors from these CIs as described in chapter 7.7.7.3 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011a), and we performed meta-analysis using the generic inverse-variance method (RevMan 2014). When possible, we reported both adjusted and unadjusted HRs, but we primarily used adjusted HRs from multivariable models of studies incorporating similar covariates (Dretzke 2014).

Assessment of heterogeneity

We expected substantial clinical heterogeneity between studies because of geographical/'ethnic' and methodological diversity. We did not intend to address statistical heterogeneity (inconsistency) using the I^2 statistic because this statistic does not indicate how much the effect size varies, which is what people want to know when asking about the implications of heterogeneity (Borenstein 2017a). Also, the I^2 statistic is problematic in the context of prognosis studies because individual studies often have large sample sizes resulting in narrow CIs, which can result in high I^2 values even if inconsistency between studies is moderate (Iorio 2015). Instead, when there were at least three studies, we reported the range of the effects of the random-effects meta-analyses using prediction intervals (Borenstein 2017b; Higgins 2009; IntHout 2016; Riley 2011; Riley 2015). In a random-effects meta-analysis, the prediction interval reflects the whole distribution of effects across study populations, including the effect expected in a future study (IntHout 2016; Riley 2015).

Certainty of the evidence

We created a 'Summary of findings' table using Review Manager 5 (RevMan 2014). We used an adapted version of the GRADE framework for prognostic factor research for describing the influence of IFG, IGT, elevated HbA1c and both IFG and IGT on the development of T2DM (Huguet 2013). We justified all decisions to downgrade the certainty of evidence using footnotes, and we made comments to aid the reader's understanding of this Cochrane Review where necessary.

Sensitivity analysis

We planned to perform sensitivity analyses to explore the influence of the following factors (when applicable) on effect sizes by excluding:

- studies at high or unclear risk of bias;
- very long or large studies to establish the extent to which they dominate the results.

Subgroup analysis

Because we stratified the analyses by IH definition and geographical locations/'ethnicity', which we thought were the main sources of heterogeneity, we did not plan to perform subgroup analyses. However, if at least 10 studies specifying diabetes incidence data were included, we would have investigated age and sex by testing for interactions between subgroups.

If T2DM incidence data were available for children and adolescents, we reported the results separately.

RESULTS

Description of studies

Results of the search

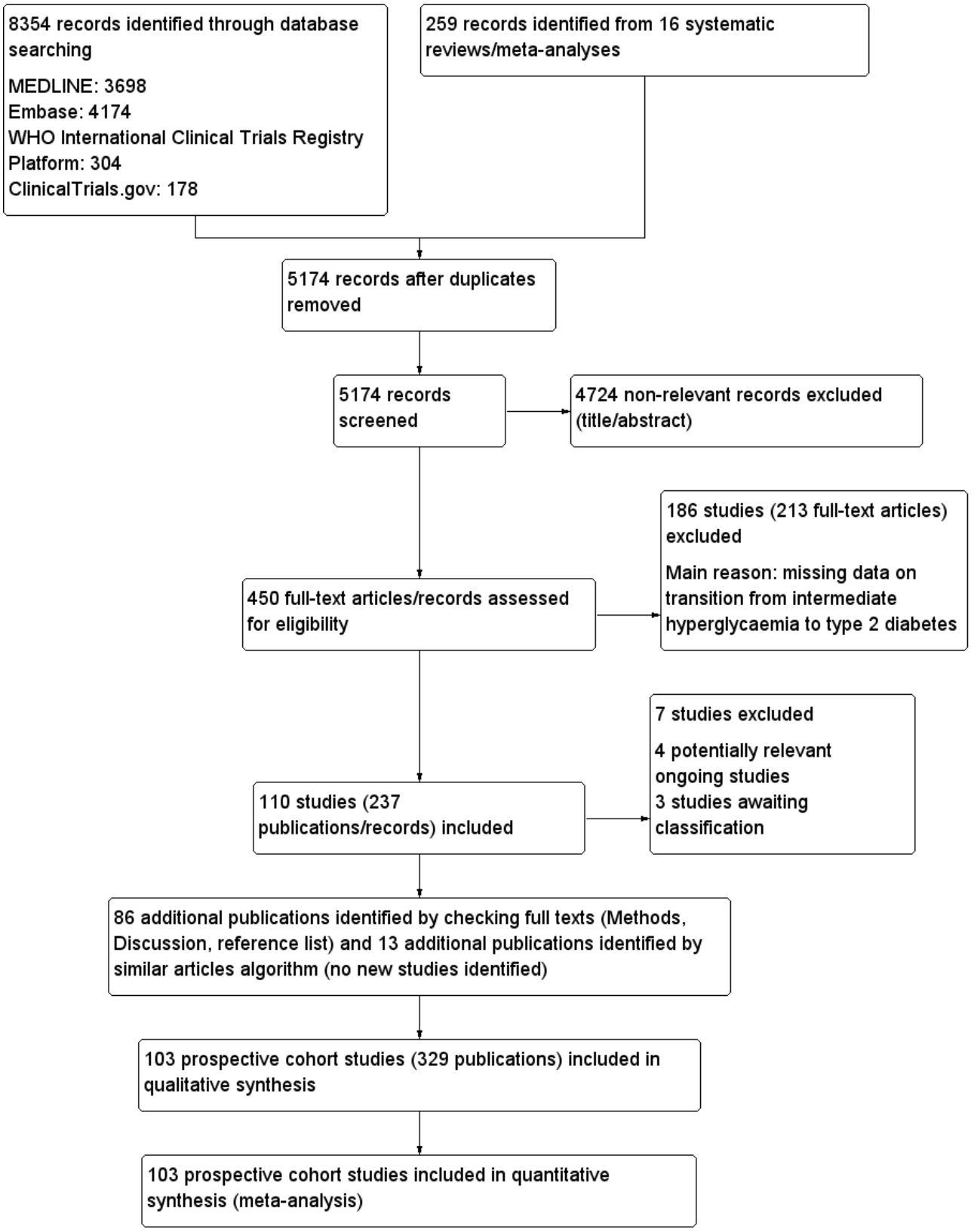
We identified a total of 8354 records through database searching and an additional 259 records from 16 systematic reviews. After excluding duplicates and non-relevant records based on title and abstract screening, we assessed 450 full-text records. Of these we excluded 213 full-text articles; the remaining 237 articles were reports of 110 studies. Of the 110 studies, 4 were potentially relevant ongoing trials (NCT00786890; NCT02838693; NCT02958579; Vilanova 2017), and 3 are awaiting classification (Li 2001; Misnikova 2011; NCT00816608). Therefore, we included 103 studies. We added 86 new publications after handsearching the full texts of included studies, but these were all secondary publications of the included studies.

The complementary 'similar articles' algorithm search using our set of known publications yielded 263 publications for screening after deduplication. This resulted in 24 new publications after excluding irrelevant articles based on title and abstract screening. We did not identify new studies but found 13 secondary publications of studies we had already included.

Altogether, we included 103 prospective cohort studies (329 publications) in the review. After the initial search in four databases (in December 2016), we observed that 98% of all included publications were indexed in Ovid MEDLINE. Therefore, we decided to restrict the pre-publication update search in February 2018 to Ovid MEDLINE.

For full details of search results see Figure 1.

Figure 1. Study flow diagram



Included studies

For a detailed description of the characteristics of the included studies, see Characteristics of included studies; Appendix 4; Appendix 5; Appendix 6; Appendix 7; Appendix 8; Appendix 9; Appendix 10; Appendix 11; Appendix 12; Appendix 13; Appendix 14; Appendix 15; Appendix 16; and Appendix 17. The following is a succinct overview.

Source of data

The 103 studies took place in the following regions of the world.

- Australia: 3 studies.
- Latin America: 7 studies (Chile, 1 study; Columbia, 1 study; Mexico, 5 studies (2 studies with primarily Mexican Americans took place in the USA (Garcia 2016; Lorenzo 2003)).
- North America: 12 studies (USA ,12 studies, with 4 studies in particular populations: Pima Indians/Native Americans, 3 studies (Vijayakumar 2017; Wang 2011; Wheelock 2016); and Japanese Americans, 1 study (McNeely 2003)).
- Africa: 1 study (performed in South Africa but with a population consisting of South African Indians (Motala 2003)).
- Middle East: 7 studies (Iran, 5 studies; Israel, 1 study; Jordan, 1 study).
- Asia: 42 studies (China, 11 studies; India, 5 studies; Japan, 8 studies; Korea, 11 studies; Singapore, 2 studies; Taiwan, 2 studies; Thailand, 3 studies).
- Islands: 2 studies (Mauritius, 1 study; Micronesia (Nauru), 1 study).
- Europe: 29 studies (Denmark, 1 study; Finland, 5 studies; France, 3 studies; Germany, 3 studies; Greece, 1 study; Italy, 3 studies; Malta, 1 study; Spain, 3 studies; Sweden, 3 studies; Netherlands, 4 studies; UK, 2 studies). One study in the Netherlands included a mixed population of South-Asian Surinamese participants, African Surinamese participants and "Ethnic Dutch" participants (Admiraal 2014).

Fifty-eight studies contributed most of the data (Appendix 4).

Measurements of overall prognosis of people with IH and of the prognostic factor IH versus normoglycaemia

Of the 103 included studies, 17 evaluated the overall prognosis of people with IH for the development of type 2 diabetes mellitus without a normoglycaemic comparison group. Of these studies, six recruited participants with IFG at baseline (Baena-Diez 2011; Gautier 2010; Lecomte 2007; Leiva 2014; Levitzky 2008; Sharifi 2013), six recruited participants with IGT at baseline (Kleber 2010; Kleber 2011; Ko 1999; Marshall 1994; Rajala 2000; Ramachandran 1986), two recruited a mixed IFG/IGT cohort (Rasmussen 2008; Toshihiro 2008), and three recruited participants with various definitions of IH (Kim 2014; Lee 2016; Song 2016a). In addition, 76 studies with a normoglycaemic comparison group contributed data to evaluate the overall prognosis of people with IH by means of cumulative incidence. Therefore, analysis of overall prognosis is based on 93 studies.

Fifty-two studies assessed the prognostic effect of IH versus normoglycaemia for the development of type 2 diabetes mellitus and provided outcome measures as ratios (hazard ratio (HR), incidence rate ratio (IRR) and/or odds ratio (OR)). Forty-seven studies explicitly defined normoglycaemia, often by a combination of FPG thresholds and two hour post-load glucose thresholds (Anjana 2015; Baena-Diez 2011; Bergman 2016; Chen 2003; Chen 2017; Coronado-Malagon 2009; Den Biggelaar 2016; Derakhshan 2016; Dowse 1991; Forouhi 2007; Guerrero-Romero 2006; Heianza 2012; Janghorbani 2015; Jaruratanasirikul 2016; Kim 2005; Ko 1999; Ko 2001; Larsson 2000; Lecomte 2007; Leiva 2014; Li 2003; Ligthart 2016; Lipska 2013; Liu 2014; Liu 2017; Lyssenko 2005; Magliano 2008; Man 2017; Meigs 2003; Motala 2003; Motta 2010; Mykkänen 1993; Nakanishi 2004; Peterson 2017; Qian 2012; Rajala 2000; Rathmann 2009; Rijkelijkhuizen 2007; Sasaki 1982; Soriguer 2008; Toshihiro 2008; Vaccaro 1999; Valdes 2008; Viswanathan 2007; Wang 2011; Wat 2001; Weiss 2005; Yeboah 2011). In the remaining studies, it was evident that normoglycaemia reflected the population with neither IH nor T2DM at baseline.

IH was commonly defined by the $IFG_{5.6}$ threshold (FPG level 5.6 mmol/L to 6.9 mmol/L or 100 mg/dL to 125 mg/dL), $IFG_{6.1}$threshold (FPG level 6.1 mmol/L to 6.9 mmol/L or 110 mg/dL to 125 mg/dL), IGT (plasma glucose concentration 7.8 mmol/L to 11.1 mmol/L or 140 mg/dL to 199 mg/dL two hours after a 75 g glucose load on the OGTT), or combinations of these criteria (Appendix 5; Appendix 6). Sixty-six studies used an OGTT at baseline as part of the strategy to assess glycaemic status, and 46 studies used OGTT at baseline and follow-up (Appendix 5).

Twelve studies defined IH by applying the $HbA1c_{5.7}$ threshold (HbA1c 5.7% to 6.4% or 39 mmol/mol to 46 mmol/mol) (Bae 2011; Cederberg 2010; Han 2017; Heianza 2012; Kim 2014; Kim 2016a; Lee 2016; Lipska 2013; Man 2017; Nakagami 2016; Vijayakumar 2017; Warren 2017), and 10 studies used the $HbA1c_{6.0}$ threshold (HbA1c 6.0% to 6.4% or 42 mmol/mol to 46 mmol/mol) (Bae 2011; Bonora 2011; Chamnan 2011; Han 2017; Heianza 2012; Kim 2016a; Nakagami 2016; Sato 2009; Wang 2011; Warren 2017).

Overview of study populations

Sixty-nine studies (67%) started recruitment after 1990 (see Characteristics of included studies), and overall follow-up ranged from 1 year in Bai 1999, Coronado-Malagon 2009 and Kleber 2010 to 24 years in Bergman 2016 (see Characteristics of included studies; Appendix 7).

Depending on the phase of the study, the number of participants differed. The first phase of every study often constituted a large epidemiological investigation of, for example, the importance of various risk factors for cardiovascular health; in total, more than 250,000 participants began the studies (Appendix 8). The number of participants with IH depended on how the studies defined this condition at baseline and the way they measured the development of T2DM.

The overall prognosis of participants with IH at baseline and across all follow-up times (1 to 20 years) was based on the following data (Table 1).

- $IFG_{5.6}$: 13,692 participants.
- $IFG_{6.1}$: 9943 participants.
- IGT: 13,728 participants.
- Both IFG and IGT: 2434 participants.
- $HbA1c_{5.7}$: 9758 participants.
- $HbA1c_{6.0}$: 2529 participants.

Follow-up time across all measures of IH at baseline had the following number of participants per year of follow-up (in parentheses, number of people with IH who regressed to normoglycaemia); see Table 1.

- 1 year: 878 (375) participants.
- 2 years: 3882 (2852) participants.
- 3 years: 3014 (1356) participants.
- 4 years: 9388 (807) participants.
- 5 years: 16,275 (2603) participants.
- 6 years: 2573 (1328) participants.
- 7 years: 3209 (679) participants.
- 8 years: 3293 (328) participants.
- 9 years: 1588 (299) participants.
- 10 years: 5425 (894) participants.
- 11 years: 1655 (736) participants.
- 12 years: 3574 (no data) participants.
- 15 years: 70 (no data) participants.
- 20 years: 114 (no data) participants.

Data on the prognostic factor IH versus normoglycaemia for the development of T2DM were based on the following number of participants with IH at baseline (Table 2). Data were reported by ratio measures (HR, IRR, OR).

- $IFG_{5.6}$: 42,694 participants.
- $IFG_{6.1}$: 12,507 participants.
- IGT: 25,617 participants.
- Both IFG and IGT: 6160 participants.
- $HbA1c_{5.7}$: 8094 participants.
- $HbA1c_{6.0}$: 6126 participants.
- Both $HbA1c_{5.7}$ and $IFG_{5.6}$: 3761 participants.

The mean age of adult participants at baseline ranged from 30 years to 77 years (Appendix 9). In two studies all the participants were female (De Abreu 2015; Larsson 2000), and in eight studies all the participants were male (Charles 1997; Lecomte 2007; Nakanishi 2004; Park 2006; Sato 2009; Stengard 1992; Toshihiro 2008; Zethelius 2004). The body mass index (BMI) of the participants at baseline ranged from 23.2 kg/m^2 to 39.1 kg/m^2. A family history of diabetes was reported in 3% to 100% of the study participants.

At baseline, 60 studies (58%) reported diastolic and systolic blood pressure; 43 studies (22%), smoking status; 66 studies (64%), FPG; 24 studies (23%), HbA1c; 44 studies (43%), two-hour glucose measurements; 7 studies (7%), medications; 26 studies (25%), comorbidities; 20 studies (19%), hypertension; and 5 studies (5%), dyslipidaemia (Appendix 10).

Categorisation of studies

In order to address the complexity of our dataset with regard to factors potentially influencing the definition, detection and development of T2DM, such as genetics, environmental and social conditions, the way risk factors and T2DM incidence were measured, and access to health care (Avilés-Santa 2016; De Rekeneire 2007; Herman 2012; Likhari 2010; Maruthur 2011; Parrinello 2016) – with all of these features interacting to some degree – we choose to provide the reader with a broad overview mainly focusing on geographic regions in the following way.

Groups consisted of participants from studies taking place in Australia, Europe or North America; people from Latin America; individuals from Asia or the Middle East; and American (Pima) Indians and Pacific/Indian Ocean islanders ('American Indians/Islands' group). The logic of grouping participants in the last cohort together resided in the fact that they shared some characteristics relevant to T2DM, including a considerable genetic background risk, historic isolation from outside communities with substantial influence from Western diets, or both (Hanson 2014; Jowett 2009; Nair 2015; Serjeantson 1983).

For 41 studies, we categorised the origin of participants as 'Australia/Europe/North America' (Admiraal 2014; Baena-Diez 2011; Bonora 2011; Cederberg 2010; Chamnan 2011; Charles 1997; Cugati 2007; De Abreu 2015; Den Biggelaar 2016; Filippatos 2016; Forouhi 2007; Gautier 2010; Hanley 2005; Kleber 2010; Kleber 2011; Larsson 2000; Lecomte 2007; Levitzky 2008; Ligthart 2016; Lipska 2013; Lyssenko 2005; Magliano 2008; Marshall 1994; McNeely 2003; Meigs 2003; Motta 2010; Mykkänen 1993; Peterson 2017; Rajala 2000; Rasmussen 2008; Rathmann 2009; Rijkelijkhuizen 2007; Schranz 1989; Soriguer 2008; Stengard 1992; Vaccaro 1999; Valdes 2008; Warren 2017; Weiss 2005; Yeboah 2011; Zethelius 2004).

For seven studies, we categorised the origin of participants as 'Latin America' (Coronado-Malagon 2009; Ferrannini 2009; Garcia 2016; Gomez-Arbelaez 2015; Guerrero-Romero 2006; Leiva 2014; Lorenzo 2003). Although Garcia 2016 and Lorenzo 2003 took place in the USA, they included primarily Mexican Americans, hence the rationale for this categorisation.

We categorised 50 studies as 'Asia/Middle East' (Aekplakorn 2006; Ammari 1998; Anjana 2015; Bae 2011; Bai 1999; Bergman 2016; Chen 2003; Chen 2017; Derakhshan 2016; Han 2017; Heianza 2012; Inoue 1996; Janghorbani 2015; Jaruratanasirikul 2016; Jeong 2010; Jiamjarasrangsi 2008a; Kim 2005; Kim 2008; Kim 2014; Kim 2016a; Ko 1999; Ko 2001; Latifi 2016; Lee 2016; Li 2003; Liu 2008; Liu 2014; Liu 2016; Liu 2017; Man 2017; Mohan 2008; Motala 2003; Nakagami 2016; Nakanishi 2004; Noda 2010; Park 2006; Qian 2012; Ramachandran 1986; Sadeghi 2015; Sasaki 1982; Sato 2009; Sharifi 2013; Shin 1997; Song 2015; Song 2016a; Toshihiro 2008; Viswanathan 2007; Wang 2007; Wat 2001; Wong 2003). Of these, 37 studies recruited participants from China, Japan, South Korea, Singapore, Taiwan and Thailand (Aekplakorn 2006; Bae 2011; Chen 2003; Chen 2017; Han 2017; Heianza 2012; Inoue 1996; Jaruratanasirikul 2016; Jeong 2010; Jiamjarasrangsi 2008a; Kim 2005; Kim 2008; Kim 2014; Kim 2016a; Ko 1999; Ko 2001; Lee 2016; Li 2003; Liu 2008; Liu 2014; Liu 2016; Liu 2017; Man 2017; Nakagami 2016; Nakanishi 2004; Noda 2010; Park 2006; Qian 2012; Sasaki 1982; Sato 2009; Shin 1997; Song 2015; Song 2016a; Toshihiro 2008; Wang 2007; Wat 2001; Wong 2003), 5 studies recruited participants from India (Anjana 2015; Bai 1999; Mohan 2008; Ramachandran 1986; Viswanathan 2007), 1 study involved Indian-South African participants (Motala 2003), and 7 studies recruited participants from Iran, Israel and Jordan (Ammari 1998; Bergman 2016; Derakhshan 2016; Janghorbani 2015; Latifi 2016; Sadeghi 2015; Sharifi 2013).

We categorised the origin of participants as 'American Indians/Islands' in five studies. Three of the five studies had American

Indians as participants (Vijayakumar 2017; Wang 2011; Wheelock 2016), one included Mauritians (Söderberg 2004), and the remaining study included Nauruans (Dowse 1991).

Six studies included black participants (Admiraal 2014; Bergman 2016; Hanley 2005; Söderberg 2004; Warren 2017; Yeboah 2011), representing 25% to 47% of all participants in these studies.

Six studies included children, adolescents or both as participants (Jaruratanasirikul 2016; Kleber 2010; Kleber 2011; Vijayakumar 2017; Weiss 2005; Wheelock 2016).

Measurement of the development of T2DM

Almost all studies combined criteria to define incident T2DM, using indicators such as FPG of 7.0 mmol/L or more, two-hour postload glucose level of 11.1 mmol/L or more, HbA1c of 6.5% or more, receipt of antidiabetic medication, physician diagnosis or self-report.

Of the 103 included studies, 64 included FPG of 7.0 mmol/L or more, and 52, two-hour postload glucose level of 11.1 mmol/L or more, in their definition of incident T2DM. Eighteen studies used HbA1c as part of the definition of T2DM, typically an HbA1c level of 6.5% or more. One study defined T2DM incidence based only on an HbA1c level of 6.5% or more (Lee 2016). In 34 studies, antidiabetic treatment comprised part of the definition of T2DM, and in 15 studies physician diagnosis or self-report was part of the T2DM incidence definition.

Risk of bias in included studies

For details on the QUIPS tool and the risk of bias of the included studies see Appendix 3 and Characteristics of included studies. The results are summarised below separately for studies that provided data on overall prognosis for people with IH and on IH versus normoglycaemia as a prognostic factor.

a) Overall prognosis of people with IH for the development of T2DM and b) regression from IH to normoglycaemia

There were 93 studies providing data on cumulative incidence. Figure 2 summarises the risk of bias results across all studies, while the results for each study are shown in Figure 3 and Figure 4 (split into two figures because of the large number of studies). We evaluated the first four risk of bias domains (i.e. study participation, study attrition, glycaemic status measurement, outcome measurement) of the QUIPS tool.

Figure 2. Risk of bias graph for studies of overall prognosis of people with intermediate hyperglycaemia for developing type 2 diabetes: review authors' judgements about each risk of bias item presented as percentages across all included studies

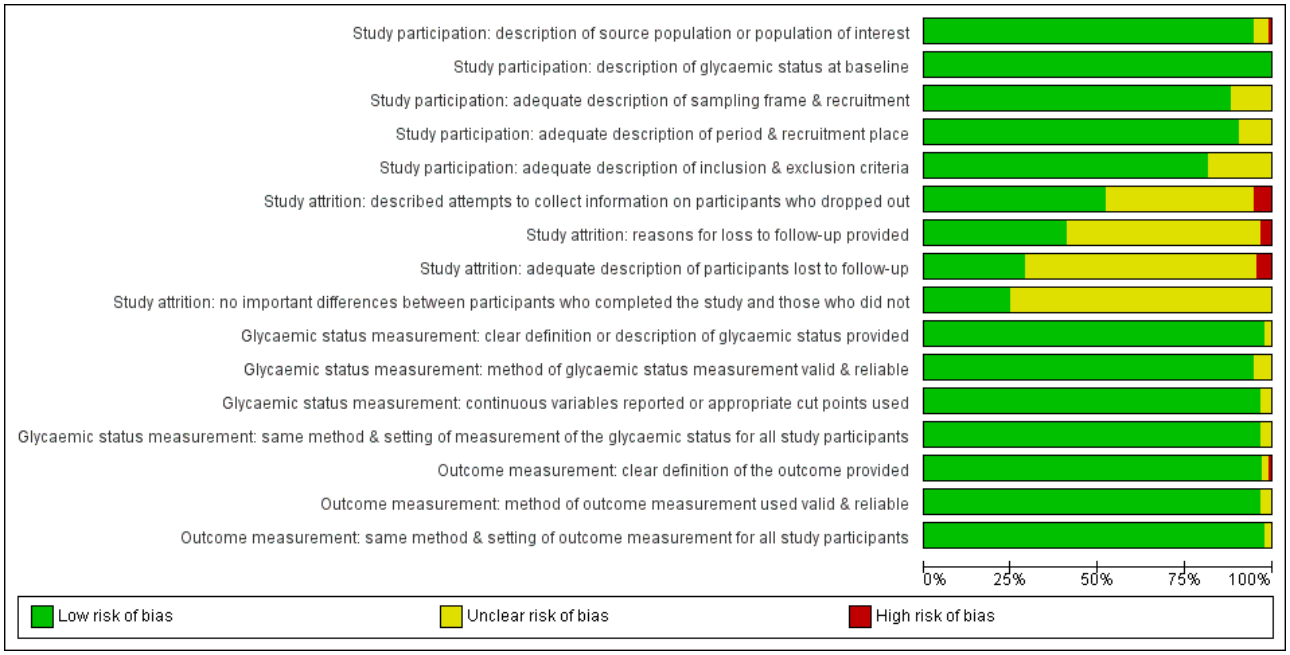


Figure 3. 'Risk of bias' summary for studies of overall prognosis in people with intermediate hyperglycaemia for developing type 2 diabetes: review authors' judgements about each risk of bias item for each included study (part 1). The summary was split into part 1 (Figure 3) and part 2 (Figure 4) for better legibility

Figure 3. (Continued)

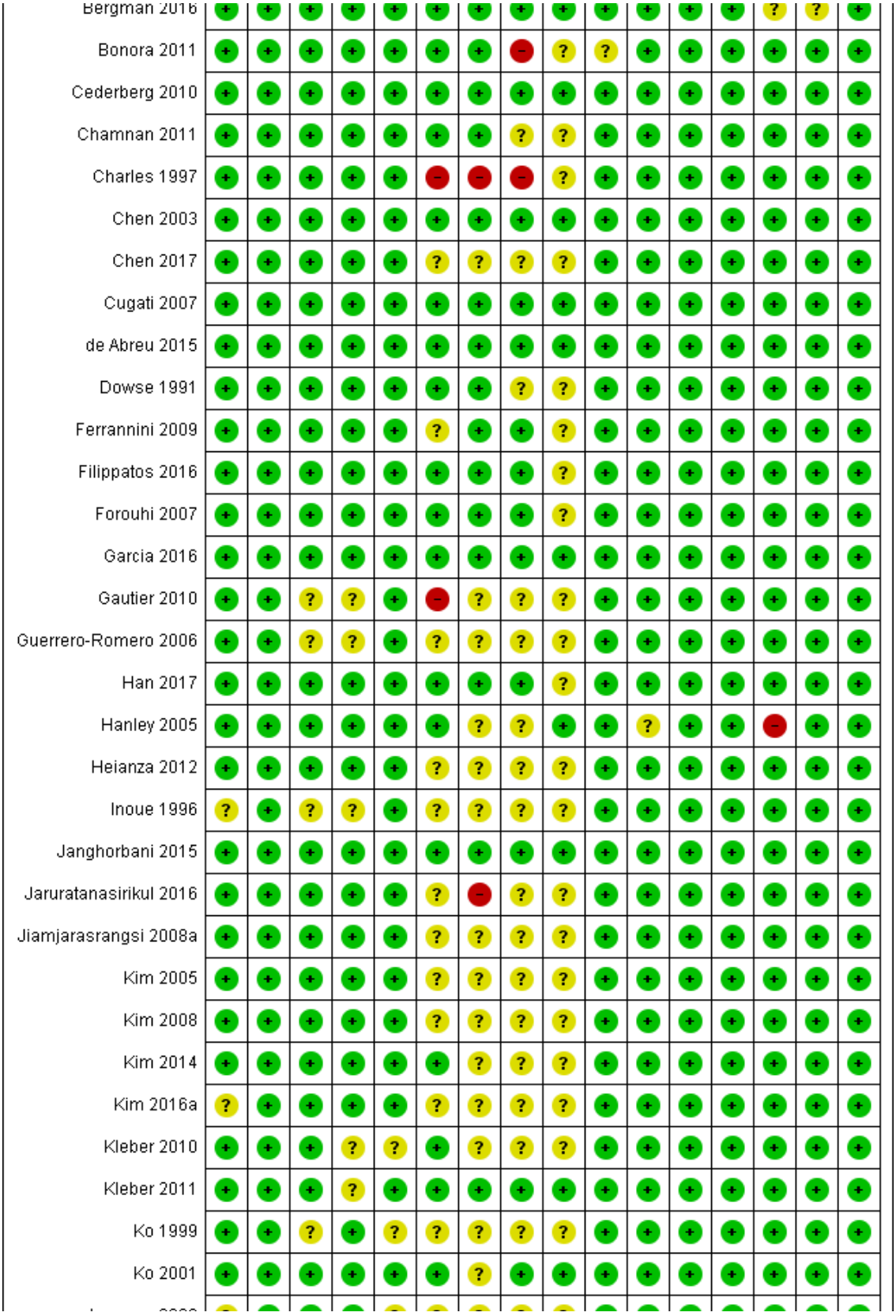


Figure 3. (Continued)

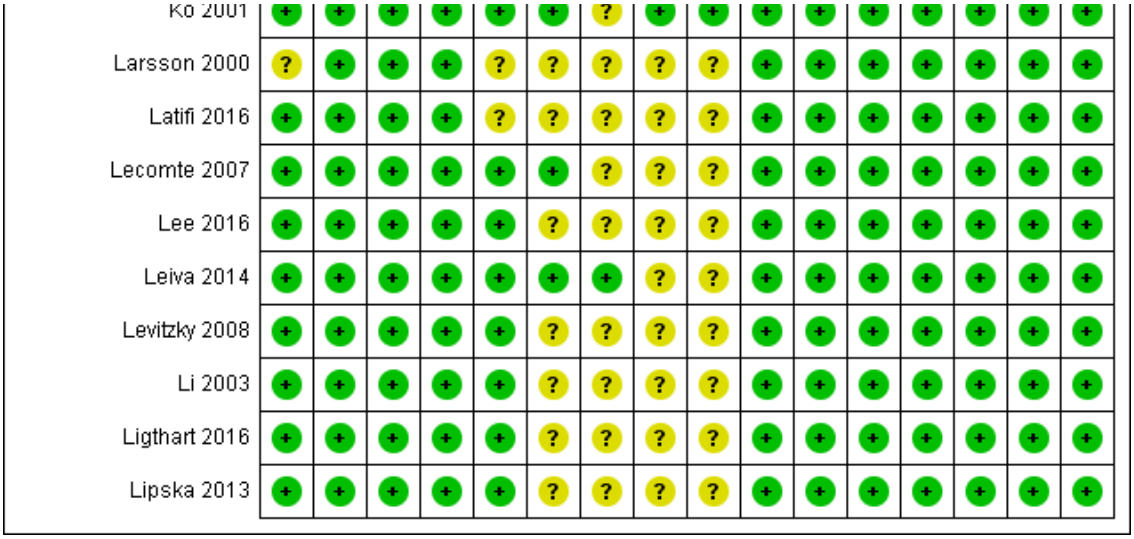


Figure 4. Risk of bias summary for studies of overall prognosis of people with intermediate hyperglycaemia for developing type 2 diabetes: review authors' judgements about each risk of bias item for each included study (part 2)

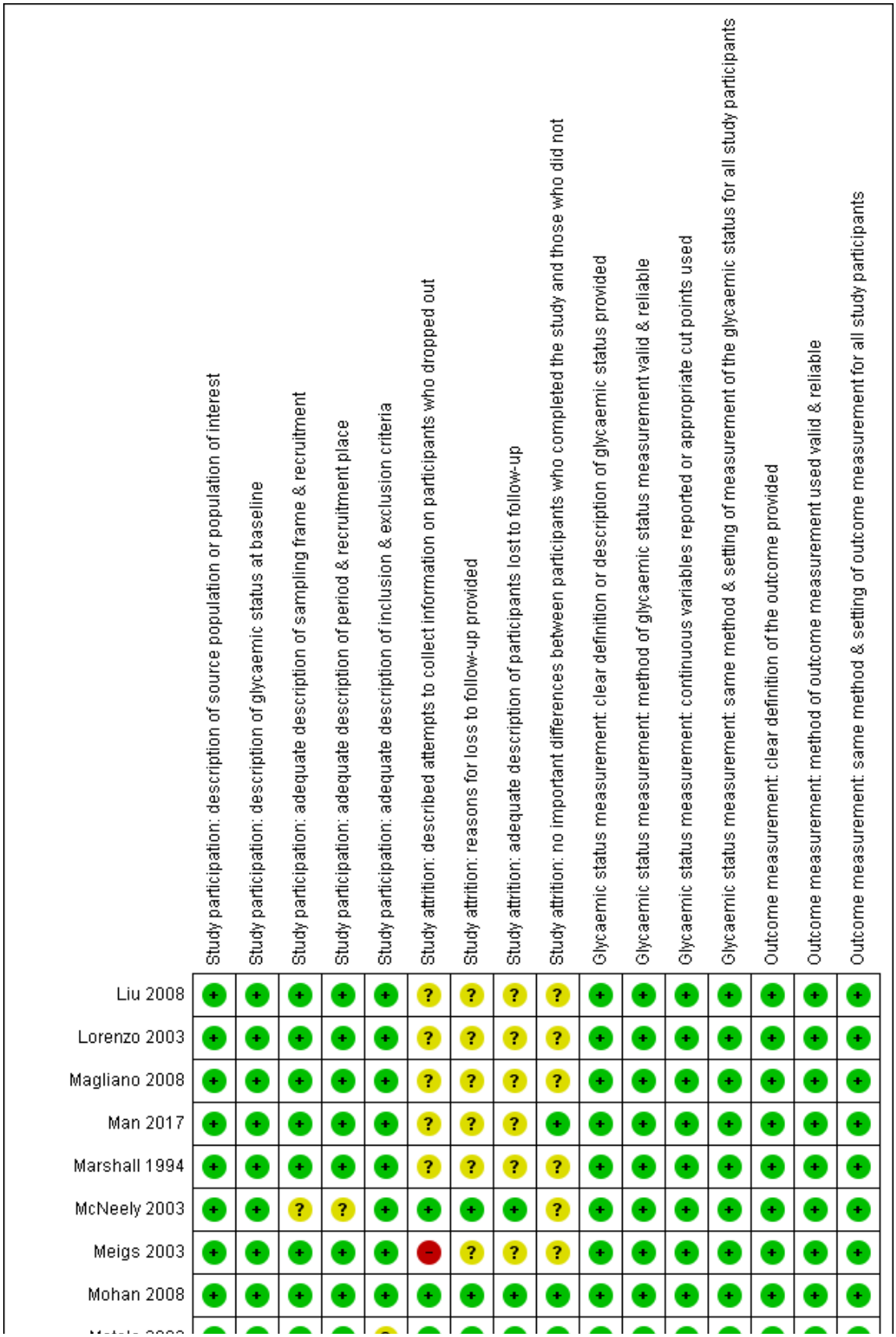
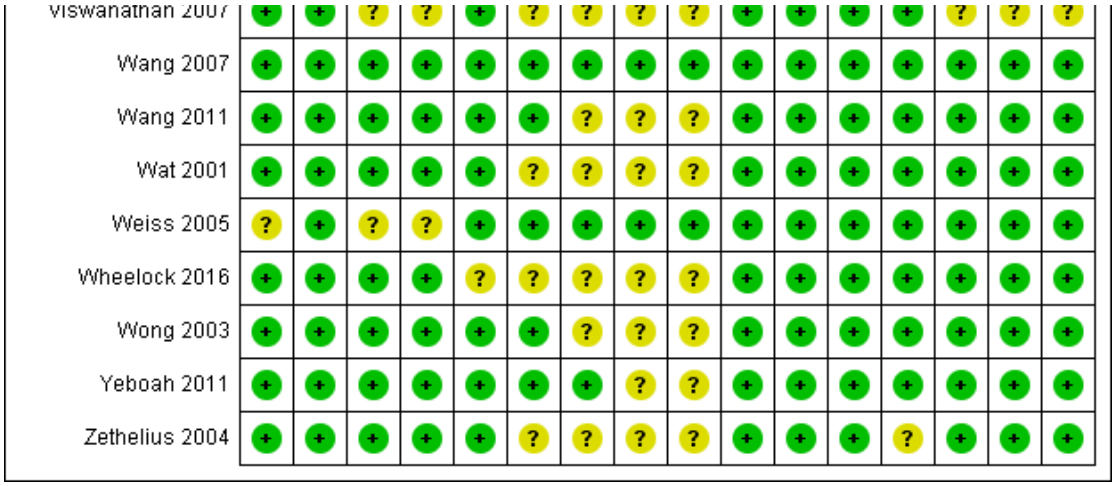


Figure 4. (Continued)

Figure 4. (Continued)



Study participation

Study authors described the five items in this domain sufficiently in most (65 studies; 70%) included studies. Eleven studies did not adequately characterise the sampling frame and/or recruitment procedures (Bae 2011; Baena-Diez 2011; Gautier 2010; Guerrero-Romero 2006; Inoue 1996; Ko 1999; McNeely 2003; Ramachandran 1986; Schranz 1989; Viswanathan 2007; Weiss 2005). One study was at high risk of bias for the item 'description of the source population or population of interest' (Ramachandran 1986).

Study attrition

Forty-eight studies attempted to collect information on participants who were lost to follow-up, while 40 studies were at unclear risk of bias and five studies were at high risk of bias (Ammari 1998; Bai 1999; Charles 1997; Gautier 2010; Meigs 2003).

In most (61 studies; 66%) of the studies we could not identify the reasons for loss to follow-up or adequate descriptions of these participants. Five studies were at high risk of bias for one or both of the items (Anjana 2015; Bai 1999; Bonora 2011; Charles 1997; Jaruratanasirikul 2016).

Only 23 studies (25%) provided information on potentially important differences between participants who completed the studies and those who did not.

Glycaemic status measurement

Study authors described these items sufficiently in 85 studies (91%). One study did not describe three of the four items ('clear definition of the outcome provided', 'adequately valid and reliable method of measurement', and 'continuous variables reported or appropriate cut points used') in enough detail (Shin 1997).

Outcome measurement

Study authors described the three items sufficiently in 89 studies (96%). One study was at high risk of bias for the item 'provision of clear definition of the outcome' (Hanley 2005).

c) Development of T2DM in people with IH as compared to people with normoglycaemia

There were 52 studies comparing IH with normoglycaemia as a prognostic factor for T2DM. Figure 5 shows the results for the six domains summarised across studies, and the result for each study is shown in Figure 6.

Figure 5. Risk of bias graph for studies of intermediate hyperglycaemia versus normoglycaemia as a prognostic factor for developing type 2 diabetes: review authors' judgements about each risk of bias item presented as percentages across all included studies

Figure 6. Risk of bias summary for studies of intermediate hyperglycaemia versus normoglycaemia as a prognostic factor for developing type 2 diabetes: review authors' judgements about each risk of bias item for each included study

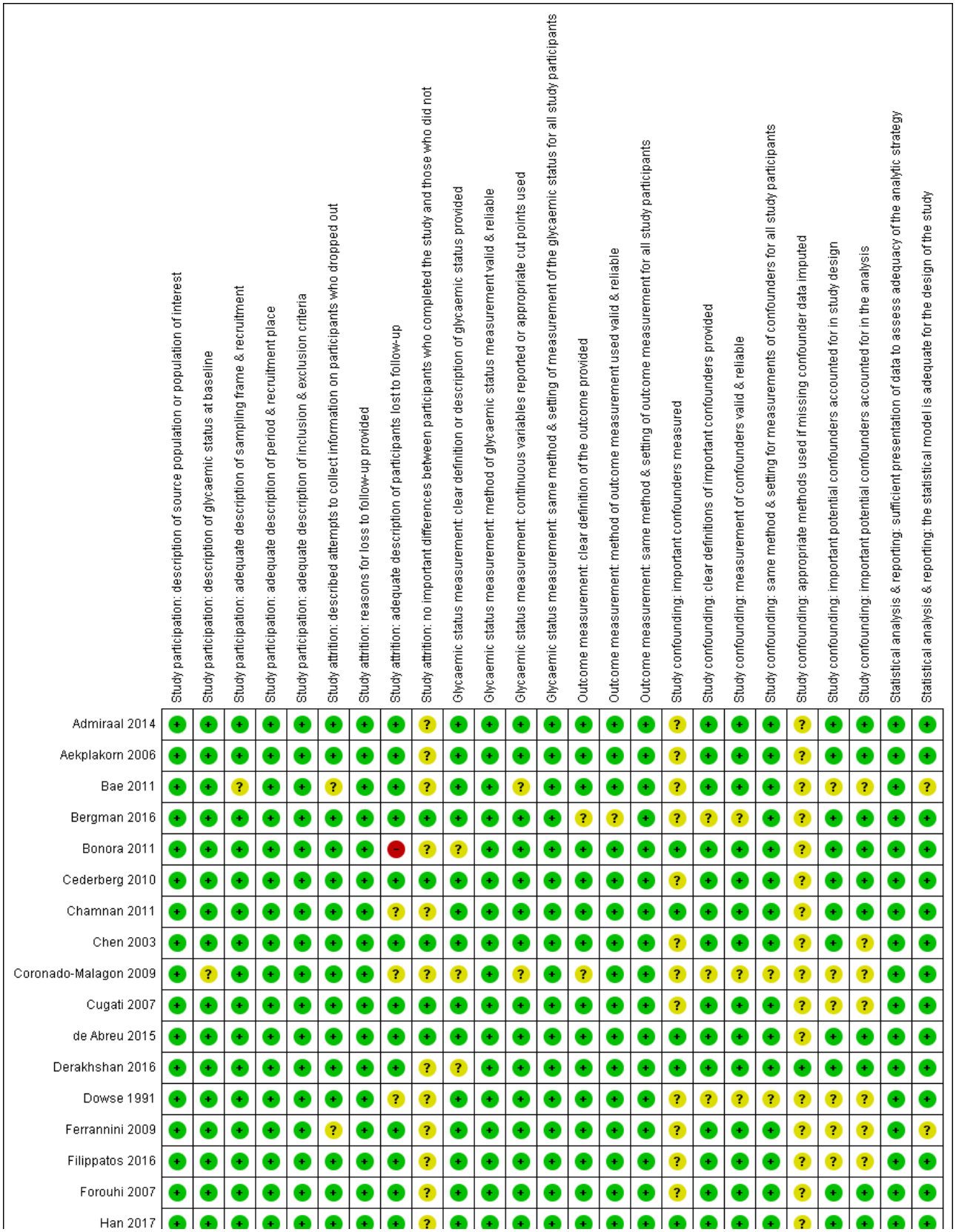
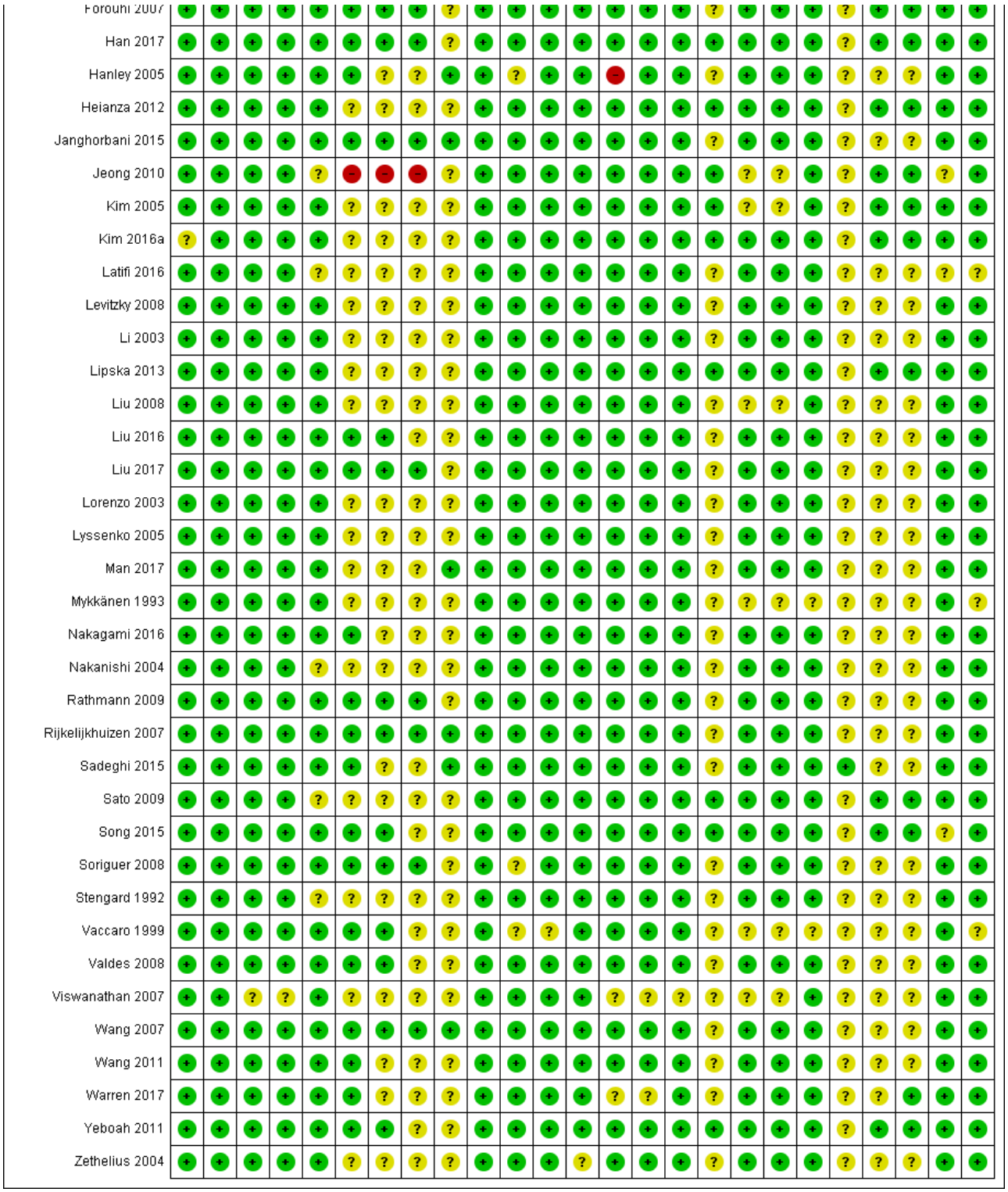


Figure 6. (Continued)



Fourteen studies provided data on multivariable HRs of T2DM incidence, adjusted for 2 to 13 covariates (Bae 2011; Bonora 2011; Forouhi 2007; Han 2017; Heianza 2012; Janghorbani 2015; Kim 2005; Li 2003; Liu 2016; Lyssenko 2005; Nakagami 2016; Wang 2011; Warren 2017; Yeboah 2011). Whenever possible, we used the reported model with the greatest number of covariates.

Study participation

Study authors described the items of this domain sufficiently in most (42 studies; 82%) of the included studies. Two studies did not adequately characterise the sampling frame and/or recruitment procedures (Bae 2011; Viswanathan 2007).

Study attrition

Study authors usually described these items sufficiently and attempted to collect information on participants who were lost to follow-up. However, in most (32 studies; 63%) of the included studies we could not identify the reasons for losses to follow-up or adequate descriptions of these participants. Only 10 studies (20%) provided information on potentially important differences between participants who completed the studies and those who did not. Two studies were at high risk of bias on one of the four items (Bonora 2011; Jeong 2010).

Glycaemic status measurement

Study authors described the items sufficiently in 40 (78%) studies.

Outcome measurement

Study authors described these items sufficiently in 46 studies (90%). One study had a high risk of bias for the item 'clear definition of the outcome provided' (Hanley 2005).

Study confounding

Only one study described all items sufficiently (Derakhshan 2016).

It was difficult to judge study confounding because the number of important covariates measured was limited. If studies analysed data by means of multivariable regression models, they often adjusted these analyses taking into account several covariates: age (43 out of 52 studies), anthropometric measures such as BMI (33 out of 52 studies), sex (31 out of 52 studies), family history of diabetes (24 out of 52 studies), smoking status (24 out of 52 studies), blood pressure/hypertension (19 out of 52 studies), triglycerides (18 out of 52 studies), cholesterol (17 out of 52 studies), physical activity (14 out of 52 studies), drinking status (12 out of 52 studies), socioeconomic status (8 out of 52 studies), 'ethnicity' (5 out 52 studies), medications (3 out of 52 studies) and renal function (1 study); for details see Appendix 16 and Appendix 17.

Twenty studies (39%) adjusted their analyses for age, sex and anthropometric measures (e.g. BMI or waist circumference) (Admiraal 2014; Bergman 2016; Bonora 2011; Chamnan 2011; Chen 2003; Derakhshan 2016; Forouhi 2007; Han 2017; Heianza 2012; Janghorbani 2015; Kim 2005; Kim 2016a; Li 2003; Man 2017; Sadeghi 2015; Soriguer 2008; Valdes 2008; Wang 2011; Warren 2017; Yeboah 2011). Six studies (12%) adjusted for age, sex, anthropometric measures and physical activity (Bonora 2011; Derakhshan 2016; Forouhi 2007; Han 2017; Kim 2016a; Yeboah 2011), and five studies (10%) also included smoking status (Bonora 2011; Derakhshan 2016; Forouhi 2007; Han 2017; Kim 2016a). When used, covariates were usually clearly defined and measured. However, only two studies reported an imputation method for missing confounders (Derakhshan 2016; Sadeghi 2015).

Statistical analysis and reporting

Study authors addressed this domain sufficiently in 44 studies (86%).

Development of T2DM in people with IH

In the following we report the results of the analyses for the overall prognosis of people with IH as well as regression from IH to normoglycaemia, and the effects of glycaemic status (IH versus normoglycaemia) as a prognostic factor for T2DM.

Definition of IH at baseline

Studies defined IH as follows.

- $IFG_{5.6}$ threshold, usually defined as a fasting plasma glucose level of 5.6 mmol/L to 6.9 mmol/L.
- $IFG_{6.1}$ threshold, usually defined as a fasting plasma glucose level of 6.1 mmol/L to 6.9 mmol/L.
- IGT, usually defined as a plasma glucose level of 7.8 mmol/L to 11.1 mmol/L two hours after a 75 g OGTT.
- Isolated IFG was defined as $IFG_{5.6}$ or $IFG_{6.1}$ alone, without IGT, and isolated IGT was defined as IGT alone, without $IFG_{5.6}$ or $IFG_{6.1}$.
- $HbA1c_{5.7}$ threshold, usually defined as HbA1c measurement of 5.7% to 6.4%.
- $HbA1c_{6.0}$ threshold, usually defined as HbA1c measurement of 6.0% to 6.4%.

Depending on how investigators measured IH, the following number of study cohorts provided information on T2DM incidence associated with glycaemic status at baseline (one study might have investigated several associations between glycaemic status and T2DM incidence within the same study, for example, one cohort with $IFG_{5.6}$, another cohort with $IFG_{6.1}$ and a third cohort with IGT).

- $IFG_{5.6}$/isolated $IFG_{5.6}$: 27/10 study cohorts.
- $IFG_{6.1}$/isolated $IFG_{6.1}$: 22/9 study cohorts.
- IGT/isolated IGT: 39/18 study cohorts.
- Combined IFG and IGT: 15 study cohorts.
- $HbA1c_{5.7}$: 7 study cohorts.
- $HbA1c_{6.0}$: 10 study cohorts.
- Combined $HbA1c_{5.7}$ and $IFG_{5.6}$: 3 study cohorts.

a) Overall prognosis of people with IH for developing T2DM

Irrespective of the definition of IH at baseline, the cumulative incidence of T2DM seemed to increase with length of follow-up, though there was no obvious linear trend. There was no clear pattern of differences between geographic regions.

IH defined by $IFG_{5.6}$ mmol/L threshold

Diabetes incidence associated with $IFG_{5.6}$ at baseline and follow-up periods from 2 to 12 years showed pooled cumulative incidences of 2% to 38% (Figure 7; Figure 8).

Figure 7. Impaired fasting glucose 5.6 mmol/L ($IFG_{5.6}$) threshold: association with cumulative type 2 diabetes mellitus (T2DM) incidence over 2–5 years
***Isolated $IFG_{5.6}$**
CI: confidence interval; M: men; n/N: events/number of participants; W: women

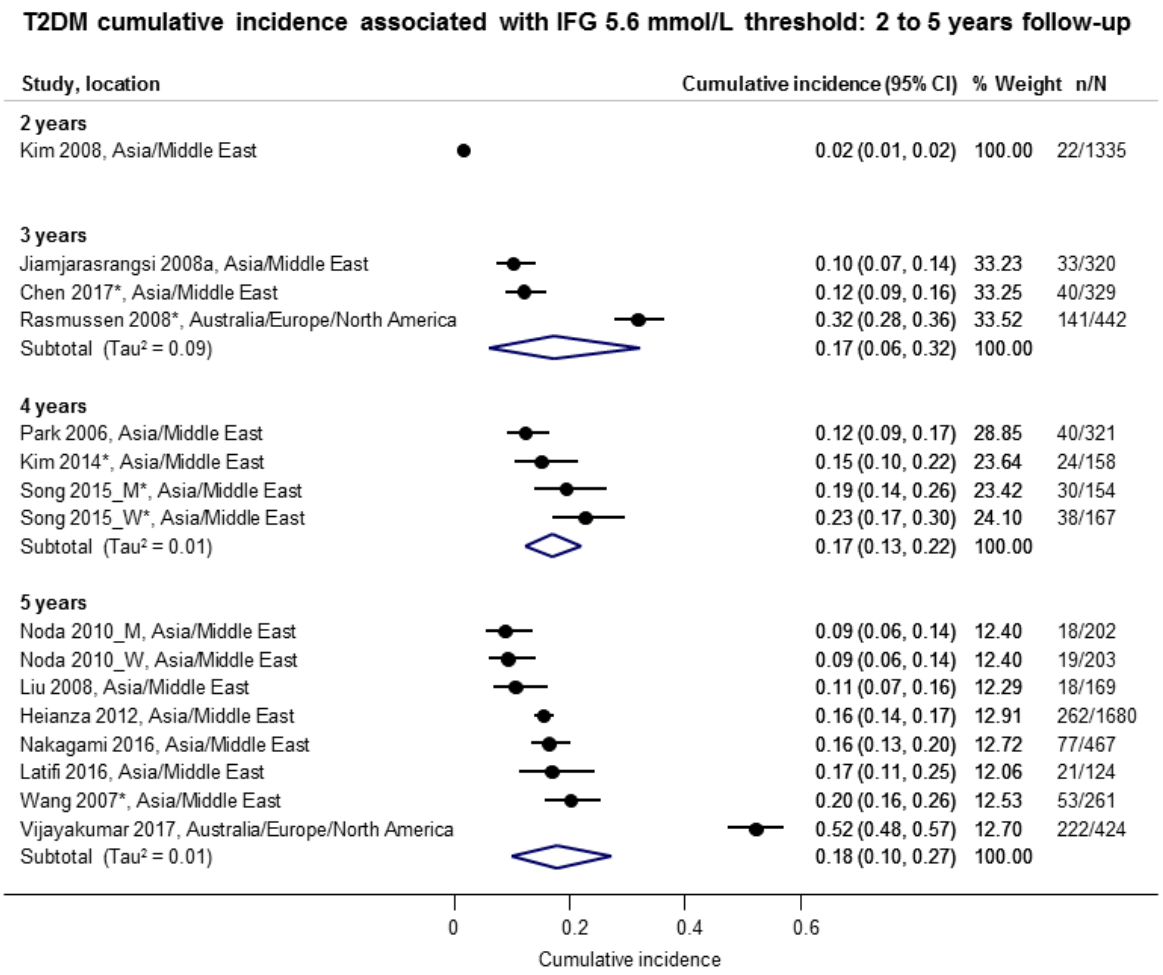
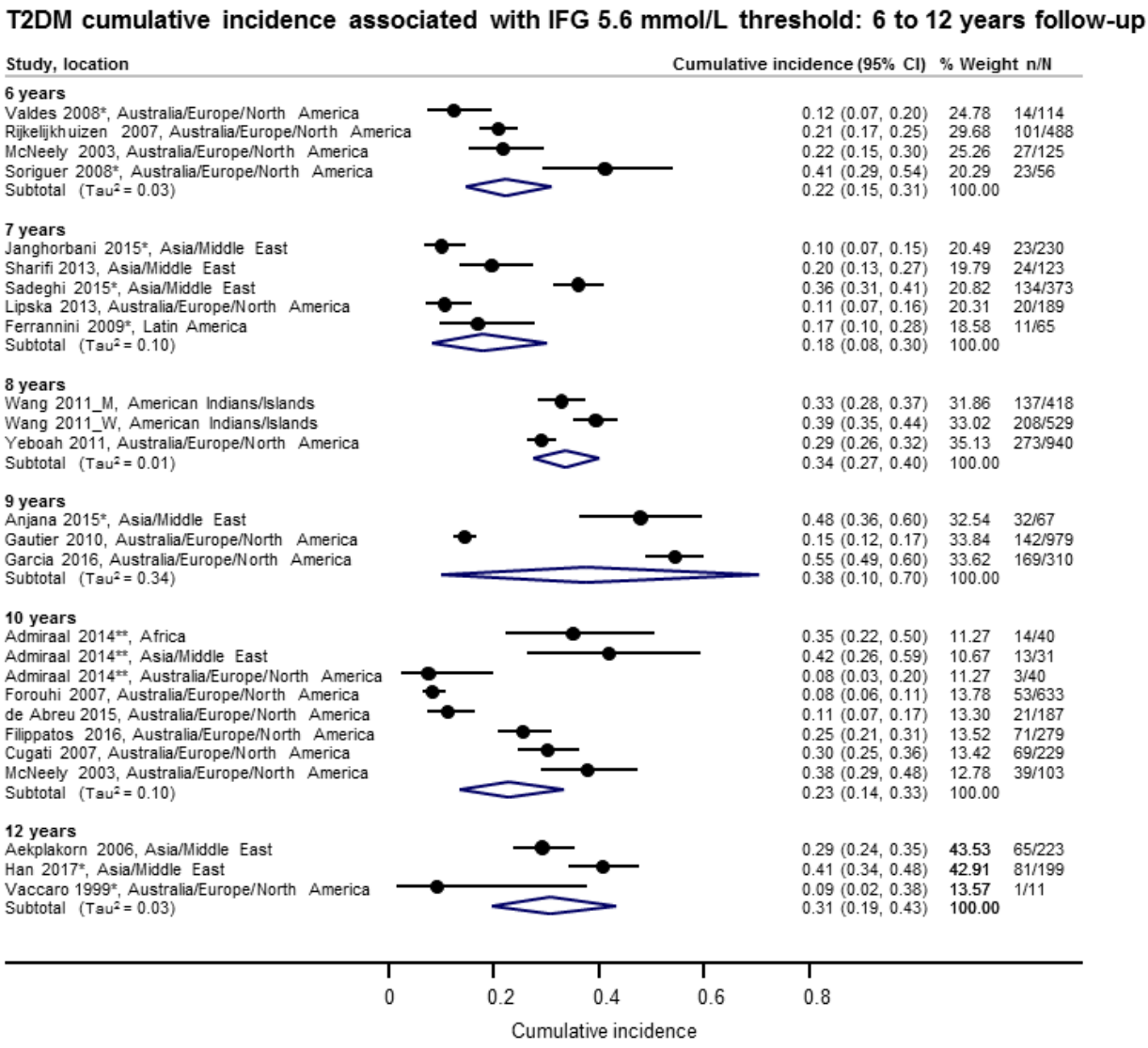


Figure 8. Impaired fasting glucose 5.6 mmol/L ($IFG_{5.6}$) threshold: association with cumulative type 2 diabetes mellitus (T2DM) incidence over 6–12 years
***Isolated $IFG_{5.6}$**
****'Africa': African Surinamese cohort, 'Asia': Asian Surinamese cohort, 'Australia/Europe/North America': 'ethnic Dutch' cohort.**
CI: confidence interval; M: men; n/N: events/number of participants; W: women



The number of studies and participants, and the cumulative incidence of T2DM (pooled if more than one study) according to follow-up period were as follows.

- 2 years' follow-up: 1 study, 1335 participants, cumulative incidence 2% (95% confidence interval (CI) 1 to 2).
- 3 years' follow-up: 3 studies, 1091 participants, cumulative incidence 17% (95% CI 6 to 32).
- 4 years' follow-up: 3 studies, 800 participants, cumulative incidence 17% (95% CI 13 to 22).
- 5 years' follow-up: 7 studies, 3530 participants, cumulative incidence 18% (95% CI 10 to 27).
- 6 years' follow-up: 4 studies, 783 participants, cumulative incidence 22% (95% CI 15 to 31).
- 7 years' follow-up: 5 studies, 980 participants, cumulative incidence 18% (95% CI 8 to 30).
- 8 years' follow-up: 2 studies, 1887 participants, cumulative incidence 34% (95% CI 27 to 40).
- 9 years' follow-up: 3 studies, 1356 participants, cumulative incidence 38% (95% CI 10 to 70).

- 10 years' follow-up: 6 studies, 1542 participants, cumulative incidence 23% (95% CI 14 to 33).
- 12 years' follow-up: 3 studies, 433 participants, cumulative incidence 31% (95% CI 19 to 34).

IH defined by $IFG_{6.1}$ mmol/L threshold

Diabetes incidence, as associated with $IFG_{6.1}$ at baseline and a follow-up period of 2 to 15 years, showed pooled cumulative incidences of 9% to 48% (Figure 9; Figure 10).

Figure 9. Impaired fasting glucose 6.1 mmol/L ($IFG_{6.1}$) threshold: association with cumulative type 2 diabetes mellitus (T2DM) incidence over 2–5 years
***Isolated $IFG_{6.1}$**
CI: confidence interval; M: men; n/N: events/number of participants; W: women

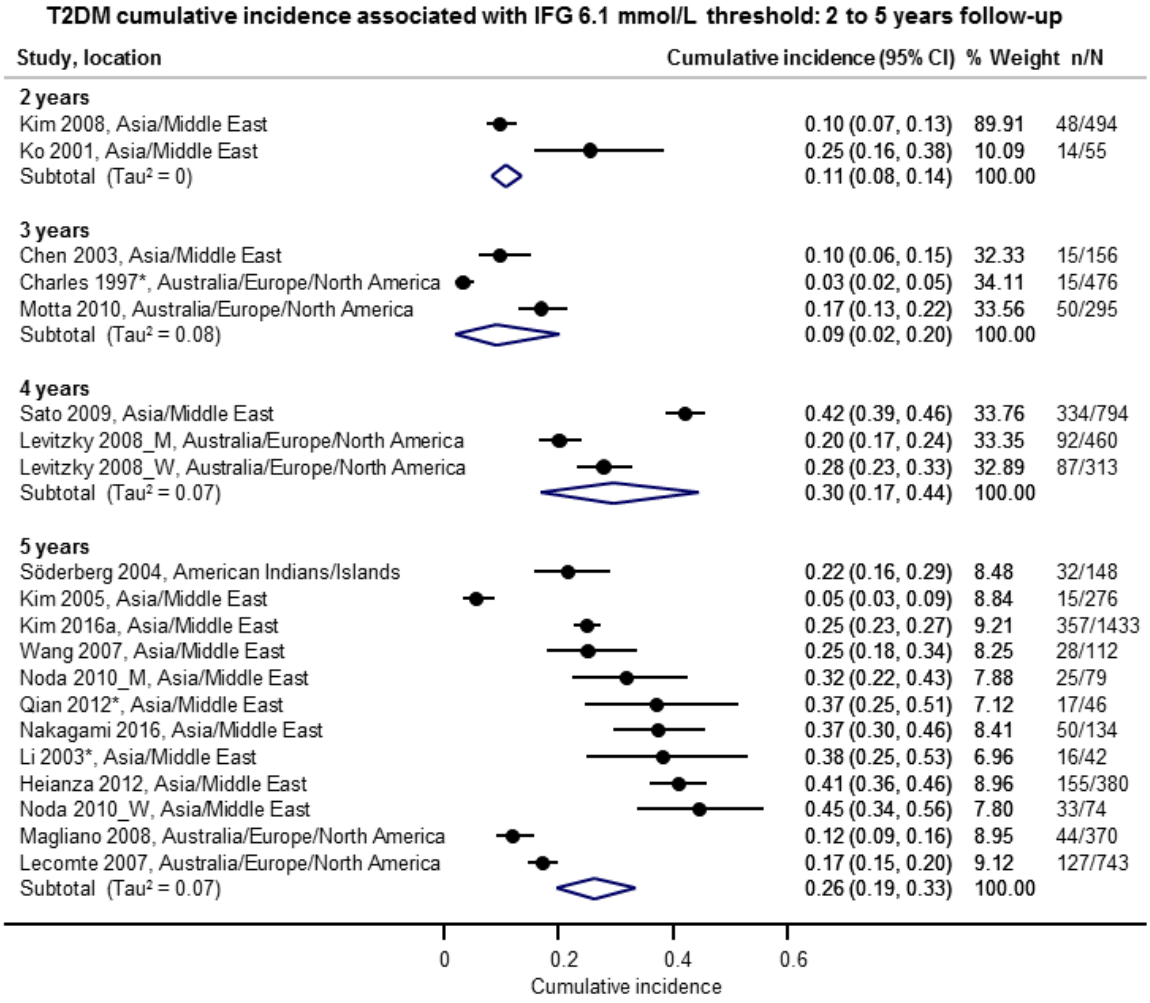
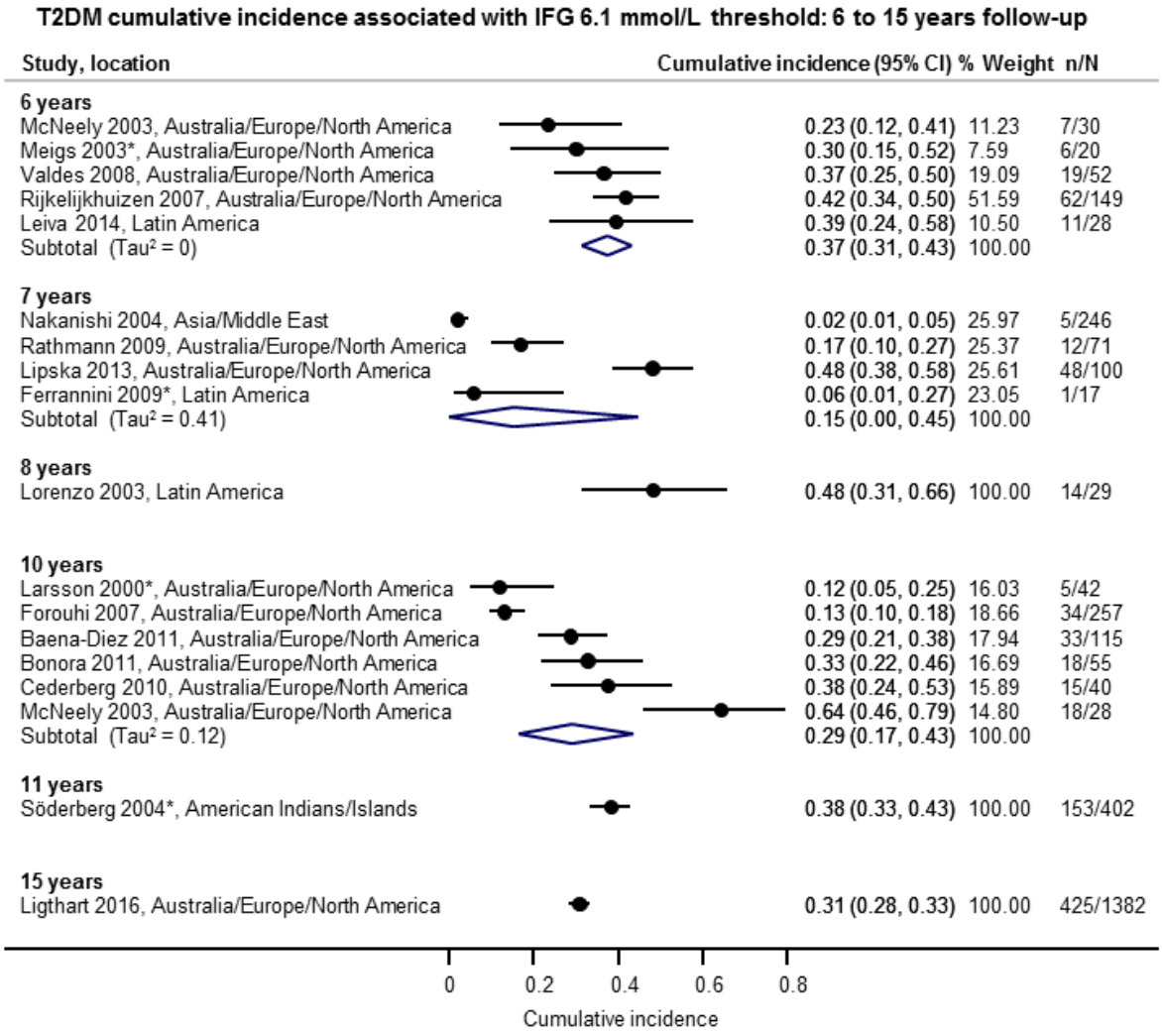


Figure 10. Impaired fasting glucose 6.1 mmol/L ($IFG_{6.1}$) threshold: association with cumulative type 2 diabetes mellitus (T2DM) incidence over 6–15 years
***Isolated $IFG_{6.1}$**
CI: confidence interval; n/N: events/number of participants



The number of studies and participants, and the cumulative incidence of T2DM (pooled if more than one study) according to follow-up period were as follows.

- 2 years' follow-up: 2 studies, 549 participants, cumulative incidence 11% (95% CI 8 to 14).
- 3 years' follow-up: 3 studies, 927 participants, cumulative incidence 9% (95% CI 2 to 20).
- 4 years' follow-up: 2 studies, 1567 participants, cumulative incidence 30% (95% CI 17 to 44).
- 5 years' follow-up: 11 studies, 3837 participants, cumulative incidence 26% (95% CI 19 to 33).
- 6 years' follow-up: 5 studies, 279 participants, cumulative incidence 37% (95% CI 31 to 43).
- 7 years' follow-up: 4 studies, 434 participants, cumulative incidence 15% (95% CI 0 to 45).
- 8 years' follow-up: 1 study, 29 participants, cumulative incidence 48% (95% CI 31 to 66).
- 10 years' follow-up: 6 studies, 537 participants, cumulative incidence 29% (95% CI 17 to 43).
- 11 years' follow-up: 1 study, 402 participants, cumulative incidence 38% (95% CI 33 to 43).
- 15 years' follow-up: 1 study, 1382 participants, cumulative incidence 31% (95% CI 28 to 33).

IH defined by IGT

Diabetes incidence associated with IGT at baseline showed pooled cumulative incidences of 13% to 60% after a follow-up period of 1 to 20 years (Figure 11; Figure 12).

Figure 11. Impaired glucose tolerance (IGT): association with cumulative type 2 diabetes mellitus (T2DM) incidence over 1–5 years
***Isolated IGT**
CI: confidence interval; n/N: events/number of participants

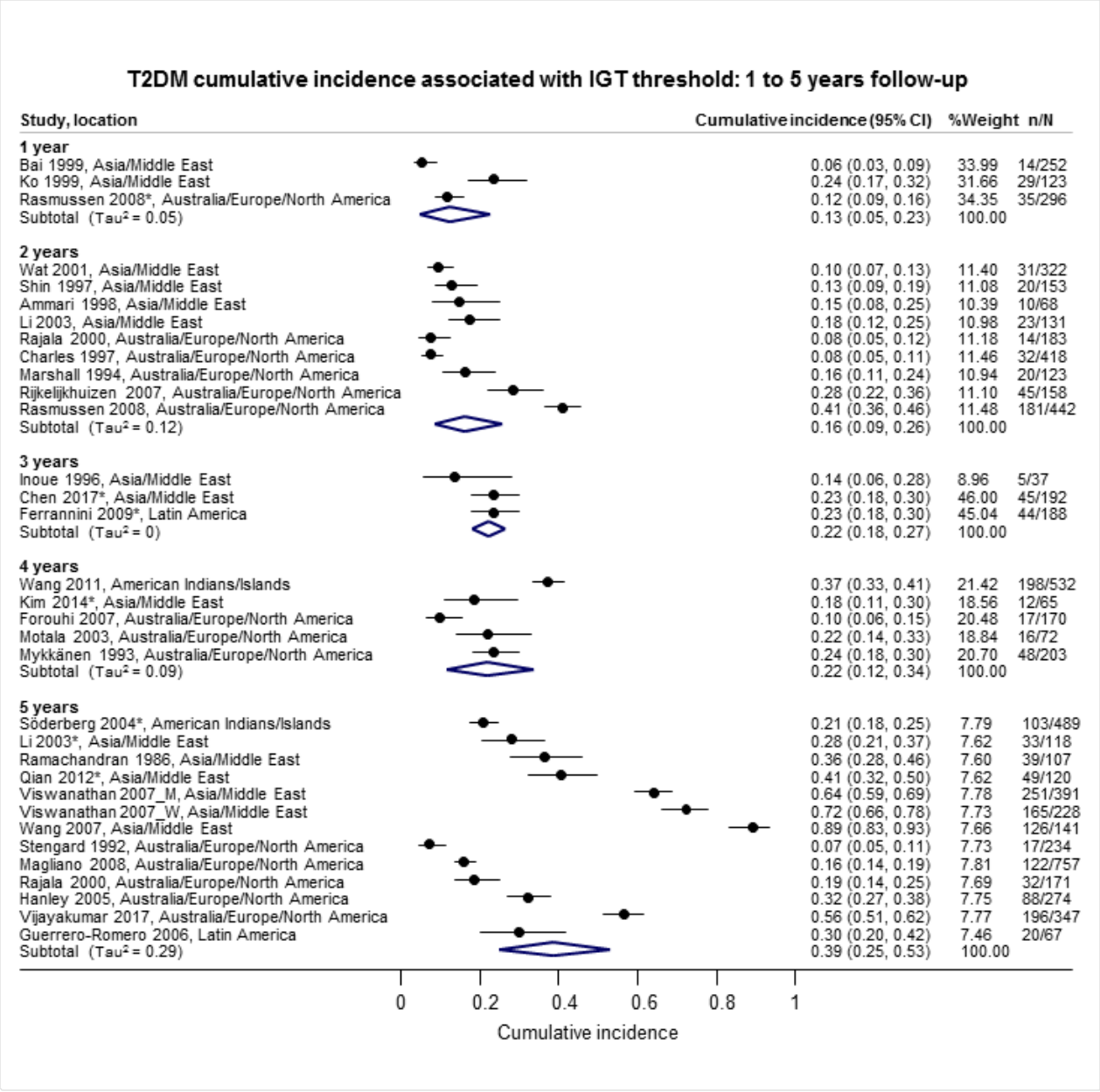
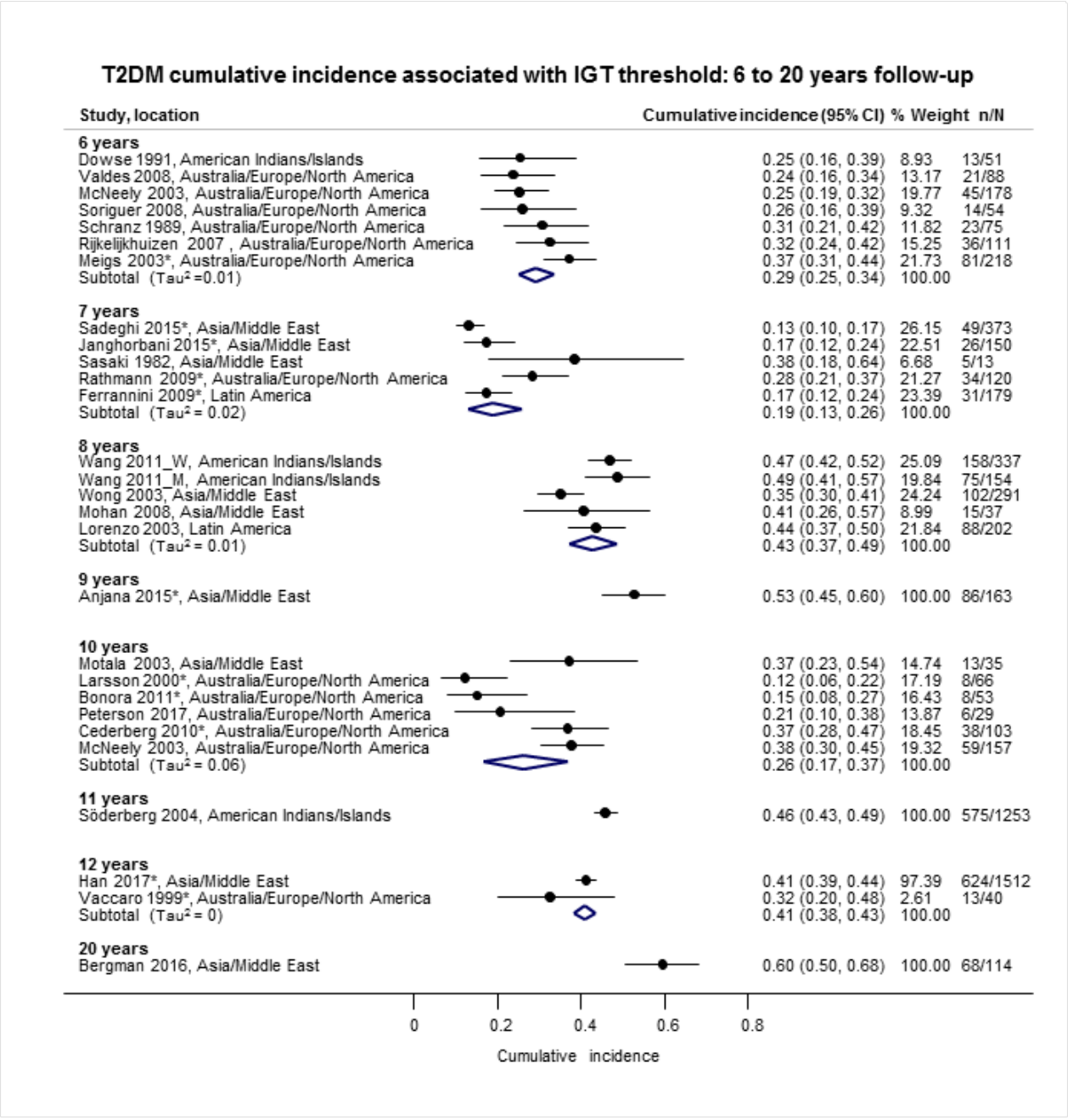


Figure 12. Impaired glucose tolerance (IGT): association with cumulative type 2 diabetes mellitus (T2DM) incidence over 6–20 years *Isolated IGT
CI: confidence interval; M: men; n/N: events/number of participants; W: women



The number of studies and participants, and the cumulative incidence of T2DM (pooled if more than one study) according to follow-up period were as follows.

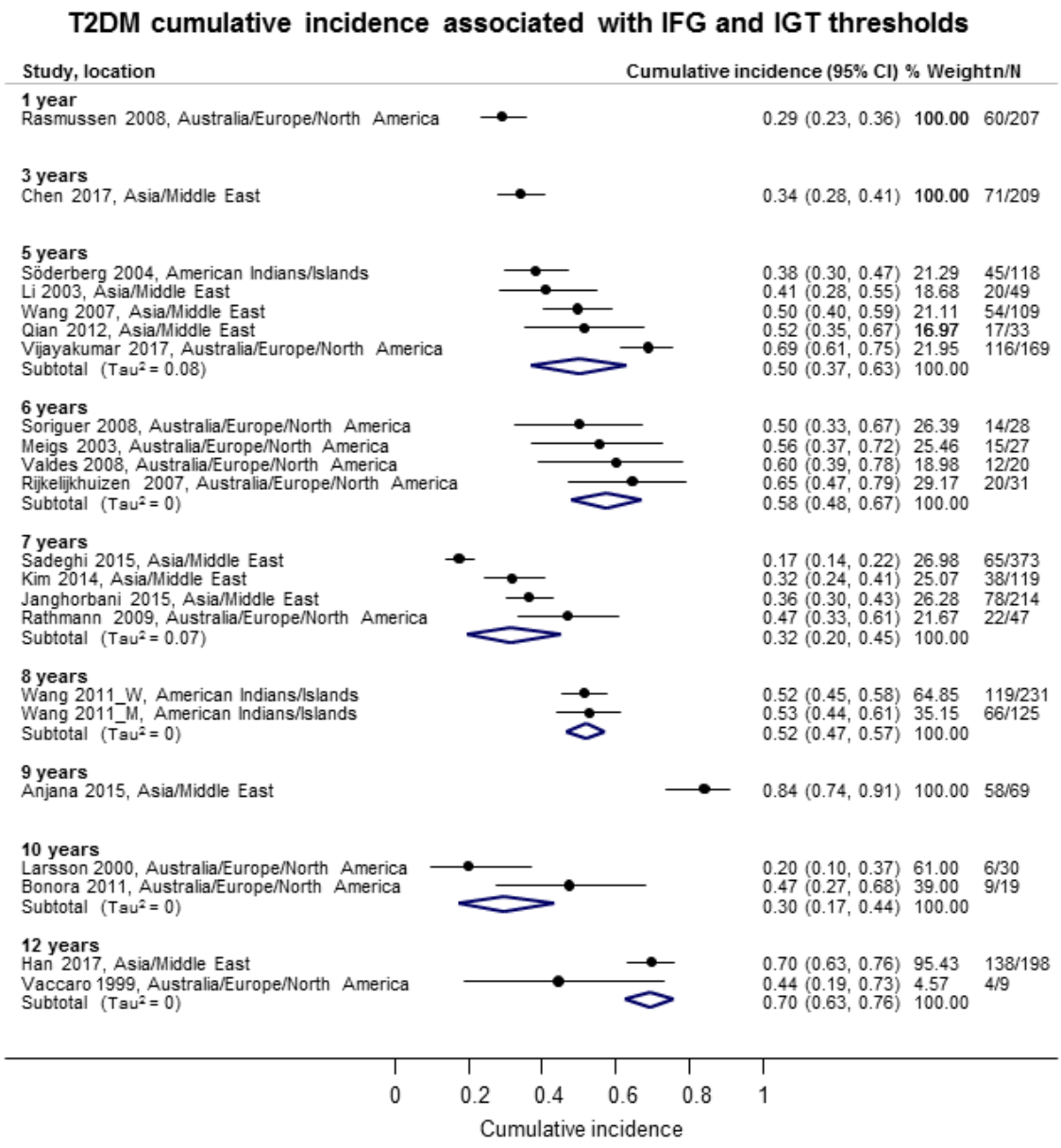
- 1 year's follow-up: 3 studies, 671 participants, cumulative incidence 13% (95% CI 5 to 23).
- 2 years' follow-up: 9 studies, 1998 participants, cumulative incidence 16% (95% CI 9 to 26).
- 3 years' follow-up: 3 studies, 417 participants, cumulative incidence 22% (95% CI 18 to 27).
- 4 years' follow-up: 5 studies, 1042 participants, cumulative incidence 22% (95% CI 12 to 34).
- 5 years' follow-up: 12 studies, 3444 participants, cumulative incidence 39% (95% CI 25 to 53).
- 6 years' follow-up: 7 studies, 775 participants, cumulative incidence 29% (95% CI 25 to 34).
- 7 years' follow-up: 5 studies, 835 participants, cumulative incidence 19% (95% CI 13 to 26).

- 8 years' follow-up: 4 studies, 1021 participants, cumulative incidence 43% (95% CI 37 to 49).
- 9 years' follow-up: 1 study, 163 participants, cumulative incidence 53% (95% CI 45 to 60).
- 10 years' follow-up: 6 studies, 443 participants, cumulative incidence 26% (95% CI 17 to 37).
- 11 years' follow-up: 1 study, 1253 participants, cumulative incidence 46% (95% CI 43 to 49).
- 12 years' follow-up: 2 studies, 1552 participants, cumulative incidence 41% (95% CI 38 to 43).
- 20 years' follow-up: 1 study, 114 participants, cumulative incidence 60% (95% CI 50 to 68).

IH defined by combined IFG and IGT

Diabetes incidence associated with the combination of both IFG and IGT at baseline showed pooled cumulative incidences of 29% to 84% at 1 to 12 years (Figure 13).

Figure 13. Combined impaired glucose tolerance (IGT) and impaired fasting glucose (IFG): association with cumulative type 2 diabetes mellitus (T2DM) incidence over 1–12 years
CI: confidence interval; M: men; n/N: events/number of participants; W: women



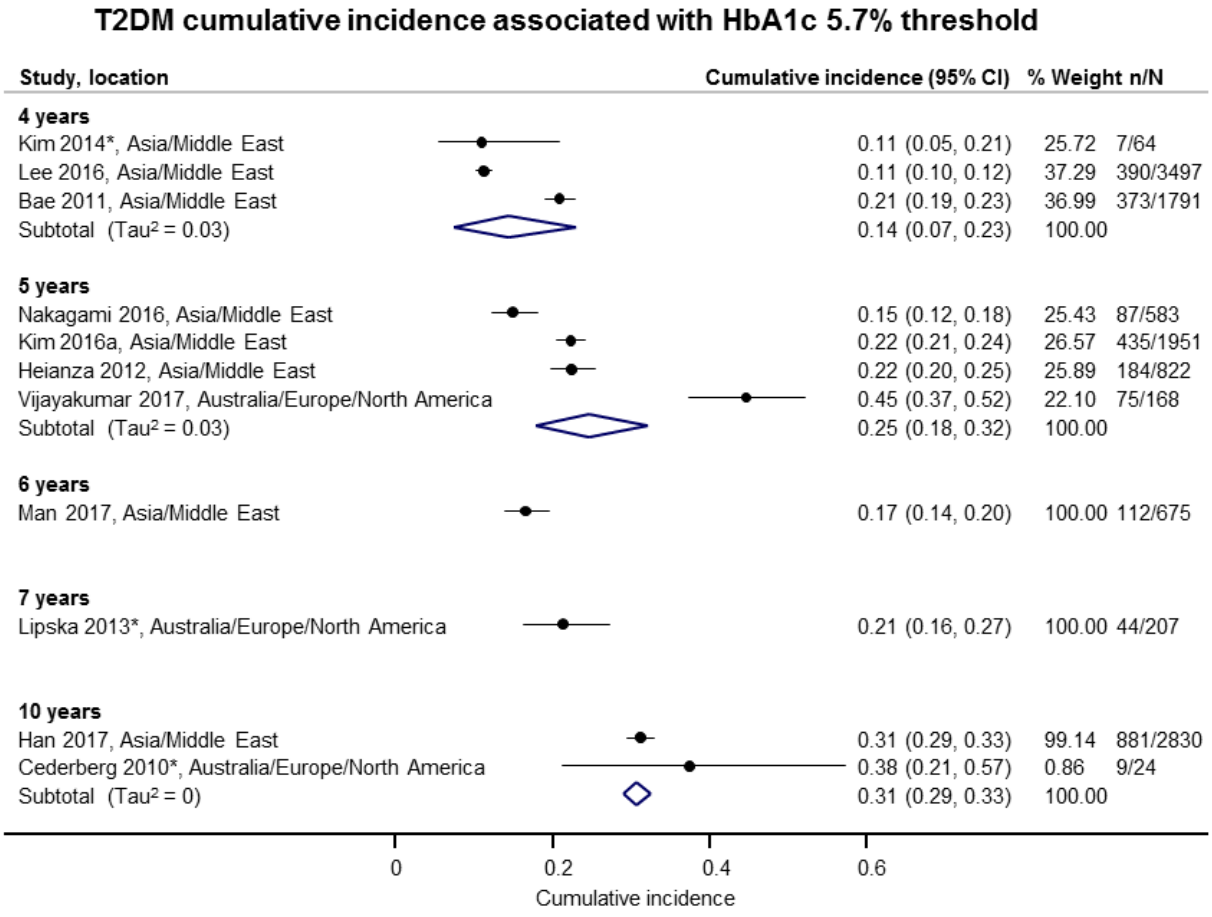
The number of studies and participants, and the cumulative incidence of T2DM (pooled if more than one study) according to follow-up period were as follows.

- 1 year's follow-up: 1 study, 207 participants, cumulative incidence 29% (95% CI 23 to 36).
- 3 years' follow-up: 1 study, 209 participants, cumulative incidence 34% (95% CI 28 to 41).
- 5 years' follow-up: 5 studies, 478 participants, cumulative incidence 50% (95% CI 37 to 63).
- 6 years' follow-up: 4 studies, 106 participants, cumulative incidence 58% (95% CI 48 to 67).
- 7 years' follow-up: 4 studies, 753 participants, cumulative incidence 32% (95% CI 20 to 45).
- 8 years' follow-up: 1 study, 356 participants, cumulative incidence 52% (95% CI 47 to 57).
- 9 years' follow-up: 1 study, 69 participants, cumulative incidence 84% (95% CI 74 to 91).
- 10 years' follow-up: 2 studies, 49 participants, cumulative incidence 30% (95% CI 17 to 44).
- 12 years' follow-up: 2 studies, 207 participants, cumulative incidence 70% (95% CI 63 to 76).

IH defined by $HbA1c_{5.7}$ threshold

Diabetes incidence associated with $HbA1c_{5.7}$ at baseline and a follow-up period of 4 to 10 years showed pooled cumulative incidences of 14% to 31% (Figure 14).

Figure 14. Elevated glycosylated haemoglobin A1c (HbA1c) 5.7% threshold: association with cumulative type 2 diabetes mellitus (T2DM) incidence over 4–10 years
CI: confidence interval; n/N: events/number of participants



The number of studies and participants, and the cumulative incidence of T2DM (pooled if more than one study) according to follow-up period were as follows.

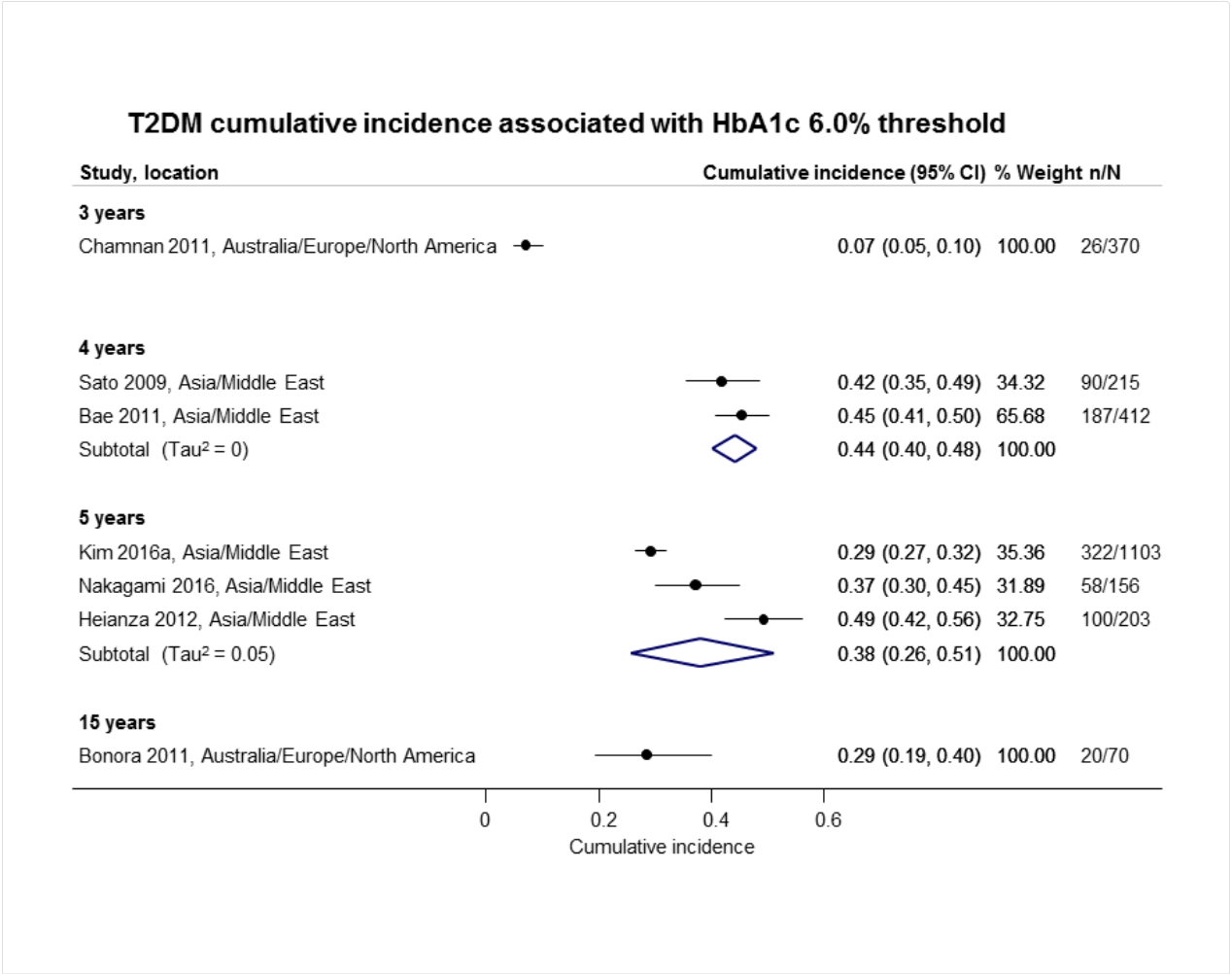
- 4 years' follow-up: 3 studies, 5352 participants, cumulative incidence 14% (95% CI 7 to 23).
- 5 years' follow-up: 4 studies, 3524 participants, cumulative incidence 25% (95% CI 18 to 32).

- 6 years' follow-up: 1 study, 675 participants, cumulative incidence 17% (95% CI 14 to 20).
- 7 years' follow-up: 1 study, 207 participants, cumulative incidence 21% (95% CI 16 to 27).
- 10 years' follow-up: 2 studies, 2854 participants, cumulative incidence 31% (95% CI 29 to 33).

IH defined by $HbA1c_{6.0}$ threshold

Most studies were undertaken in Asia. Diabetes incidence associated with $HbA1c_{6.0}$ at baseline and a follow-up period of 3 to 15 years showed pooled cumulative incidences of 7% to 44% (Figure 15).

Figure 15. Elevated glycosylated haemoglobin A1c (HbA1c) 6.0% threshold: association with cumulative type 2 diabetes mellitus (T2DM) incidence over 3–15 years
CI: confidence interval; n/N: events/number of participants



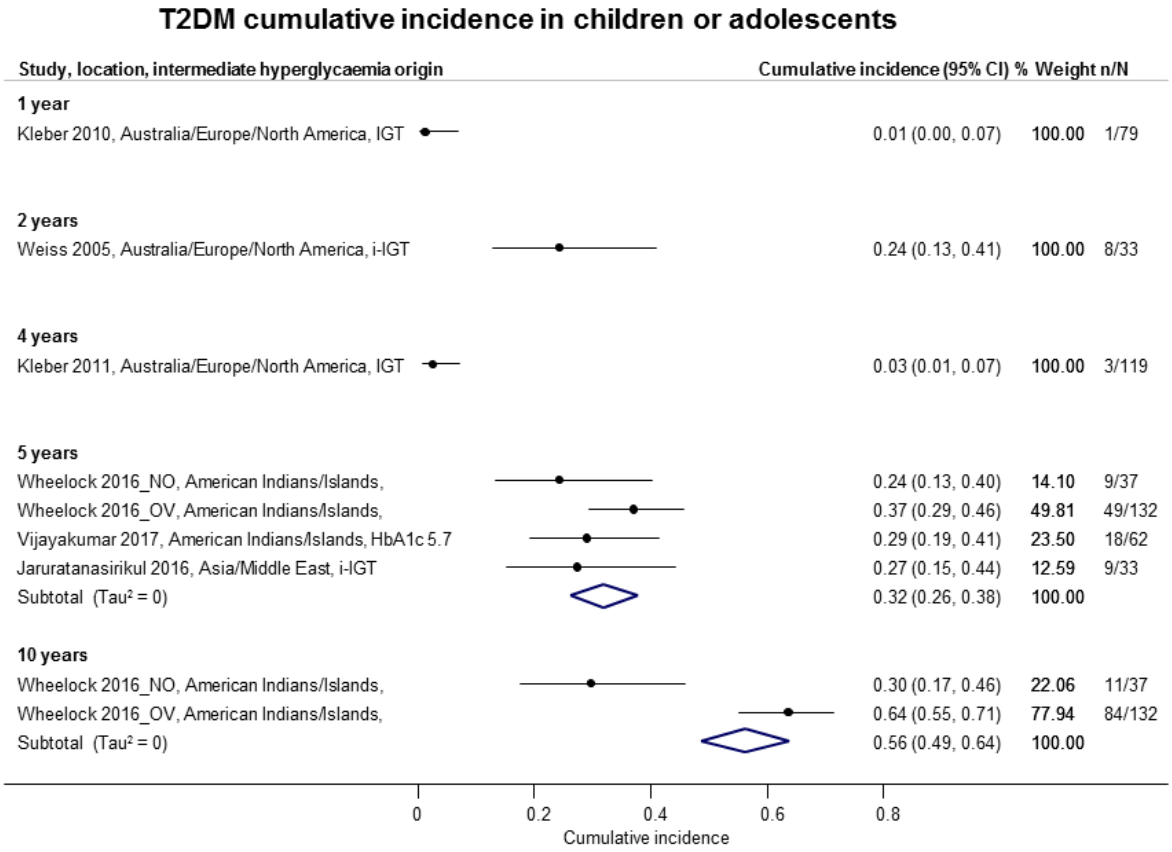
The number of studies and participants, and the cumulative incidence of T2DM (pooled if more than one study) according to follow-up period were as follows.

- 3 years' follow-up: 1 study, 370 participants, cumulative incidence 7% (95% CI 5 to 10).
- 4 years' follow-up: 2 studies, 627 participants, cumulative incidence 44% (95% CI 40 to 48).
- 5 years' follow-up: 3 studies, 1462 participants, cumulative incidence 38% (95% CI 26 to 51).
- 15 years' follow-up: 1 study, 70 participants, cumulative incidence 29% (95% CI 19 to 40).

Children and adolescents with IH (mostly IGT)

Diabetes incidence in children and adolescents, usually associated with IGT at baseline and with follow-up of 1 to 10 years, showed pooled cumulative incidences of 1% to 56% (Figure 16). We did not observe any distinct pattern between T2DM incidence and geography.

Figure 16. Cumulative type 2 diabetes mellitus (T2DM) incidence in children/adolescents over 1–10 years
CI: confidence interval; HbA1c 5.7: glycosylated haemoglobin A1c 5.7% threshold; (i-)IGT: (isolated) impaired glucose tolerance; n/N: events/number of participants; NO: non-overweight; OV: overweight



The number of studies and participants, and the cumulative incidence of T2DM (pooled if more than one study) according to follow-up period were as follows.

- 1 year's follow-up: 1 study, 79 participants, cumulative incidence 1% (95% CI 0 to 7).
- 2 years' follow-up: 1 study, 33 participants, cumulative incidence 24% (95% CI 13 to 41).
- 4 years' follow-up: 1 study, 119 participants, cumulative incidence 3% (95% CI 1 to 7).
- 5 years' follow-up: 3 studies, 264 participants, pooled cumulative incidence 32% (95% CI 26 to 38).
- 10 years' follow-up: 1 study (2 subpopulations), 169 participants, cumulative incidence 56% (95% CI 49 to 64).

Special populations with IH

Studies involving black populations were scarce: one study reported a cumulative T2DM incidence of 35% in African Surinamese after 10 years of follow-up in association with $IFG_{5.6}$ at baseline (Admiraal 2014). Another study, which used $IFG_{5.6}$ at baseline, reported a T2DM cumulative incidence of 33% in African Americans after 7.5 years of follow-up (Yeboah 2011).

b) Regression from IH to normoglycaemia

Adults

In the 47 studies reporting data on regression from IH to normoglycaemia in adults within a follow-up period of 1 to 11 years, pooled percentages ranged from 17% to 59% (Figure 17; Figure 18). Regression to normoglycaemia varied widely and showed neither a clear linear reduction or increase nor a distinct pattern associated with geography. Regression rates were often reported in association with IGT at baseline; however, there were no distinct differences in regression rates when compared with $IFG_{5.6}$, $IFG_{6.1}$ or $HbA1c_{5.7}$ as IH risk factors.

Figure 17. Regression from intermediate hyperglycaemia to normoglycaemia in adults over 1–5 years
CI: confidence interval; $HbA1c_{5.7}$: glycosylated haemoglobin A1c 5.7%; $i\text{-}IFG_{5.6/6.1}$: (isolated) impaired fasting glucose 5.6/6.1 mmol/L threshold;IGT: impaired glucose tolerance; n/N: events/number of participants

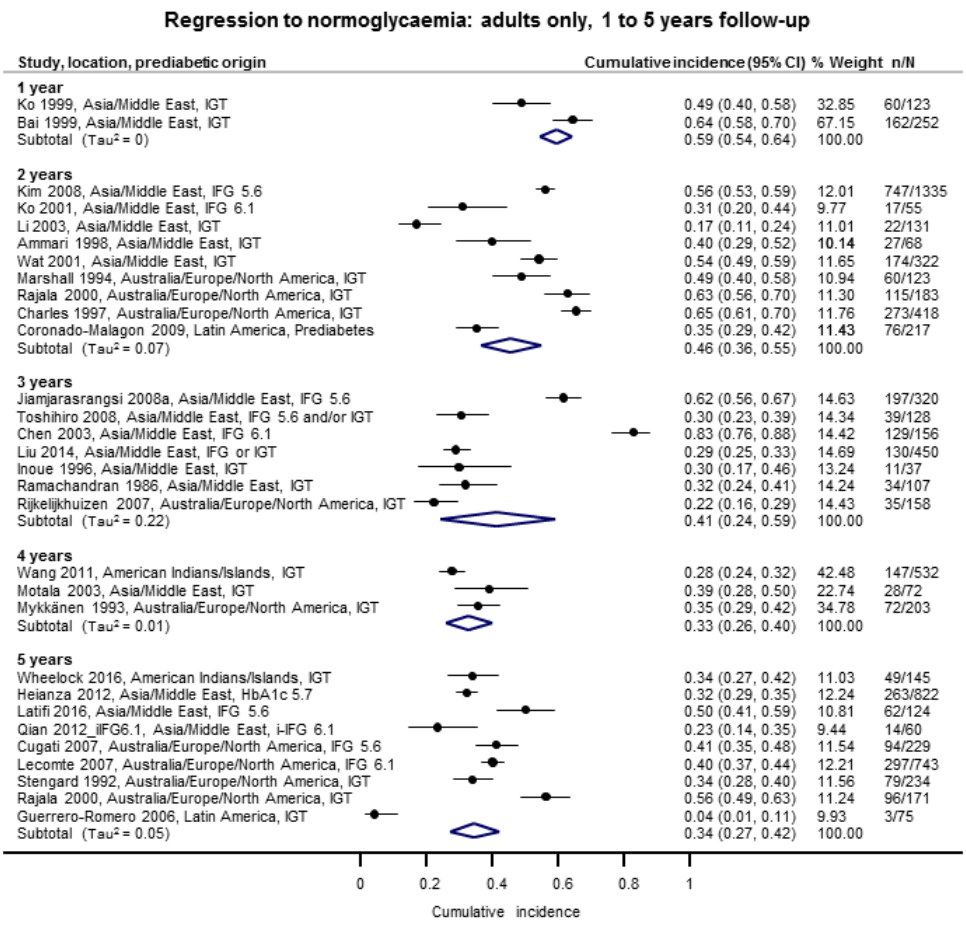
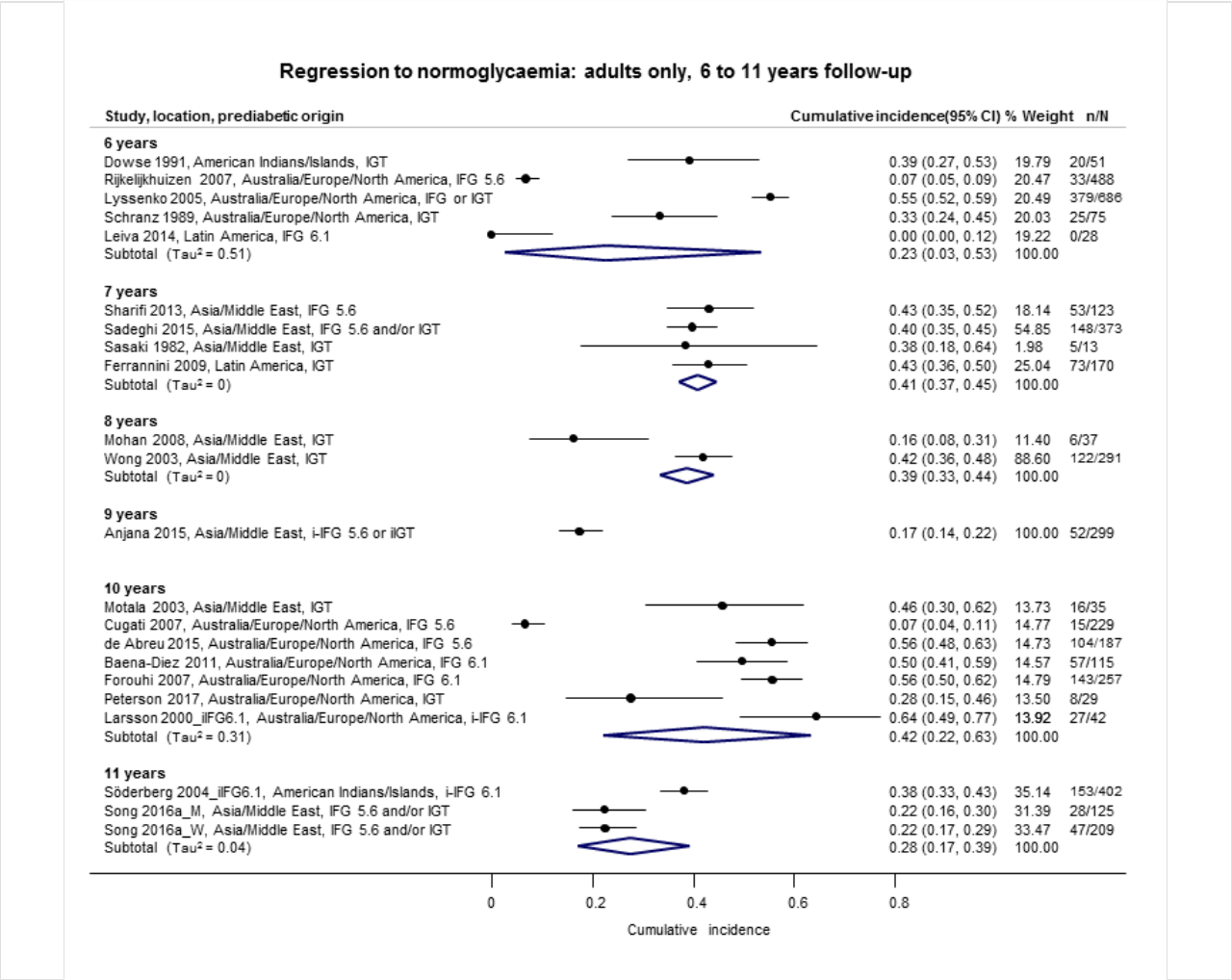


Figure 18. Regression from intermediate hyperglycaemia to normoglycaemia in adults over 6–11 years
CI: confidence interval; i-IFG$_{5.6/6.1}$: (isolated) impaired fasting glucose 5.6/6.1 mmol/L threshold; i-IGT: (isolated) impaired glucose tolerance; n/N: events/number of participants



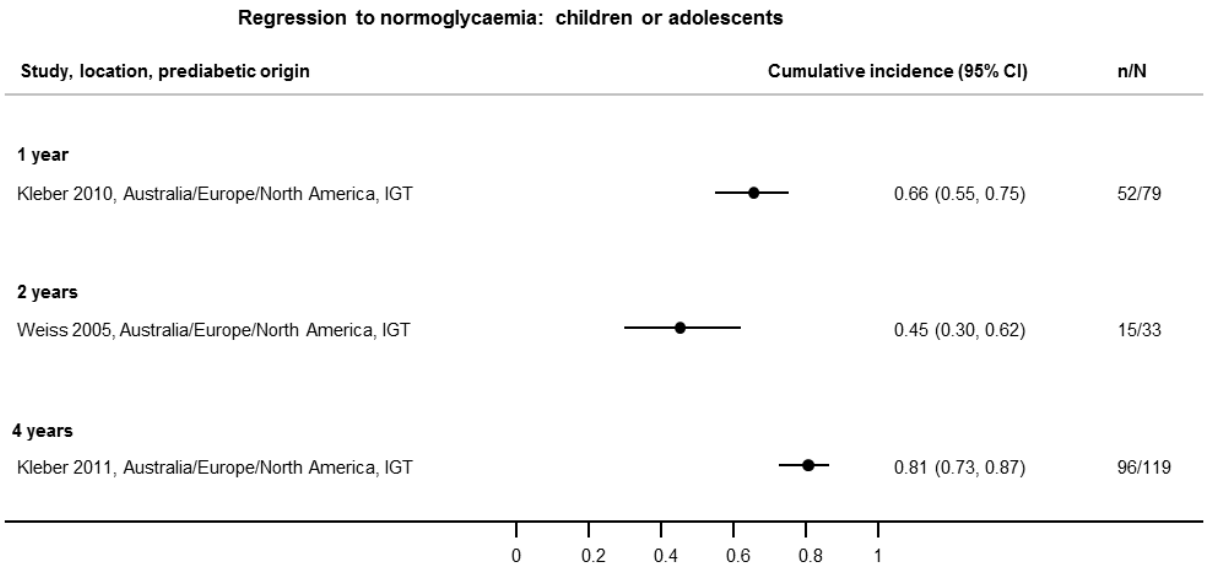
The number of studies and participants, and the proportion regressing from IH to normoglycaemia (pooled if more than one study) according to follow-up period were as follows.

- 1 year's follow-up: 2 studies, 375 participants, regression to normoglycaemia 59% (95% CI 54 to 64).
- 2 years' follow-up: 9 studies, 2852 participants, regression to normoglycaemia 46% (95% CI 36 to 55).
- 3 years' follow-up: 7 studies, 1356 participants, regression to normoglycaemia 41% (95% CI 24 to 59).
- 4 years' follow-up: 3 studies, 807 participants, regression to normoglycaemia 33% (95% CI 26 to 40).
- 5 years' follow-up: nine studies, 2603 participants, regression to normoglycaemia 34% (95% CI 27 to 42).
- 6 years' follow-up: 5 studies, 1328 participants, regression to normoglycaemia 23% (95% CI 3 to 53).
- 7 years' follow-up: 4 studies, 679 participants, regression to normoglycaemia 41% (95% CI 37 to 45).
- 8 years' follow-up: 2 studies, 328 participants, regression to normoglycaemia 39% (95% CI 33 to 44).
- 9 years' follow-up: 1 study, 299 participants, regression to normoglycaemia 17% (95% CI 14 to 22)
- 10 years' follow-up: 7 studies, 894 participants, regression to normoglycaemia 42% (95% CI 22 to 63).
- 11 years' follow-up: 2 studies, 736 participants, regression to normoglycaemia 28% (95% CI 17 to 39).

Children and adolescents

Regression from IH to normoglycaemia in children and adolescents within a follow-up period of one to four years showed percentages from 45% to 81% (Figure 19). There were no distinct patterns with regard to geography. IGT at baseline was often investigated as the IH risk factor.

Figure 19. Regression from intermediate hyperglycaemia to normoglycaemia in children/adolescents over 1–4 years
CI: confidence interval; IGT: impaired glucose tolerance; n/N: events/number of participants



The number of studies and participants, and the proportion regressing from IH to normoglycaemia according to follow-up period were as follows.

- 1 year's follow-up: 1 study, 79 participants, regression to normoglycaemia 66% (95% CI 55 to 75).
- 2 years' follow-up: 1 study, 33 participants, regression to normoglycaemia 45% (95% CI 30 to 62).
- 4 years' follow-up: 1 study, 119 participants, regression to normoglycaemia 81% (95% CI 73 to 87).

c) IH versus normoglycaemia as a prognostic factor for developing T2DM

Prognostic factor studies used various definitions for IH and different effect measures (IRR, OR and HR) to express the effect of glycaemic status on development of T2DM. The findings are presented below according to IH definition and effect measure. No data were available on the prognostic factor IH versus normoglycaemia for children or adolescents.

HR as the effect measure

IFG 5.6 mmol/L threshold

Eight studies reported HRs and the $IFG_{5.6}$ threshold for IH at baseline (Analysis 1.1). The length of follow-up ranged from 4 to 22 years (studies are ordered with ascending length of follow-up in Analysis 1.1). The studies included 9017 participants with IH and 25,850 participants with normoglycaemia. The overall HR was 4.32 (95% CI 2.61 to 7.12). The 95% prediction interval ranged from 0.75 to 25.01

The comparison of geographic regions showed the following results (Analysis 1.1).

- Asia/Middle East (4 studies, 2385 participants with IH and 12,418 participants with normoglycaemia, 5 to 12 years' follow-up): the pooled HR was 5.07 (95% CI 3.41 to 7.53). The 95% prediction interval ranged from 1.07 to 24.02.
- Australia/Europe/North America (3 studies, 5685 participants with IH and 12,837 participants with normoglycaemia, 8 to 22 years' follow-up): the pooled HR was 4.15 (95% CI 1.24 to 13.87). Calculation of the 95% prediction interval did not provide a meaningful estimate.
- American Indians/Islands (1 study, 947 participants with IH and 595 participants with normoglycaemia, 4 years' follow-up): the HR was 2.38 (95% CI 1.85 to 3.06).

IFG 6.1 mmol/L threshold

Nine studies reported HRs and the $IFG_{6.1}$ threshold for IH at baseline (Analysis 1.2). The length of follow-up ranged from 5 to 22 years (studies are ordered by ascending length of follow-up in Analysis 1.2). The studies included 2818 participants with IH and 18,591 participants with normoglycaemia. The overall HR was 5.47 (95% CI 3.50 to 8.54). The 95% prediction interval ranged from 1.09 to 27.56

The comparison of geographic regions showed the following results (Analysis 1.2).

- Asia/Middle East (5 studies, 1054 participants with IH and 9756 participants with normoglycaemia, 5 to 11 years' follow-up): the pooled HR was 10.55 (95% CI 3.61 to 30.81). Calculation of the 95% prediction interval did not provide a meaningful estimate.
- Australia/Europe/North America (4 studies, 1736 participants with IH and 8835 participants with normoglycaemia, 6 to 22 years' follow-up): the pooled HR was 3.30 (95% CI 2.32 to 4.67). The 95% prediction interval ranged from 0.84 to 12.99.

- Latin America (1 study, 28 participants with IH and 66 participants with normoglycaemia, 6 years' follow-up): the HR was 2.06 (95% CI 1.76 to 2.41).

IGT

Five studies reported HRs and IGT for IH at baseline (Analysis 1.3). The length of follow-up ranged from 5 to 16 years (studies are ordered by ascending length of follow-up in Analysis 1.3). These studies included 4010 participants with IH and 12,566 participants with normoglycaemia. The overall HR was 3.61 (95% CI 2.31 to 5.64). The 95% prediction interval ranged from 0.69 to 18.97.

The comparison of geographic regions showed the following results (Analysis 1.3).

- Asia/Middle East (3 studies, 1780 participants with IH and 6695 participants with normoglycaemia, 5 to 12 years' follow-up): the pooled HR was 4.48 (95% CI 2.81 to 7.15). Calculation of the 95% prediction interval did not provide a meaningful estimate.
- Australia/Europe/North America (2 studies, 2230 participants with IH and 5871 participants with normoglycaemia, 6 to 16 years' follow-up): the pooled HR was 2.53 (95% CI 1.52 to 4.19).

Combined IFG and IGT

Five studies reported HRs and used both IFG and IGT for defining IH at baseline (Analysis 1.4). The length of follow-up ranged from 4 to 12 years (studies are ordered by ascending length of follow-up in Analysis 1.4). These studies included 1038 participants with IH and 8719 participants with normoglycaemia. The overall HR was 6.90 (95% CI 4.15 to 11.45). The 95% prediction interval ranged from 1.06 to 44.95.

The comparison of geographic regions showed the following results (Analysis 1.4).

- Asia/Middle East (3 studies, 461 participants with IH and 6695 participants with normoglycaemia, 5 to 12 years' follow-up): the pooled HR was 10.20 (95% CI 5.45 to 19.09). Calculation of the 95% prediction interval did not provide a meaningful estimate.
- Australia/Europe/North America (1 study, 221 participants with IH and 1429 participants with normoglycaemia, 6 years' follow-up): the HR was 3.80 (95% CI 2.30 to 6.28).
- American Indians/Islands (1 study, 356 participants with both IFG and IGT and 595 participants with normoglycaemia, 4 years' follow-up): the HR was 4.06 (95% CI 3.05 to 5.40).

HbA1c 5.7% threshold

Four studies reported HRs and the $HbA1c_{5.7}$ threshold for IH at baseline (Analysis 1.5). The length of follow-up ranged from 4 to 22 years (studies are ordered by ascending length of follow-up in Analysis 1.5). The studies included 5223 participants with IH and 19,824 participants with normoglycaemia. The overall HR was 5.55 (95% CI 2.77 to 11.12). The 95% prediction interval ranged from 0.23 to 141.18.

The comparison of geographic regions showed the following results (Analysis 1.5).

- Asia/Middle East (3 studies, 3196 participants with IH and 13,609 participants with normoglycaemia, 4 to 5 years' follow-up): the pooled HR was 7.21 (95% CI 5.14 to 10.11). The 95% prediction interval ranged from 0.81 to 64.52.
- Australia/Europe/North America (1 study, 2027 participants with IH and 6215 participants with normoglycaemia, 22 years' follow-up): the HR was 2.71 (95% CI 2.48 to 2.96).

HbA1c 6.0% threshold

Six studies reported HRs and the $HbA1c_{6.0}$ threshold for IH at baseline (Analysis 1.6). The length of follow-up ranged from 4 to 22 years (studies are ordered by ascending length of follow-up in Analysis 1.6). The studies included 4532 participants with IH and 26,167 participants with normoglycaemia. The overall HR was 10.10 (95% CI 3.59 to 28.43). Calculation of the 95% prediction interval did not provide a meaningful estimate.

The comparison of geographic regions showed the following results (Analysis 1.6).

- Asia/Middle East (4 studies, 3492 participants with IH and 19,242 participants with normoglycaemia, 4 to 12 years' follow-up): the pooled HR was 13.12 (95% CI 4.10 to 41.96). Calculation of the 95% prediction interval did not provide a meaningful estimate.
- Australia/Europe/North America (2 studies, 1040 participants with IH and 6925 participants with normoglycaemia, 15 to 22 years' follow-up): the pooled HR was 5.09 (95% CI 1.69 to 15.37).

Both elevated HbA1c and IFG

One study in Japanese participants provided data on elevated HbA1c and IFG for defining IH at baseline and estimated the effect of IH versus normoglycaemia using the HR (Analysis 1.7). The combination of $HbA1c_{5.7}$ plus $IFG_{5.6}$ (410 participants) when compared with normoglycaemia (4149 participants) showed an HR of 32.50 (95% CI 23.00 to 45.92). The combination of $HbA1c_{5.7}$ plus $IFG_{6.1}$ (159 participants) when compared with normoglycaemia (5198 participants) showed an HR of 37.90 (95% CI 28.10 to 51.12). The combination of $HbA1c_{6.0}$ plus $IFG_{5.6}$ (135 participants) when compared with normoglycaemia (4493 participants) showed an HR of 53.70 (95% CI 38.40 to 75.09). The combination of $HbA1c_{6.0}$ plus $IFG_{6.1}$ (72 participants) when compared with normoglycaemia (5730 participants) showed an HR of 52.30 (95% CI 37.80 to 72.37).

IH in special populations

Data on black populations were scarce: one study in African Surinamese reported an adjusted OR of 5.1 (95% CI 2.0 to 13.3) for the association between $IFG_{5.6}$ at baseline and T2DM incidence at 7.5 years' follow-up (Admiraal 2014). Another study including a subgroup of African Americans reported the association of various measures of IH at baseline with the development of T2DM using HRs (Warren 2017): after 16 years of follow-up the HR for $IFG_{5.6}$ was 2.65 (95% CI 2.11 to 3.32); for $IFG_{6.1}$, the HR was 3.16 (95% CI 2.47 to 4.06); and for IGT, the HR was 2.55 (95% CI 2.01 to 3.22). After 22 years' follow-up, the HR for $IFG_{5.6}$ was 2.05 (95% CI 1.75 to 2.40); for $IFG_{6.1}$, the HR was 2.66 (95% CI 2.26 to 3.13); for $HbA1c_{5.7}$, the HR was 2.24 (95% CI 1.92 to 2.61); and for $HbA1c_{6.0}$, the HR was 2.60 (95% CI 2.21 to 3.05).

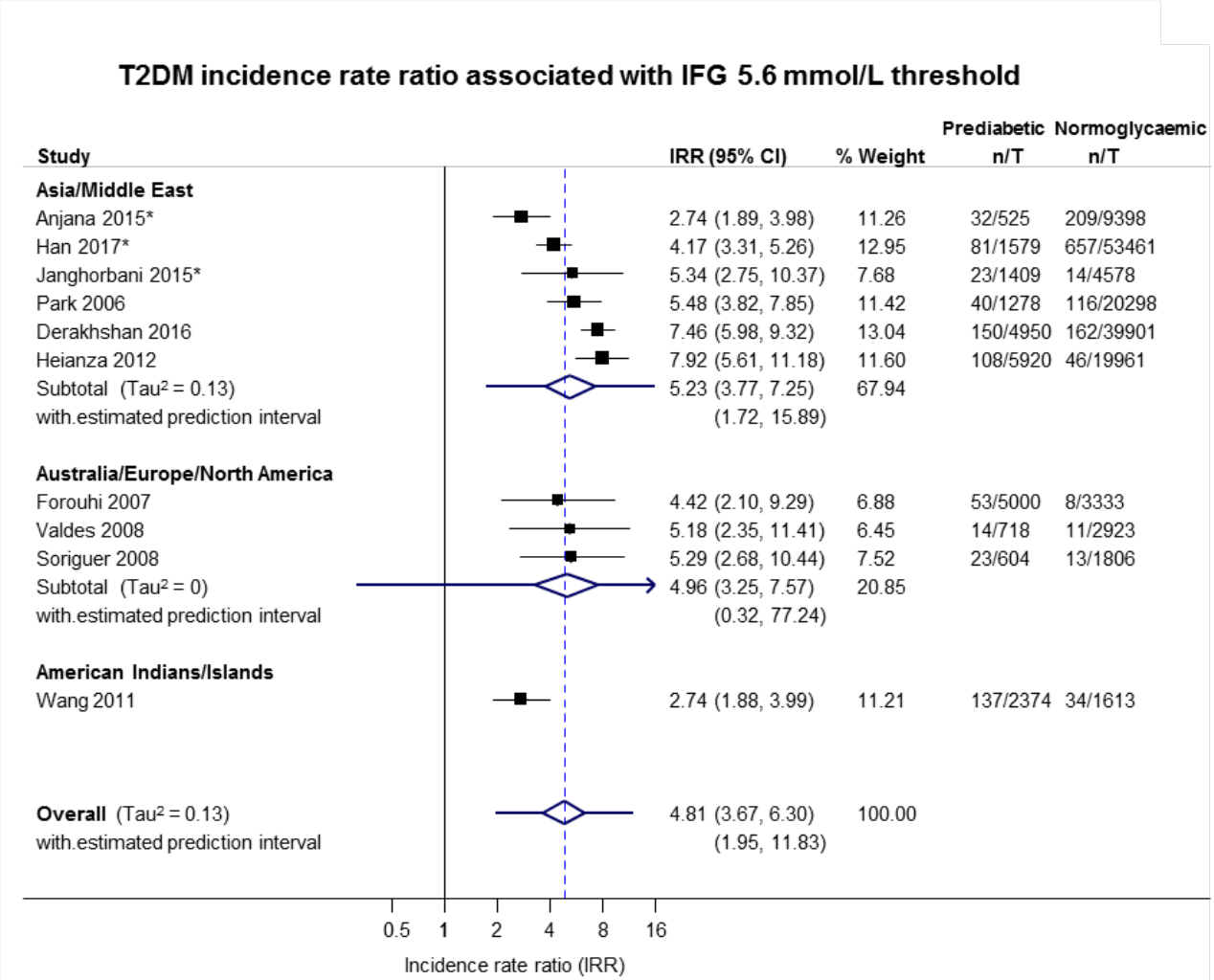
Incidence rate ratio as the effect measure

IFG 5.6 mmol/L threshold

Ten studies reported incidence rate ratios (IRRs) and used the $IFG_{5.6}$ threshold for IH. The studies included 24,357 participants with IH and 155,272 participants with normoglycaemia (Figure 20). Of

those with IH, 661 (2.7%) developed T2DM compared with 1270 (0.8%) in participants with normoglycaemia. The overall IRR was 4.81 (95% CI 3.67 to 6.30) with a 95% prediction interval ranging from 1.95 to 11.83.

Figure 20. IFG: impaired fasting glucose; IRR: incidence rate ratio; n: number of cases; T: person-time in years



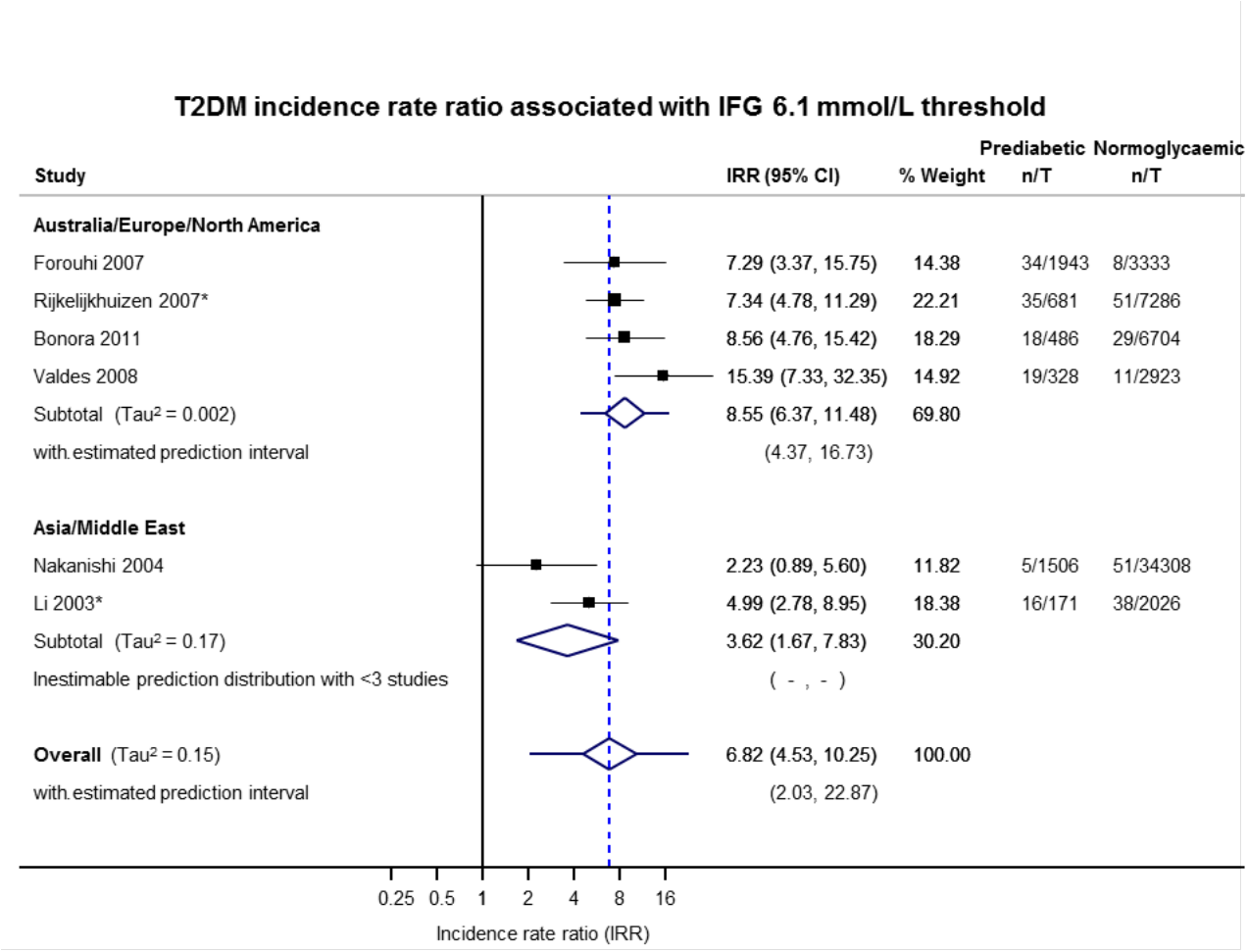
The results for the geographic regions were as follows.

- Asia/Middle East (6 studies): T2DM developed in 434/15,661 (2.8%) participants with IH and in 1204/145,597 (0.8%) participants with normoglycaemia. The pooled IRR was 5.23 (95% CI 3.77 to 7.25) with a 95% prediction interval ranging from 1.72 to 15.89.
- Australia/Europe/North America (3 studies): T2DM developed in 90/6322 (1.4%) participants with IH and in 32/8062 (0.4%) participants with normoglycaemia. The pooled IRR was 4.96 (95% CI 3.25 to 7.57) with a 95% prediction interval ranging from 0.32 to 77.24.
- American Indians/Islands (1 study): T2DM developed in 137/2374 (5.8%) participants with IH and in 34/1613 (2.1%) participants with normoglycaemia. The IRR was 2.74 (95% CI 1.88 to 3.99).

IFG 6.1 mmol/L threshold

Six studies reported IRRs and used an $IFG_{6.1}$ threshold for IH. Thee studies included 5115 participants with IH, of whom 127 (2.5%) developed T2DM, plus 56,580 participants with normoglycaemia, of whom 188 (0.3%) developed T2DM (Figure 21). The overall IRR was 6.82 (95% CI 4.53 to 10.25) with a 95% prediction interval ranging from 2.03 to 22.87.

Figure 21. IFG: impaired fasting glucose; IRR: incidence rate ratio; n: number of cases; T: person-time in years



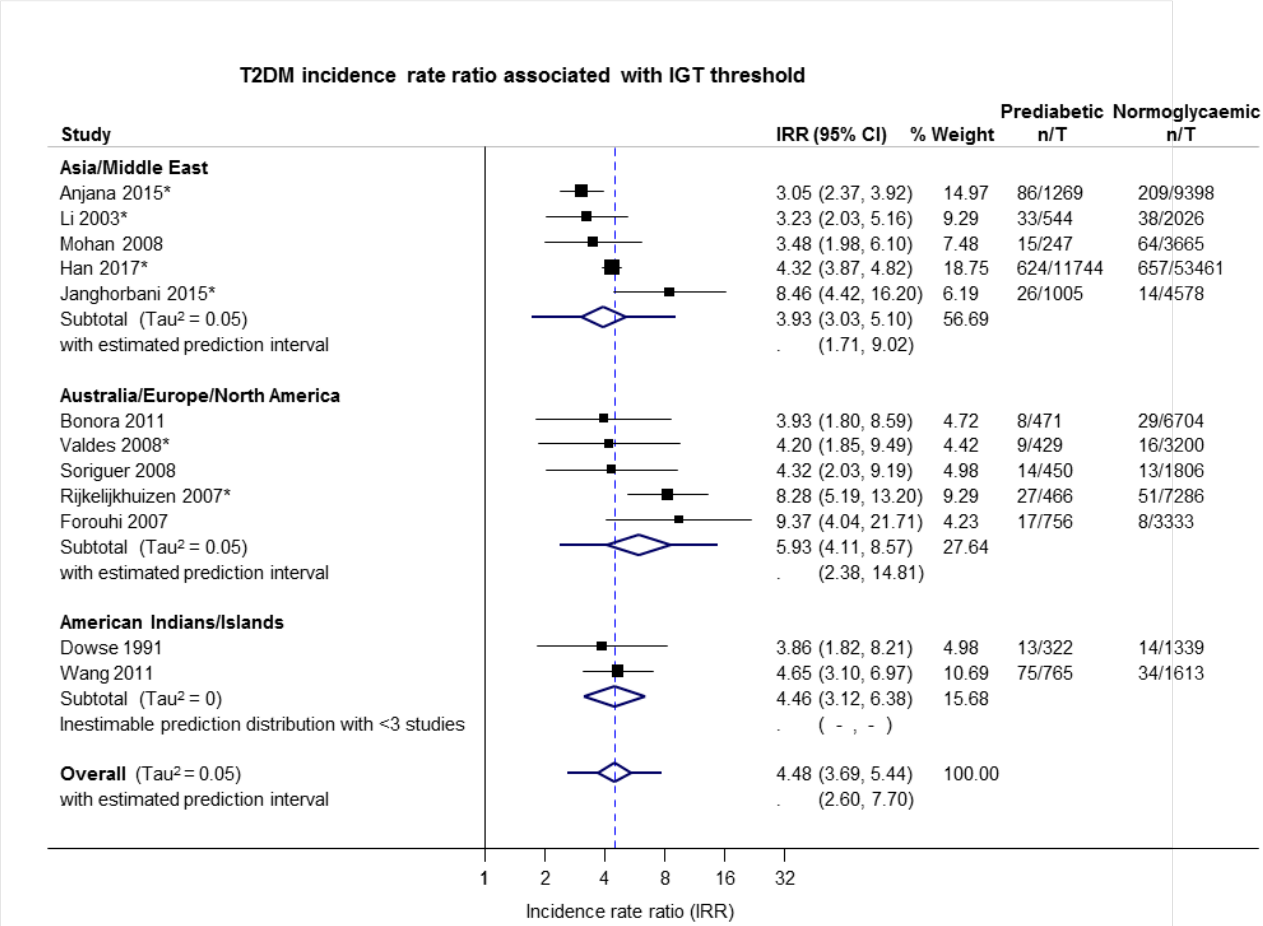
The comparison of geographic regions showed a lower IRR for Asia/Middle East as follows.

- Asia/Middle East (2 studies): T2DM developed in 21/1677 (1.3%) participants with IH and in 89/36,334 (0.2%) participants with normoglycaemia. The pooled IRR was 3.62 (95% CI 1.67 to 7.83).
- Australia/Europe/North America (4 studies): T2DM developed in 106/3438 (3.1%) participants with IH and in 99/20,246 (0.5%) participants with normoglycaemia. The pooled IRR was 8.55 (95% CI 6.37 to 11.48) with a 95% prediction interval ranging from 4.37 to 16.73.

IGT threshold

Twelve studies reported IRRs and defined IH using IGT. The studies included 18,468 participants with IH and 98,409 participants with normoglycaemia (Figure 22). T2DM developed in 947 (5.1%) participants with IH compared to 1147 (1.2%) in participants with normoglycaemia. The overall IRR was 4.48 (95% CI 3.69 to 5.44) with a 95% prediction interval ranging from 2.60 to 7.70.

Figure 22. IGT: impaired glucose tolerance; IRR: incidence rate ratio; n: number of cases; T: person-time in years



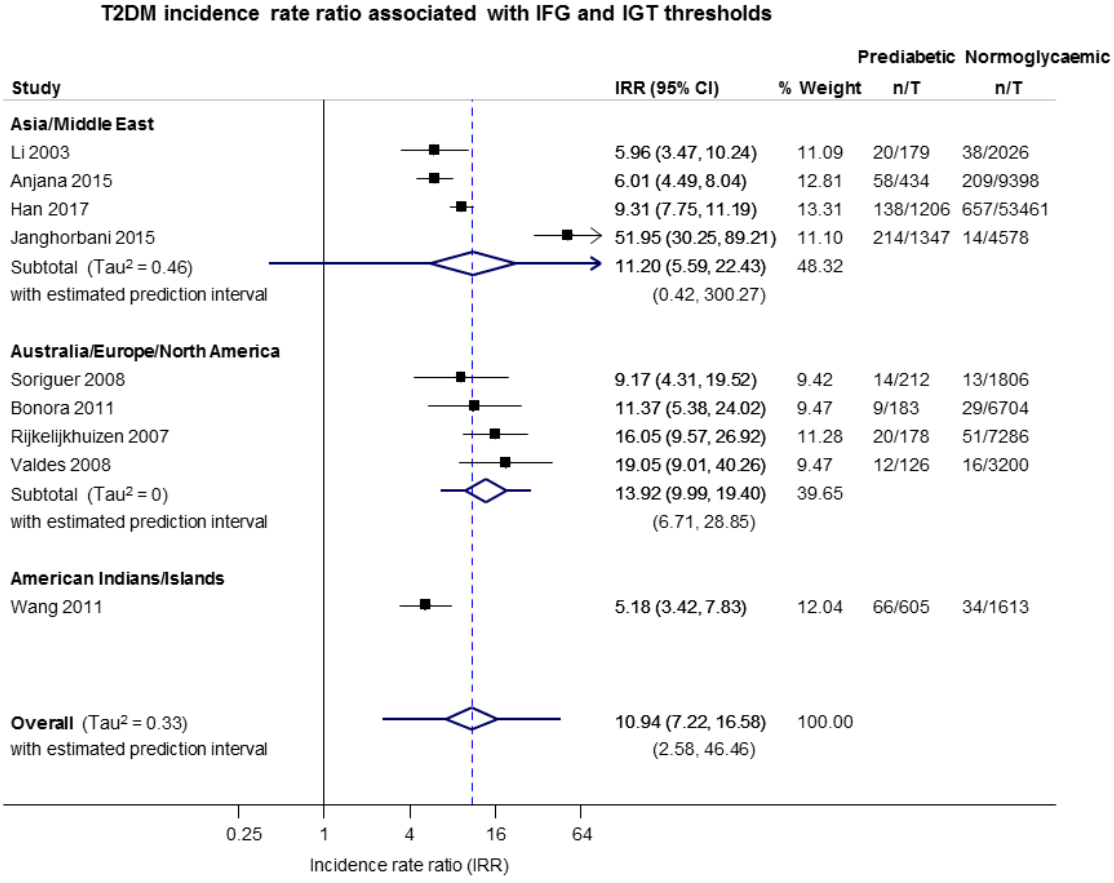
The findings according to geographic regions were as follows.

- Asia/Middle East (5 studies): T2DM developed in 766/14,809 (5.2%) participants with IH and in 390/73,128 (0.5%) participants with normoglycaemia. The pooled IRR was 3.93 (95% CI 3.03 to 5.10) with a 95% prediction interval ranging from 1.71 to 9.02.
- Australia/Europe/North America (5 studies): T2DM developed in 75/2572 participants with IH and in 117/22,329 (0.5%) participants with normoglycaemia. The pooled IRR was 5.93 (95% CI 4.11 to 8.57) with a 95% prediction interval ranging from 2.38 to 14.81.
- American Indians/Islands (2 studies): T2DM developed in 88/1087 (8.1%) participants with IH and in 48/2952 (1.6%) participants with normoglycaemia. The pooled IRR was 4.46 (95% CI 3.12 to 6.38).

Combined IFG and IGT

Nine studies used both IFG and IGT to define IH and reported IRRs. Of the 4470 participants with IH included in the studies, 551 (12.3%) developed T2DM compared with 1091 of the 90,072 (1.2%) participants with normoglycaemia (Figure 23). The overall IRR was 10.94 (95% CI 7.22 to 16.58) with 95% prediction interval ranging from 2.58 to 46.46.

Figure 23. IFG: impaired fasting glucose; IGT: impaired glucose tolerance; IRR: incidence rate ratio; n: number of cases; T: person-time in years



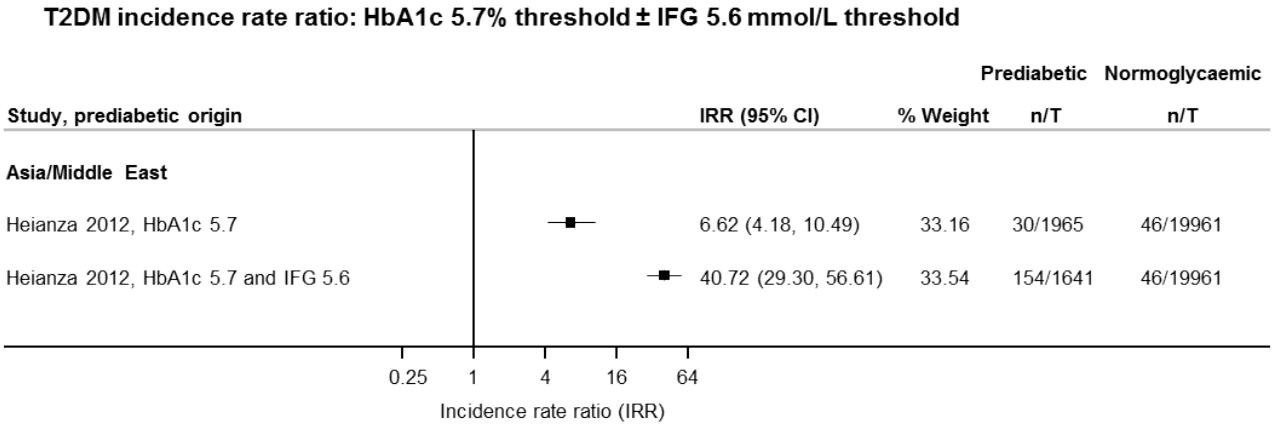
A lower pooled IRR was observed for the American Indians/Islands cohort compared to other cohorts as shown below.

- Asia/Middle East (4 studies): T2DM developed in 430/3166 (13.6%) participants with IH and in 918/69,463 (1.3%) participants with normoglycaemia. The pooled IRR was 11.20 (95% CI 5.59 to 22.43). Calculation of the 95% prediction interval did not provide a meaningful estimate.
- Australia/Europe/North America (4 studies): T2DM developed in 55/699 (7.9%) participants with IH and in 109/18,966 (0.6%) participants with normoglycaemia. The pooled IRR was 13.92 (95% CI 9.99 to 19.40) with a 95% prediction interval ranging from 6.71 to 28.85.
- American Indians/Islands (1 study): T2DM developed in 66/605 (10.9%) participants with IH and in 34/1613 (2.1%) participants with normoglycaemia. The pooled IRR was 5.18 (95% CI 3.42 to 7.83).

HbA1c 5.7% threshold only and the combination of HbA1c 5.7% threshold with IFG 5.6 mmol/L threshold

One study, Heianza 2012, reported using $HbA1c_{5.7}$ only or the combination of $IFG_{5.6}$ plus $HbA1c_{5.7}$ to define IH at baseline (Figure 24).

Figure 24. IFG: impaired fasting glucose; HbA1c: glycosylated haemoglobin A1c; IRR: incidence rate ratio; n: number of cases; T: person-time in years



T2DM developed in 30/1965 (1.5%) participants with IH defined using $HbA1c_{5.7}$ only compared with 46/19,961 (0.2%) in participants with normoglycaemia. The IRR was 6.62 (4.18 to 10.49).

In the cohort with both $HbA1c_{5.7}$ and $IFG_{5.6}$, T2DM developed in 154/1641 (9.4%) participants compared with 46/19961 (0.2%) in participants with normoglycaemia. The IRR was 40.72 (95% CI 29.30 to 56.61).

Odds ratio as the effect measure

IFG 5.6 mmol/L threshold

Twenty-one studies reported ORs and the $IFG_{5.6}$ threshold for IH (Analysis 2.1). The length of follow-up ranged from 4 to 24 years (studies are ordered by ascending length of follow-up in Analysis 2.1). The studies included 9320 participants with IH and 38,327 participants with normoglycaemia. The overall OR was 4.15 (95% CI 2.75 to 6.28). The 95% prediction interval ranged from 0.54 to 32.00.

The comparison of geographic regions showed the following results (Analysis 2.1).

- Asia/Middle East (10 studies, 6359 participants with IH and 28,218 participants with normoglycaemia, 4 to 24 years' follow-up): the pooled OR was 2.94 (95% CI 1.77 to 4.86). The 95% prediction interval ranged from 0.43 to 19.93.
- Australia/Europe/North America (9 studies, 1949 participants with IH and 7920 participants with normoglycaemia, 4 to 12 years' follow-up): the pooled OR was 6.47 (95% CI 3.81 to 11.00). The 95% prediction interval ranged from 0.99 to 42.32.
- Latin America (1 study, 65 participants with IH and 1594 participants with normoglycaemia, 7 years' follow-up): the OR was 4.28 (95% CI 3.21 to 5.71).
- American Indians/Islands (1 study, 947 participants with IH and 595 participants with normoglycaemia, 4 years' follow-up): the OR was 3.12 (95% CI 2.31 to 4.21).

The test for subgroup differences did not indicate a significant subgroup effect (P = 0.07). However, two of the four subgroups had only one study each, so the validity of the analysis is uncertain. Furthermore, there is substantial heterogeneity between studies (Tau^2 = 0.65 and 0.59) within each of the other two subgroups, and the subgroup analysis does not appear to have explained heterogeneity.

IFG 6.1 mmol/L threshold

Fifteen studies reported ORs and the $IFG_{6.1}$ threshold for IH at baseline (Analysis 2.2). The length of follow-up ranged from 3 to 24 years (studies are ordered by ascending length of follow-up in Analysis 2.2). The studies included 4574 participants with threshold for IH and 32,292 participants with normoglycaemia. The overall OR was 6.60 (95% CI 4.18 to 10.43). The 95% prediction interval ranged from 0.93 to 46.82.

The comparison between geographic regions showed the following results (Analysis 2.2).

- Asia/Middle East (7 studies, 3317 participants with IH and 25,604 participants with normoglycaemia, 3 to 24 years' follow-up): the pooled OR was 5.18 (95% CI 2.32 to 11.53). The 95% prediction interval ranged from 0.29 to 91.37.
- Australia/Europe/North America (7 studies, 1240 participants with IH and 5094 participants with normoglycaemia, 4 to 15 years' follow-up): the pooled OR was 8.69 (95% CI 4.95 to 15.24). The 95% prediction interval ranged from 1.20 to 62.69.
- Latin America (1 study, 17 participants with IH and 1594 participants with normoglycaemia, 7 years' follow-up): the OR was 3.73 (95% CI 2.18 to 6.38).

The test for subgroup differences did not indicate a significant subgroup effect (P = 0.10). However, one of the three subgroups had only one study, and there is substantial heterogeneity between studies (Tau^2 = 1.08 and 0.57) within each of the other two subgroups.

IGT

Twenty studies reported adjusted ORs and IGT for IH at baseline (Analysis 2.3). The length of follow-up ranged from 5 to 24 years (studies are ordered by ascending length of follow-up in Analysis 2.3). The studies included 3139 participants with IH and 18,413 participants with normoglycaemia. The overall OR was 4.61 (95% CI 3.76 to 5.64). The 95% prediction interval ranged from 2.10 to 10.13.

The comparison of geographic regions showed the following results (Analysis 2.3).

- Asia/Middle East (6 studies, 1226 participants with IH and 7417 participants with normoglycaemia, 5 to 24 years' follow-up): the pooled OR was 3.74 (95% CI 2.83 to 4.94). The 95% prediction interval ranged from 1.70 to 8.21.
- Australia/Europe/North America (11 studies, 1481 participants with IH and 7684 participants with normoglycaemia, 4 to 12 years' follow-up): the pooled OR was 5.20 (95% CI 3.62 to 7.45). The 95% prediction interval ranged from 1.50 to 18.09.
- Latin America (2 studies, 381 participants with IH and 3097 participants with normoglycaemia, 7 to 8 years' follow-up): the pooled OR was 4.94 (95% CI 3.15 to 7.76).
- American Indians/Islands (1 study, 51 participants with IH and 215 participants with normoglycaemia, 5 to 8 years' follow-up): the OR was 3.60 (95% CI 1.40 to 9.26).

The test for subgroup differences did not indicate a significant subgroup effect (P = 0.47). However, two of the four subgroups had only one or two studies, so the validity of the analysis is uncertain.

Combined IFG and IGT

Nine studies reported ORs and used both IFG and IGT for defining IH at baseline (Analysis 2.4). The length of follow-up ranged from 5 to 24 years (studies are ordered by ascending length of follow-up in Analysis 2.4). The studies included 652 participants with IH and 9004 participants with normoglycaemia. The overall OR was 13.14 (95% CI 7.41 to 23.30). The 95% prediction interval ranged from 1.84 to 93.66.

The comparison of geographic regions showed the following results (Analysis 2.4).

- Asia/Middle East (3 studies, 498 participants with IHT and 3704 participants with normoglycaemia, 5 to 24 years' follow-up): the pooled OR was 6.99 (95% CI 3.09 to 15.83). Calculation of the 95% prediction interval did not provide a meaningful estimate.
- Australia/Europe/North America (6 studies, 154 participants with IH and 5300 participants with normoglycaemia, 6 to 12 years' follow-up): the pooled OR was 20.95 (95% CI 12.40 to 35.40). The 95% prediction interval ranged from 4.93 to 89.05.

The OR for the Australia/Europe/North America cohort of studies appeared to be higher compared with the Asia/Middle East cohort.

HbA1c 5.7% threshold

Three studies reported ORs and $HbA1c_{5.7}$ threshold for IH at baseline (Analysis 2.5). The length of follow-up ranged from 6 to 10 years (studies are ordered with ascending length of follow-up in Analysis 2.5). The studies included 906 participants with IH and 2562 participants with normoglycaemia. The overall OR was 4.43 (95% CI 2.20 to 8.88). Calculation of the 95% prediction interval did not provide a meaningful estimate.

The results by geographic region are as follows (Analysis 2.5).

- Asia/Middle East (1 study, 675 participants with IH and 462 participants with normoglycaemia, 6 years' follow-up): the OR was 4.54 (95% CI 2.65 to 7.78).
- Australia/Europe/North America (2 studies, 231 participants with IH and 2100 participants with normoglycaemia, 7 to 10 years' follow-up): the pooled OR was 4.38 (95% CI 1.36 to 14.15).

HbA1c 6.0% threshold

Three studies reported ORs and the $HbA1c_{6.0}$ threshold for IH at baseline (Analysis 2.6). The length of follow-up ranged from three to five years. The studies included 1594 participants with IH and 16,723 participants with normoglycaemia. The overall OR was 12.79 (95% CI 4.56 to 35.85). Calculation of the 95% prediction interval did not provide a meaningful estimate.

The comparison of geographic regions showed the following results (Analysis 2.6).

- Asia/Middle East (1 study, 1103 participants with IH and 10,763 participants with normoglycaemia, 5 years' follow-up): the OR was 23.20 (95% CI 18.70 to 28.78).
- Australia/Europe/North America (1 study, 370 participants with IH and 5365 participants with normoglycaemia, 3 years' follow-up): the OR was 15.60 (95% CI 6.90 to 35.27).
- American Indians/Islands (1 study, 121 participants with IH and 595 participants with normoglycaemia, 4 years' follow-up): the OR was 5.89 (95% CI 4.23 to 8.20).

The OR for the Asia/Middle East and Australia/Europe/North America studies appeared higher compared with the American Indians/Islands study.

Combination of HbA1c 5.7% threshold with IFG 5.6 mmol/L threshold

Two studies defined IH using a combination of $HbA1c_{5.7}$ and $IFG_{5.6}$ at baseline and reported ORs (Analysis 2.7). The length of follow-up ranged from five to seven years (studies are ordered by ascending length of follow-up in Analysis 2.7).The studies included 2120 participants with IH and 11,886 participants with normoglycaemia. The pooled OR was 35.91 (95% CI 20.43 to 63.12).

The findings for each geographic region are as follows (Analysis 2.7).

- Asia/Middle East (1 study, 1951 participants with IH and 10,761 participants with normoglycaemia, 5 years' follow-up): the OR was 46.70 (95% CI 33.60 to 64.91).
- Australia/Europe/North America (1 study, 169 participants with IH and 1125 participants with normoglycaemia, 7 years' follow-up): the OR was 26.20 (95% CI 16.30 to 42.11).

Subgroup and sensitivity analyses

There were not enough data to perform subgroup analyses by age or sex. The special group of children and adolescents is reported under the headings corresponding to the association between IH and T2DM incidence and regression to normoglycaemia.

Sensitivity analyses for risk of bias were not meaningful because of the diversity in measurement of T2DM incidence, definitions of IH, and follow-up periods. The analysis of adequate adjustment for confounding factors in studies reporting HRs may have provided interesting information, but there were not enough data to analyse the impact of at least four or five well-known covariates influencing the relationship between prognostic factor and T2DM incidence. There were no very large studies including participants with IH at baseline.

Overview of complete data set and certainty of the evidence

Table 1 provides a succinct overview of the overall prognosis of people with IH as well as regression from IH to normoglycaemia over 1 to 20 years of follow-up.

Table 2 provides a succinct overview of IH compared with normoglycaemia as a prognostic factor for developing T2DM according to geographic regions/special populations and type of outcome measurement.

Figure 25 shows the overall prognosis of IH as measured by cumulative incidence over different follow-up periods and across all populations, as well as regression from IH to normoglycaemia.

Figure 25. Overall prognosis of people with intermediate hyperglycaemia (cumulative type 2 diabetes incidence and regression to normoglycaemia) associated with measures of intermediate hyperglycaemia HbA1c5.7/HbA1c6.0: glycosylated haemoglobin A1c 5.7%/6.0% threshold; IFG5.6/6.1: impaired fasting glucose 5.6/6.1 mmol/L threshold; IGT: impaired glucose tolerance

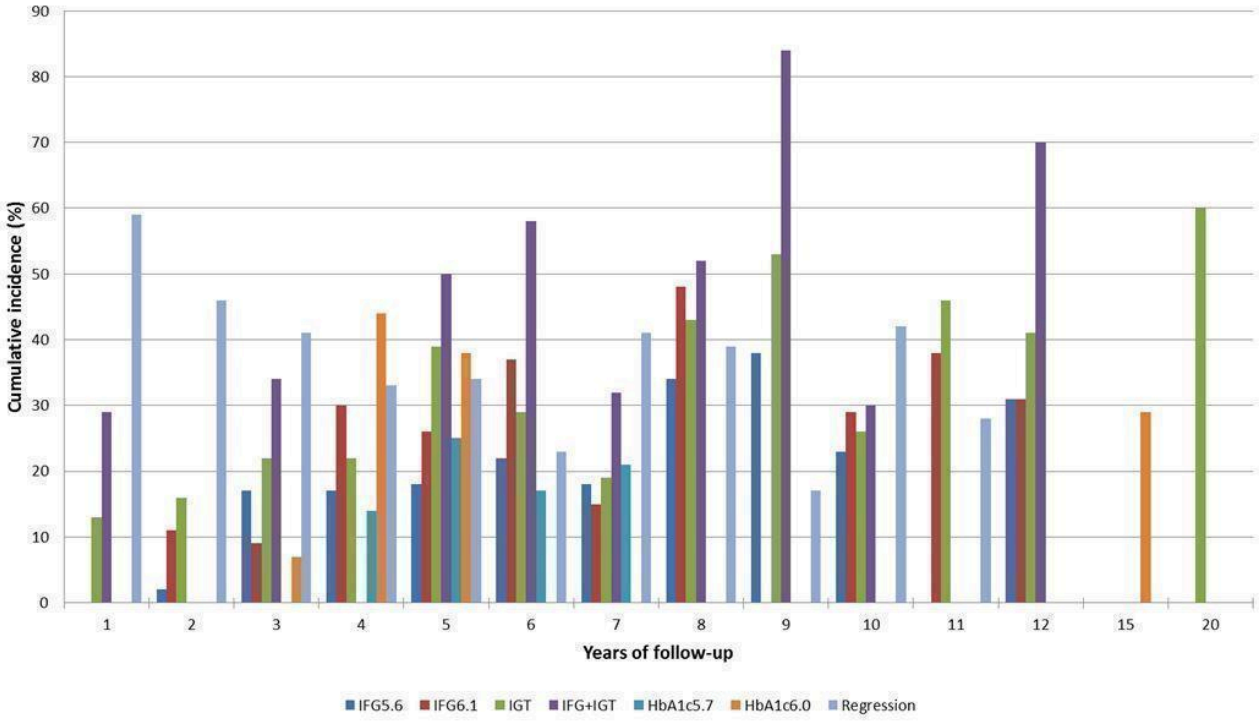
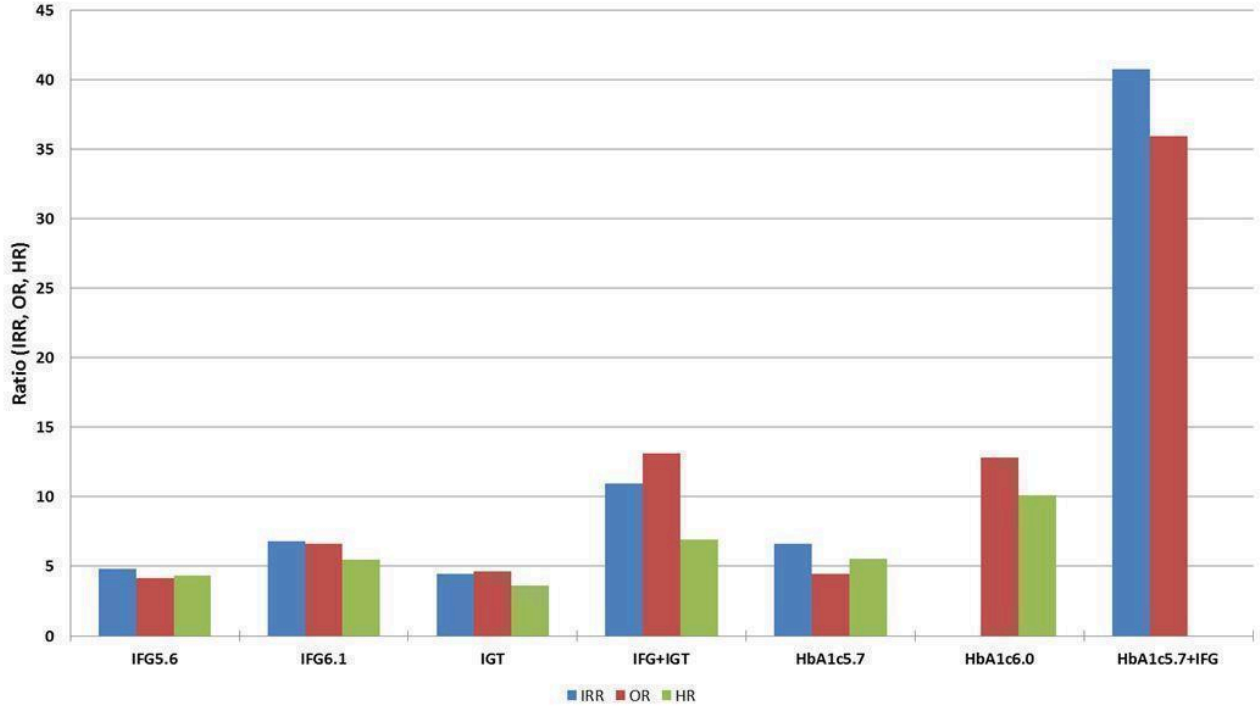


Figure 26 shows IH versus normoglycaemia as a prognostic factor for developing T2DM measured by IRR, OR or HR across all populations.

Figure 26. Intermediate hyperglycaemia versus normoglycaemia as a prognostic factor for developing type 2 diabetes (associated with different measures and relative risks of intermediate hyperglycaemia) HbA1c5.7/HbA1c6.0: glycosylated haemoglobin A1c 5.7%/6.0% threshold; IFG5.6/6.1: impaired fasting glucose 5.6/6.1 mmol/L threshold; IGT: impaired glucose tolerance; IRR: incidence rate ratio; OR: odds ratio; HR: hazard ratio



Taking into account all follow-up times and all populations, the percentages of people with IH *not* developing T2DM over time (i.e. either regressing to normoglycaemia or remaining 'prediabetic') were as follows (see Appendix 11): $IFG_{5.6}$ cohorts, 79.2%; $IFG_{6.1}$ cohorts, 75.4%; IGT cohorts, 66.7%; combined IFG and IGT cohorts, 57.2%; $HbA1c_{5.7}$ cohorts, 79.7%; and $HbA1c_{6.0}$ cohorts, 69.0%.

For overall prognosis, we started with high-certainty evidence because prospective cohort studies represent an adequate study design to investigate overall prognosis. However, we downgraded the certainty of the evidence to moderate because of imprecise results for most definitions of IH (Summary of findings for the main comparison).

We considered the overall certainty of the evidence for the prognostic factor IH versus normoglycaemia as low (Summary of findings 2; Summary of findings 3; Summary of findings 4; Summary of findings 5; Summary of findings 6; Summary of findings 7). We started with a high level of evidence because most included studies were phase 2 explanatory studies, defined as studies that aimed to confirm independent associations between the prognostic factor and the outcome (Huguet 2013). We downgraded the evidence for all IH measurements to low, first one level due to study limitations because many studies did not adequately adjust for confounders (only six studies used the covariate core set of age, sex, anthropometric measures and physical activity for adjustments in multivariable regression analyses - Bonora 2011; Derakhshan 2016; Forouhi 2007; Han 2017; Kim 2016a; Yeboah 2011). Furthermore, we downgraded one level for imprecision/inconsistency (wide 95% CIs/wide 95% prediction intervals, sometimes ranging from negative to positive prognostic factor to outcome associations).

DISCUSSION

Summary of main results

We included 103 prospective cohort studies from many parts of the world evaluating people with IH, usually defined using the $IFG_{5.6}$ or $IFG_{6.1}$ threshold, IGT, combined IFG/IGT or elevated HbA1c. However, we did not identify studies involving black Africans or Eastern Europeans. Participants were of Australian, European or North American origin in 41 studies; primarily of Latin American origin in 7 studies; Asian or Middle Eastern origin in 50 studies; American Indians in 3 studies; Mauritians in 1 study; and Nauruans in 1 study. Six studies included children, adolescents or both.

Ninety-three studies contributed data to estimate the overall prognosis of people with IH, and 52 studies evaluated baseline glycaemic status as a prognostic factor by comparing an IH cohort with a normoglycaemic cohort.

Cumulative incidence of T2DM for the $IFG_{5.6}$ threshold, the $IFG_{6.1}$ threshold, IGT, combined IFG/IGT and elevated HbA1c, showed increasing percentages over follow-up time; however, there was no clear linear increase over time. Regression rates to normoglycaemia, though decreasing over follow-up, showed fluctuations and no clear linear decrease over time. The estimates of the prognostic effect of IH versus normoglycaemia were comparable when using HR, IRR or OR across the different

definitions of IH. There was no clear pattern of risk differences between geographic regions.

Overall completeness and applicability of evidence

A limiting factor of our review was that most studies took place in Asia, the Middle East, Australia, Western Europe and North America, affecting the generalisability of findings to other populations residing in Africa and Eastern Europe. We are also aware that categorising the included studies based on region or 'ethnicity' has deficiencies with regard to clearly delineating study participants. The complicated interplay of factors like genetics, diets, and changing environmental and social conditions, among others, makes it virtually impossible to achieve a generally accepted categorisation. We chose an approach based primarily on geographic location because we thought that most readers would be interested in having a broad overview of any potential differences in T2DM incidence based on this characteristic. At the same time, we tried not to overload the reader with too much information by fragmenting our dataset into all the different countries or into more precisely defined 'ethnicities', since some investigators even reported several 'ethnic' subgroups within a single study cohort. However, we do provide detailed information, when available, in our appendices to enable the interested reader to identify studies according to whatever combination of factors seems of value to generate hypotheses of potential differences between the diverse study groups.

Only six studies addressed the overall prognosis of IH in 495 children or adolescents, with approximately 50% originating from high-risk American Indian cohorts, also affecting the applicability of findings to other populations. No data were available on the prognostic factor of IH versus normoglycaemia for children or adolescents. Most studies determined the glycaemic status of participants at baseline and follow-up on the basis of a single FPG, glucose tolerance test or HbA1c. Therefore, participants may have been misclassified at baseline, follow-up or both in either direction. Interestingly, 93 studies provided data on overall prognosis of IH, but only 49 studies published information on regression from IH to normoglycaemia.

Certainty of the evidence

To our knowledge there is no validated risk of bias tool for studies addressing overall prognosis. Moreover, information on some applicable risk of bias domains of the QUIPS tools were limited. However, as illustrated in Figure 25, there was a wide fluctuation between the various definitions of IH as well as no linear increase in T2DM incidence over time of follow-up. Of note, regression rates to normoglycaemia were also high, even after more than five years of follow-up, emphasising that transition from IH to T2DM might be an intermediate state (Taylor 2017).

The certainty of the evidence for the overall prognosis of IH was moderate due to imprecise results for most IH definitions. The certainty of the evidence for the prognostic factor of IH versus normoglycaemia was low, mainly because most studies did not adjust for confounders known to be independently associated with T2DM incidence and due to substantial imprecision (wide 95% CIs) and inconsistency (wide 95% prediction intervals). However, the results of the six studies that adjusted for sex, anthropometric measures and physical activity were similar to the rest of the prospective cohort studies.

Limitations in the review process

As described in the Methods section, it was difficult to define a reliable search strategy, which probably holds true for many systematic reviews of prognostic studies. We noted that when checking other systematic reviews on the topic and the references of the included studies, around one third of our included studies were identified through reference checking. However, using PubMed's 'similar articles' algorithm did not yield new studies but did help us identify 13 secondary publications of studies we had already included. The 103 prospective cohort studies included in this review represent by far the largest amount of data synthesised on the overall prognosis of IH and the impact of IH versus normoglycaemia as a prognostic factor for T2DM development. We did not contact study authors for additional information, mainly for logistical reasons but also because we anticipated poor response, since many studies were published long ago. Moreover, retrieval of additional information, often demanding recalculations, would have imposed a considerable burden on study authors.

During the review process, the need to establish a database of cohort studies specifying details on prognostic factors and outcomes, amongst other things, became clear. Many large cohort studies investigate the association of a great number of prognostic factors with yet another large number of outcomes. These data may only be detected through a detailed analysis of the full text (especially tables and figures). It is evident that screening titles and abstracts will miss this information.

We did not include participants of randomised controlled trials. Though potentially some trials with longer time of follow-up could provide additional data, we decided not to include information from intervention trials at this stage on theoretical grounds, as any intervention will interfere with peoples' lives, as opposed to demonstrating the natural progression of a disorder. In addition, we are conducting a series of Cochrane Reviews on interventions for people with IH and may integrate these data in a later update of this review (Hemmingsen 2016a; Hemmingsen 2016b; Hemmingsen 2016c).

Agreements and disagreements with other reviews

Gerstein 2007 is a widely cited review including 21 cohort studies and nine randomised controlled trials published between 1979 and 2004. The review authors annualised T2DM incidence rates, which varied from 5% to 10%. Their relative risks for T2DM incidence of 6.35 in people with IGT, 4.66 in people with IFG and 12.1 with both IFG and IGT were higher but comparable to our HR data. We did not annualise incidence rates because with pronounced fluctuations between regression and development of T2DM, assumptions to establish a model for annualising incidence data over prolonged period of times appeared too strong. Zhang 2010 examined ranges of HbA1c and also associated these with annualised diabetes incidences. The results of seven included studies reporting HbA1c categories showed an increase in T2DM incidence across an HbA1c range from 5.0% to 6.5%. No meta-analysis was performed. Our results also showed increased T2DM incidence when the threshold of the HbA1c value at baseline was raised from 5.7% to 6.0%. Morris et al. performed a meta-analysis of prospective observational studies in which participants had IH at baseline (Morris 2013). The review included 70 studies and estimated pooled incidence rates using IFG (35.5 incident cases per 1000 person-years as defined by ADA and 47.4 incident cases per 1000 person-years as defined

by WHO, 11 and 34 studies, respectively), IGT (45.5 incident cases per 1000 person-years, 46 studies) and IFG/IGT (70.4 incident cases per 1000 person-years, 15 studies) definitions for IH. Elevated HbA1c was associated with a pooled incidence rate of 35.6 per 1000 person-years. Similar to our results, the review found that progression rates to T2DM differed by definition of IH.

AUTHORS' CONCLUSIONS

Implications for practice

Our systematic review on the development of type 2 diabetes mellitus (T2DM) in people with intermediate hyperglycaemia (IH) or 'prediabetes' identified several uncertainties: glycaemic status can be measured in various ways, with IH usually defined by impaired fasting glucose (IFG) with cut-off levels of 5.6 mmol/L or 6.1 mmol/L, by impaired glucose tolerance (IGT) or by elevated HbA1c levels with thresholds of 5.7% or 6.0%. These definitions imply specific settings and demands on resources. It is likely that the accuracy of information provided by the tests will need to be balanced against the time, effort and cost required to capture them. IFG measurement is cumbersome because of the need for overnight fasting. HbA1c measurement is resource intensive and must be standardised, taking into account potential interference factors like anaemia, haemoglobinopathy or renal insufficiency. IGT measurement is cumbersome and also resource intensive. Overall, the certainty of the evidence was low for IH versus normoglycaemia, mainly because many of the prospective cohort studies did not adequately investigate other factors or covariates which could have confounded or modified the prognostic effect of glycaemic status on T2DM incidence. Moreover, results varied widely, making it difficult to specify the best definition for IH. The certainty of the evidence for the overall prognosis of people with IH as well as regression from IH to normoglycaemia was moderate because of imprecise results for most intermediate hyperglycaemia definitions. With increasing years of follow-up, T2DM incidence increased, but regression from IH to normoglycaemia was also high. There was no clear pattern of geographical differences; again, studies showed wide variation depending on the definition of IH, mode of measurement and length of follow-up. Due to the fluctuating stages of normoglycaemia, IH and T2DM, which might show transition from one stage to another in both directions and even after years of follow-up, practitioners should be careful about the potential implications of any active intervention for people 'diagnosed' with IH.

Implications for research

Future prospective cohort studies should address the consequences of IH to minimise secondary analyses of cohort studies where investigators synthetically form a subgroup of people with prediabetes, as such analyses are suboptimal. There is an urgent need for data from Eastern Europe and Africa to enable assessment of the prognostic value of IH in these regions, and for prospective cohort studies designed to examine the relationship between IH and normoglycaemia, T2DM incidence and the development of diabetic complications. The studies should adjust for confounding using important, well-defined factors such as age, sex, 'ethnicity', anthropometric measures and physical activity. Also, studies should be adequately powered and analysed using suitable statistical techniques such as time-dependent regression methods. There is a need for a database of cohort studies with details on all analysed prognostic factor to outcome associations because many cohort studies start with general questions like the influence of various risk factors on cardiovascular disease, and specific factors may only be identified by investigating the full text. The nature of these investigations means that search strategies basing their retrieval on titles and abstracts only will not be sufficient to identify these studies.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Admiraal 2014

Name of study	Surinamese in the Netherlands: study on health and ethnicity/healthy life in an urban setting (SUNSET/HELIUS)
Inclusion criteria	Participants of 2 studies (SUNSET and HELIUS), Surinamese and ethnic Dutch, southeast Amsterdam, aged 35–60 years with completed interviews and medical examinations at baseline and follow-up
Exclusion criteria	Missing FPG data, diabetes

Admiraal 2014 *(Continued)*

Notes	Baseline data for total cohort included in the analyses (N = 456): South-Asian Surinamese (N = 90), African Surinamese (N = 190), ethnic Dutch (N = 176)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Surinamese in the Netherlands study
Study participation: description of glycaemic status at baseline	Low risk	456 participants available for analysis; table 1 specifies people with $IFG_{5.7}$
Study participation: adequate description of sampling frame & recruitment	Low risk	Random sample of 2975 Surinamese and ethnic Dutch individuals, aged 35–60, drawn from the population register of 2 neighbourhoods in southeast Amsterdam
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria specified
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Those who were lost to follow-up were younger, had a higher BMI and greater waist circumference, a higher FPG and more often had baseline IFG than those with follow-up data available after 10 years
Study attrition: reasons for loss to follow-up provided	Low risk	777/1444 lost to follow-up (moved outside of Amsterdam, declined to participate, died, non-response); figure S1
Study attrition: adequate description of participants lost to follow-up	Low risk	Reported in Table S2
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	See above
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	FPG measurement by G6PD test
Glycaemic status measurement: continuous	Low risk	IFG: FPG 5.7–6.9

Admiraal 2014 *(Continued)*

variables reported or appropriate cut points used		
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; HbA1c ≥ 6.5; self-reported T2DM
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Reliable measurement
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Limited number of confounders measured
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Adjustment for sex, age, BMI and change in BMI after 10 years
Study confounding: important potential confounders accounted for in the analysis	Low risk	Unadjusted and adjusted analyses
Statistical analysis & reporting: sufficient presentation of data to assess	Low risk	Cumulative incidence, odds ratio

Admiraal 2014 *(Continued)*

adequacy of the analytic strategy		
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate logistic regression

Aekplakorn 2006

Name of study	None
Inclusion criteria	Eymployees of the Electric Generation Authority Bangkok, Thailand aged ≥ 35 years ('exploratory cohort'); middle-income social class
Exclusion criteria	Diabetes at baseline
Notes	Baseline data for cohort becoming diabetic (N = 361)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Cohort study of employees of the Electric Generation Authority of Bangkok, Thailand
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	3499 employees aged ≥ 35 years; mostly urban dwellers of middle-income social class
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria specified
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Of 3254 participants without diabetes at baseline, 2667 took part in the 1997 survey
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Individuals lost to follow-up were slightly older

Aekplakorn 2006 *(Continued)*

Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Unclear, limited data only
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	2-h OGTT after 75-g glucose load
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Glucose oxidase method
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG ≥ 5.6 to < 7.0; IGT: 2-h PG ≥ 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0 or 2-h glucose ≥ 11.1; development of T2DM during the follow-up period until 1997 according to FPG or diagnosis and/or receipt of diabetes medication during follow-up
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Limited number of confounders
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes

Aekplakorn 2006 *(Continued)*

Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Age, sex, BMI, waist circumference, smoking status, drinking status, family history, hypertension
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes; IFG status (model 2) and IGT status (model 3)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariable logistic regression

Ammari 1998

Name of study	None
Inclusion criteria	Community-based survey of cardiovascular risk factors in 4 Jordanian towns, individuals aged ≥ 25 years; follow-up on one of the town (Sikhra) and matched control group with non-IGT (normal) individuals from initial survey
Exclusion criteria	Diabetes
Notes	Few baseline data reported for total study population (N = 212)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	4 community-based survey of cardiovascular risk factors in 4 Jordanian towns
Study participation: description of glycaemic status at baseline	Low risk	Community-based survey of cardiovascular risk factors in 4 Jordanian towns
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes

Ammari 1998 *(Continued)*

Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	High risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not described (some comparison of participants with non-participants)
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not described
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	FPG and 2-h 75 g OGTT
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG 7.8 to < 11.1 (WHO 1985)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG ≥ 11.1 (WHO 1985)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of	Low risk	Yes (probably FPG and 2-h OGTT was also measured at follow-up)

Ammari 1998 *(Continued)*

outcome measurement for all study participants		
Study confounding: important confounders measured	Unclear risk	Some baseline parameters were investigated (hypercholesterolaemia, hypertriglyceridaemia, obesity, hypertension, family history of diabetes)
Study confounding: clear definitions of important confounders provided	Unclear risk	Scarce data
Study confounding: measurement of confounders valid & reliable	Unclear risk	Scarce data
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Not reported

Anjana 2015

Name of study	Chennai Urban Rural Epidemiology Study (CURES)
Inclusion criteria	Representative sample from Chennai, ≥ 20 years of age
Exclusion criteria	Diabetes at baseline, unknown glycaemic status
Notes	Baseline data for cohort becoming diabetic at follow-up (N = 176)

Anjana 2015 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Chennai Urban Rural Epidemiology Study
Study participation: description of glycaemic status at baseline	Low risk	299 with 'prediabetes'
Study participation: adequate description of sampling frame & recruitment	Low risk	Representative sample from Chennai, ≥ 20 years
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria specified
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	High risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	i-IFG, i-IGT, IFG/IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	i-IGT: 2-h PG 7.8–11.0 and FPG > 5.6; i-IFG: FPG 5.6–6.9 and 2-h PG < 7.8; prediabetes: FPG 5.6–6.9 or 2-h PG 7.8–11.0 (i-IGT or i-IFG or IFG/IGT)

Anjana 2015 *(Continued)*

Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; diagnosed; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	For IFG/IGT, several confounders measured as predictors for incident diabetes
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cox proportional hazards model for various single factors
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Univariate analyses
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate

Anjana 2015 *(Continued)*

Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Cox proportional hazards model, univariate analyses for single variables

Bae 2011

Name of study	None
Inclusion criteria	Individuals who participated in comprehensive health check-ups annually for 5 years
Exclusion criteria	Anaemia with a haemoglobin level < 7.4 mmol/L; self-reported diabetes and undiagnosed diabetes (FPG concentration 7.0 mmol/l or HbA1c 6.5%; absence of HbA1c data at any visit
Notes	Baseline data for total cohort

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Participants partially undergoing annual or biannual health check-ups (Kangbuk Samsung Hospital Total,Healthcare Center)
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Scarce data
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who complet-	Unclear risk	Not reported

Bae 2011 *(Continued)*

ed the study and those who did not		
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	$HbA1c_{5.7}$ and $HbA1c_{6.0}$
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Unclear risk	Normal reference for HbA1c: < 5
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; HbA1c ≥ 6.5; history of diabetes; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	2 covariates measured: age and sex
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if	Unclear risk	Not reported

Bae 2011 *(Continued)*

missing confounder data imputed		
Study confounding: important potential confounders accounted for in study design	Unclear risk	2 covariates included: age and sex
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	2 covariates analysed: age and sex
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Kaplan-Meier method, Cox proportional hazard analysis (2 covariates), ROC analysis

Baena-Diez 2011

Name of study	None
Inclusion criteria	Participants aged > 18 years visiting a healthcare centre with impaired fasting glucose measured twice
Exclusion criteria	Corticosteroid therapy, terminal illness, life expectancy of 1 year or less, diabetes
Notes	Baseline data for cohort with intermediate hyperglycaemia (N = 115)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Study participation: description of source population or population of interest	Low risk	Healthcare centre in Barcelona, Spain, "Cohorta Zona Franca"
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Scarce data
Study participation: adequate description of period & recruitment place	Low risk	Yes

Baena-Diez 2011 *(Continued)*

Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria specified
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Quote: "no significant differences"
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	FPG measured twice
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: 6.1–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0 (measured twice)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	FPG
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes

Baena-Diez 2011 *(Continued)*

Study confounding: important confounders measured	Unclear risk	Some variables (univariate analyses) associated with progression to diabetes
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some confounders measured
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Univariate analyses for single variables
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Cox regression for other risk factors (e.g. obesity) associated with progression to diabetes

Bai 1999

Name of study	None
Inclusion criteria	Staff of the Indian Institute of Technology of Chennai, along with their family members, aged 20 years and over
Exclusion criteria	Treatment for diabetes
Notes	Baseline data for the IGT cohort (N = 252)
Risk of bias	

Bai 1999 *(Continued)*

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Staff of the Indian Institute of Technology of Chennai, along with their family members, aged 20 years and over
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	High risk	Not reported
Study attrition: reasons for loss to follow-up provided	High risk	Not reported
Study attrition: adequate description of participants lost to follow-up	High risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 7.8 to < 11.1 (WHO 1985)
Glycaemic status measurement: same method and setting of measure-	Low risk	Yes

Bai 1999 *(Continued)*

ment of the glycaemic status for all study participants		
Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG ≥ 11.1 (WHO 1985)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Not reported, cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical	Unclear risk	Not reported

Bai 1999 *(Continued)*

model is adequate for the design of the study	

Bergman 2016

Name of study	Israel study of glucose intolerance, obesity and hypertension (Israel GOH study)
Inclusion criteria	Survival until follow-up with fasting blood glucose < 126 mg/dL (7.0 mmol/L) and 1- and 2-h postload glucose values available at baseline
Exclusion criteria	Individuals with diabetes
Notes	Baseline data for IGT cohort (N = 24)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Israeli general population registry sample
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Comment: "no differences" between non-participants and participants

Bergman 2016 *(Continued)*

Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Comment: IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	Comment: FPG 5.6–7.8; 2-h BG 7.8–11.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Unclear risk	Comment: FPG ≥ 7.8, 2-h BG ≥ 11.1; reported diabetes
Outcome measurement: method of outcome measurement used valid & reliable	Unclear risk	Non-standard FPG thresholds
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Comment: some confounders were measured
Study confounding: clear definitions of important confounders provided	Unclear risk	Comment: scarce data
Study confounding: measurement of confounders valid & reliable	Unclear risk	Comment: scarce data
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported

Bergman 2016 *(Continued)*

Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple multinomial logistic regression

Bonora 2011

Name of study	Bruneck Study
Inclusion criteria	White men and women, aged 40–79 years
Exclusion criteria	Not reported
Notes	No baseline data (except white participants aged > 40 years, N = 919)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Bruneck study, a long-term prospective population-based study of atherosclerosis and its risk factors
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion criteria described

Bonora 2011 *(Continued)*

Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	High risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Unclear risk	HbA1c categories, IFG (additional analyses)
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	HbA1: 6.0–6.49; IFG: not defined, probably FPG 5.6–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; HbA1c ≥ 6.5; diabetes treatment
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Yes

Bonora 2011 *(Continued)*

Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards models; additional models were run with updates variables (HbA1c and other variables were assessed every 5 years during follow-up)

Cederberg 2010

Name of study	None
Inclusion criteria	All inhabitants of the city of Oulo, Finland, born in 1935
Exclusion criteria	Diabetes at baseline
Notes	Baseline data for the total cohort (N = 553), men (N = 223), women (N = 330)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source popula-	Low risk	Part of a longer follow-up study assessing type 2 diabetes and IGT

Cederberg 2010 *(Continued)*

tion or population of interest		
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG, IGT, IFG/IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: 6.1–6.9; 2-h PG < 7.8; IGT: FPG > 7.0; 2-h PG 7.8 to < 11.1; elevated HbA1c: 5.7–6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Cederberg 2010 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	Confirmed by 2 diabetic 75 g OGTTs (2-h PG ≥ 11.1) and/or fasting values
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some confounders measured
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, risk ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Log-binomial regression

Chamnan 2011

Name of study	European Prospective Investigation of Cancer (EPIC)-Norfolk cohort
Inclusion criteria	Participants aged 40–74 years from the Norfolk region, UK; individuals with HbA1c measurements at baseline and the second health assessment
Exclusion criteria	Diabetes at baseline, missing data
Notes	Baseline data for HbA1c 6.0–6.4 cohort (N = 370)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Population-based study monitoring individuals recruited from general practice in the Norfolk region, UK
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	HbA1c (50% of all participants had information on this measure at baseline); analyses were limited to these individuals

Chamnan 2011 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	HbA1c 6.0–6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	HbA1c ≥ 6.5; reported physician-diagnosed diabetes or diabetes medications; antihyperglycaemic medication; diagnosis through medical records, registers or death certificates; results for clinically and/or biochemically diagnosed diabetes were used
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Yes
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes

Chamnan 2011 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression (for every 0.5% increase in HbA1c as well as for different categories of HbA1c)

Charles 1997

Name of study	Paris Prospective Study
Inclusion criteria	Longitudinal epidemiologic study of cardiovascular risk factors in male employees of the Paris police, born in France between 1917–28
Exclusion criteria	No diabetes or cardiovascular disease
Notes	Baseline data for individuals with IGT converting to T2DM (N = 32)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Longitudinal epidemiologic study of cardiovascular risk factors in male employees of the Paris
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	High risk	Not reported

Charles 1997 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	High risk	Not reported
Study attrition: adequate description of participants lost to follow-up	High risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG ≥ 7.8 to < 11.1 (WHO 1985)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG ≥ 11.1 (WHO 1985); physician diagnosed diabetes
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Charles 1997 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes (see below)
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate logistic regression (odds ratio for an increase of 1 SD in the population of participants with NGT or IGT)

Chen 2003

Name of study	None
Inclusion criteria	Residents of Penghu, Taiwan aged 40–79 years were selected for a baseline diabetes prevalence study
Exclusion criteria	Diabetes at baseline
Notes	Baseline data for cohort converting to T2DM (N = 26)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Random sample of residents of Penghu, Taipei were selected for a baseline diabetes prevalence survey

Chen 2003 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Quote: "the 600 persons who were re-examined did not significantly differ from the others"
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–7.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Chen 2003 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some confounders measured
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Age-sex adjusted odds ratio
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression (selected risk factors)

Chen 2017

Name of study	None
Inclusion criteria	Participants with complete 3 year follow-up and non-pharmacological interventions
Exclusion criteria	Participants aged 0–60 years, incomplete baseline data, diabetes at baseline
Notes	Baseline data for i-IFG/i-IGTand IFG/IGT across age groups < 40 years + > 60 years (data indicate range across groups) (i-IFG < 40 years: N = 51 and > 60 years: N = 278; i-IGT < 40 years: N = 41 and > 60 years: N = 151; IFG/IGT: < 40 years: N = 34 and > 60 years: N = 175)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Permanent participants of Fujian province (China), part of the baseline survey from the REACTION study investigating the association between diabetes and cancer
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG, IGT, IFG/IGT

Chen 2017 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 5.6–6.9 + 2-h PG ≤ 7.8; IGT: FPG < 5.6 + 2-h PG 7.8 to ≤ 11.0; IFG/IGT: FPG 5.6–6.9 + 2-h PG 7.8 to ≤ 11.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; previously diagnosed diabetes
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Confounder adjustment for HOMA-IR and HOMA-B
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes

Chen 2017 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes (HOMA-IR, HOMA-B)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Stepwise multiple regression analysis (for HOMA-IR or HOMA-B)

Coronado-Malagon 2009

Name of study	None
Inclusion criteria	Healthy Mexicans
Exclusion criteria	Previous diabetes diagnosis, various diseases and medications affecting glucose metabolism
Notes	Baseline characteristics for the prediabetic cohort (N = 217)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Personnel working for Petróleos Mexicanos with annual health-checkups living in the metropolitan area of Mexico City
Study participation: description of glycaemic status at baseline	Unclear risk	Quote: "prediabetes"
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes

Coronado-Malagon 2009 *(Continued)*

Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Unclear risk	IFG and IGT (ADA 2007), vague definition
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Unclear risk	IFG and IGT: 5.6–6.9 and 7.8 to < 11.1 (ADA 2007), vague definition
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Unclear risk	FPG ≥ 7.0 or 2-h PG ≥ 11.1 (ADA 2007), vague definition
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Scarce data
Study confounding: clear definitions of important confounders provided	Unclear risk	Scarce data

Coronado-Malagon 2009 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Unclear risk	Scarce data
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Scarce data
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Scarce data
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, relative risk
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression

Cugati 2007

Name of study	Blue Mountains Eye Study (BMES)
Inclusion criteria	Survey of vision and common eye diseases in 2 postcode areas west of Sydney; all permanent non-institutionalised residents with birth date prior to January 1943 (aged 49+ at baseline) were invited to attend a detailed eye examination at a local clinic
Exclusion criteria	Nursing home residents, diabetes at baseline, missing data
Notes	Baseline data for BMES I study, people without diabetes (N = 3437/3654)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Older community within the geographically defined area west of Sydney, Australia; population-based survey of vision and common eye diseases

Cugati 2007 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes, for most variables
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 5.6 -6.9 (originally FPG ≥ 6.1 to < 7.0)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Cugati 2007 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; self-reported diabetes history; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Few variables (adjustment for age and sex)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Few variables
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Few variables
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate-adjusted discrete logistic models, few variables

De Abreu 2015

Name of study	Geelong Osteoporosis Study (GOS)
Inclusion criteria	Female arm of the GOS
Exclusion criteria	No FPG level or self-report of antihyperglycaemic medication or diabetes status
Notes	Baseline data for IFG cohort at baseline (N = 187)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Utilised data from the female arm of the Geelong Osteoporosis Study, Australia
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG

De Abreu 2015 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: 5.5–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; self-reported; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Yes, also age-standardised incidence rate and additional covariates reported (metabolic syndrome, fasting glucose at baseline) (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes

De Abreu 2015 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression

Den Biggelaar 2016

Name of study	Cohort on Diabetes and Atherosclerosis Maastricht (CODAM)
Inclusion criteria	Individuals with an elevated risk of type 2 diabetes and cardiovascular disease
Exclusion criteria	Previously diagnosed type 2 diabetes at baseline, who did not undergo an OGTT and incomplete OGTT data
Notes	Baseline data for prediabetic group (N = 122)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Participants of the Cohort on Diabetes and Atherosclerosis Masstricht (CODAM) study on natural progression of glucose tolerance
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Low risk	Yes

Den Biggelaar 2016 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Analyses restricted individuals without T2DM who participated in the follow-up measurements
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG and IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FPG 6.1–6.9; 2-h PG 7.8–11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Not reported, cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported

Den Biggelaar 2016 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Discriminatory ability of beta-cell functions indices to predict 'prediabetes' and T2DM by means of ROC curves

Derakhshan 2016

Name of study	Tehran Lipid and Glucose Study (TLGS)
Inclusion criteria	3 separate analyses to investigate incidence of type 2 diabetes, hypertension and chronic kidney disease
Exclusion criteria	Individuals aged < 20 years, type 2 diabetes at baseline, missing data, no follow-ups
Notes	Baseline data for 'prediabetes' group with normal blood pressure (IFG and/or IGT, N = 523)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Population-based study on a representative sample of the population of Tehran to determine the prevalence and incidence of non-communicable diseases and their risk factors

Derakhshan 2016 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Unclear risk	Quote: "prediabetes" (IFG and IGT)
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	5.55 ≤ FPG < 7.0; 7.77 ≤ 2-h PG ≤ 11.1; no antihyperglycaemic medication
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Derakhshan 2016 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Yes
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Low risk	Multiple imputation
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Incidence rate, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazard models

Dowse 1991

Name of study	Nauru Study
Inclusion criteria	All Nauruans aged 20 years and over; this survey included 266 individuals who were not diabetic in the combined 1975/76 survey; individuals who had previously attended either or both the 1975/76 and 1982 surveys; individuals with at least one parent identified as being of Nauruan heritage
Exclusion criteria	Diabetes
Notes	No baseline data

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Nauruan population, persons of Micronesian ancestry
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Description of inclusion and exclusion criteria
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Some reasons provided
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IGT

Dowse 1991 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: FPG < 7.8 and 2-h PG ≥ 7.8 - < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG ≥ 11.1 (WHO 1985); FPG ≥ 7.8
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some confounders were measured
Study confounding: clear definitions of important confounders provided	Unclear risk	Yes
Study confounding: measurement of confounders valid & reliable	Unclear risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Yes

Dowse 1991 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression models

Ferrannini 2009

Name of study	Mexico City Diabetes Study
Inclusion criteria	Population-based study of diabetes and cardiovascular risk factors in low-income neighbourhoods in Mexico City, participants aged 35–64 years
Exclusion criteria	Type 2 diabetes, type 1 diabetes, pregnant women
Notes	Baseline characteristics provided for a range across different definitions of 'prediabetes'

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Data were collected as part of the Mexico City Diabetes Study
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Description of inclusion and exclusion criteria
Study attrition: description of attempts to col-	Unclear risk	Not reported

Ferrannini 2009 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Unclear, limited data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	(i)IFG, (i)IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9; IGT: FPG < 7.0 and 2-h PG 7.8–11.1; i-$IFG_{6.1}$/i-$IFG_{5.6}$: 2-h PG < 7.8 and FPG 6.1–6.9/5.6–6.1; i-IGT/i-$IGT_{6.1}$/i-$IGT_{5.6}$
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Not for transition data (intermediate hyperglycaemia to T2DM)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Ferrannini 2009 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Scarce data
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Scarce data
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, relative risk (multiple model odds ratios were calculated for 1 SD of the population value of that variable, in order to compare the relative importance of the variables (sex, familial diabetes, age, BMI, FPG, 2-h PG)
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Logistic regression (for calculation of odds ratios, see above)

Filippatos 2016

Name of study	ATTICA (province of Attica, Greece)
Inclusion criteria	1 participant per household, inhabitants from the Attica province
Exclusion criteria	People living in institutions; people with CVD and of those with chronic viral infections
Notes	Baseline data for $IFG_{5.6}$ cohort

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	ATTICA study

Filippatos 2016 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described (participants with no diabetes and no CVD at baseline)
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes (85% participation rate)
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	$IFG_{5.6}$
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FBG 5.6–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Filippatos 2016 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FBG > 6.9; use of antidiabetic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some confounders measured
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some confounders included
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some confounders analysed
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression models

Forouhi 2007

Name of study	Ely Study (Cambridgeshire, UK)
Inclusion criteria	All adults free of known diabetes registered with a single practice serving Ely, adults aged 40–69 years
Exclusion criteria	Diabetes
Notes	Baseline data for the $IFG_{6.1}$ cohort (N = 257) Cumulative incidence increased across increasing age groups and was higher in men than in women

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	The Ely Study (Cambridgeshire, UK) was a prospective study of the aetiology of T2DM
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG

Forouhi 2007 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	$IFG_{6.1}$: FPG 6.1–6.9 (FPG < 7.0 and 2-h PG < 11.1) and $IFG_{5.6}$: FPG 5.6–6.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; physician diagnosis or treatment for diabetes
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some confounders measured
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes

Forouhi 2007 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox regression (cumulative hazard curves by glucose status)

Garcia 2016

Name of study	Sacramento Area Latino Study on Aging (SALSA)
Inclusion criteria	Older Mexican Americans residing in the Sacramento metropolitan statistical area
Exclusion criteria	Missing baseline diabetes status, certain neighbourhoods
Notes	Baseline data for the IFG cohort (N = 310)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Participants were from the Sacramento Area Latino Study on Aging (SALSA), a longitudinal cohort study of physical and cognitive impairment and cardiovascular diseases in community-dwelling older Mexican Americans residing in the Sacramento Metropolltan Statistical Area
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes

Garcia 2016 *(Continued)*

Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Not reported but only 12/1789 participants were excluded
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FBG 5.6–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; self-reported; antihyperglycaemic medication; diabetes comedication at death
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some confounders measured
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Garcia 2016 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Multistate Markov models
Study confounding: important potential confounders accounted for in the analysis	Low risk	Multistate Markov models
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence (hazard ratio was calculated for the association between neighbourhood scocioeconomic position (NSEP) scores and transitions between various (pre)diabetic stages)
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multistate Markov models

Gautier 2010

Name of study	Data from an Epidemiological Study on the Insulin Resistance Syndrome (DESIR) cohort
Inclusion criteria	Men and women aged 30–64 years recruited from volunteers who were offered periodic health examinations free of charge by the French Social Security at 10 health centres in western France
Exclusion criteria	Diabetes at baseline, individuals with unknown diabetes status at the 9-year examination
Notes	No baseline data for cohort with intermediate hyperglycaemia

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Participants of the Data from an Epidemiological Study on the Insulin Resistance Syndrome (DESIR) cohort who had IFG at baseline

Gautier 2010 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Key characteristics unclear
Study participation: adequate description of period & recruitment place	Unclear risk	Time frame unclear
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	High risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IFG
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 5.6–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Gautier 2010 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; treatment for diabetes (at 1 of the 3-yearly examinations)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Some confounders measured
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes (see below)
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes (see below)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence (odds ratios for 9-year incident diabetes per 1 SD change in waist circumference and weight in IFG)
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic models (for increases in waist circumference and weight)

Gomez-Arbelaez 2015

Name of study	None
Inclusion criteria	Adults ≥ 35 years attending a general practitioner for any reason
Exclusion criteria	Known diabetes, acute illness, pregnancy, use of antihyperglycaemic medication
Notes	Baseline data for the total cohort (N = 772)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Longitudinal observational study conducted in a healthcare centre in Floridablanca, Colombia
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	The sub-sample of people with intermediate hyperglycaemia was followed for diabetes incidence
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	High risk	Not reported
Study attrition: reasons for loss to follow-up provided	High risk	Not reported
Study attrition: adequate description of participants lost to follow-up	High risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Intermediate hyperglycaemia as measured by FPG, OGTT, HbA1c; FINDRISC score

Gomez-Arbelaez 2015 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: ≥ 5.6 to < 7.0; IGT: ≥ 7.8 to < 11.1; HbA1c ≥ 5.7 to ≤ 6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; OGTT ≥ 11.1; HbA1c ≥ 6.5
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Age and sex-adjusted odds ratios for FINDRISC score
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	For FINDRISC score

Gomez-Arbelaez 2015 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Age and sex-adjusted odds ratios
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate logistic regression for the association between the FINDRISC score and incident T2DM

Guerrero-Romero 2006

Name of study	None
Inclusion criteria	Men and non-pregnant women, aged 20–64 years, were recruited from the city of Durango, northern Mexico; with NGT or IGT
Exclusion criteria	Participants who failed to attend 2 or more visits
Notes	Baseline data for IGT cohort at baseline progressing to T2DM (N = 20); all individuals were counselled on the importance of diet and physical exercise (standard care for the whole cohort)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Study participation: description of source population or population of interest	Low risk	Cohort study in healthy Mexicans to determine predictors for the development of metabolic disorders
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Time frame unclear
Study participation: adequate description of period & recruitment place	Unclear risk	Period of recruitment unclear
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Unclear risk	Not reported

Guerrero-Romero 2006 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG ≥ 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG: ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (for association between beta-cell function and IGT/T2DM) (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported

Guerrero-Romero 2006 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	For beta-cell function and IGT/T2DM
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some confounders measured
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate logistic regression on relative risk of IGT or T2DM associated with beta-cell function

Han 2017

Name of study	Ansung-Ansan cohort study, part of the Korean Genome and Epidemiology Study (KoGES), to investigate the trends in diabetes and associated risk factors
Inclusion criteria	Urban (Ansan) and rural (Ansung) communities (within 60 km of Seoul)
Exclusion criteria	Unknown glucose status, individuals with known diabetes, participants who were newly diagnosed with type 2 diabetes at baseline examination; persons with a history of malignant diseases, liver failure, end-stage renal disease, rheumatological diseases and acute or chronic infectious diseases, individuals who had taken steroids in the previous 3 months; individuals who did not undergo any follow-up examination after the baseline examination
Notes	Baseline data for i-IFG, i-IGT and IFG/IGT

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source popula-	Low risk	Ansung-Ansan Cohort Study, part of the Korean Genome and Epidemiology Study (KoGES)

Han 2017 *(Continued)*

tion or population of interest		
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes (follow-up rate at 12 years 60.6%)
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 5.6–6.9 and no diagnosis of diabetes; IGT: 2-h PG 7.8 to < 11.1; i-$IFG_{5.6}$: IFG without IGT; i-IGT: IGT without IFG; IGT/IGT: IFG+IGT; 'prediabetes': IFG or IGT
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Han 2017 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; HbA1c ≥ 6.5; current antihyperglycaemic treatment
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Yes
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate Cox proportional hazard model

Hanley 2005

Name of study	Insulin Resistance Atherosclerosis Study (IRAS)
Inclusion criteria	4 clinical centres (Oakland, Los Angeles - non-Hispanic whites and blacks recruited from Kaiser Permanente) and San Antonio, San Luis Valley (non-Hispanic whites and Hispanics): from 2 population-based studies (San Antonio Heart Study and the San Luis Valley Diabetes study)
Exclusion criteria	Participants with inflammatory diseases; diabetes; no information on metabolic variables of interest and follow-up glucose tolerance status
Notes	Baseline data for diabetic cohort at follow-up (N = 131); participants were recruited from 2 population-based studies: the San Antonio Heart Study and the San Luis Valley diabetes study

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Observational study of the relationship between insulin resistance, cardiovascular disease and its known risk factors in different ethnic groups and varying states of glucose tolerance; the study was conducted at 4 clinical centres; report on individuals who were nondiabetic at baseline and for whom information was available on metabolic variables of interest and follow-up glucose tolerance status
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Response rate 81%
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes

Hanley 2005 *(Continued)*

Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Unclear risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG, IGT (WHO 1999)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	High risk	Not specified
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported

Hanley 2005 *(Continued)*

Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates (age, sex, clinical centre, ethnicity) (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression

Heianza 2012

Name of study	Toranomon Hospital Health Management Center Study (TOPICS)
Inclusion criteria	Participants from the TOPICS: apparently healthy Japanese government employees who underwent annual multiphasic health screening examinations; the study attempted to elucidate the incidence of and risk factors for various diseases among the Japanese population
Exclusion criteria	Diabetes at baseline, missing data at baseline
Notes	Baseline data for the total cohort (N = 6241)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Study participation: description of source population or population of interest	Low risk	Healthy Japanese government employees who underwent annual examinations for health screening
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes

Heianza 2012 *(Continued)*

Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 5.6–6.9 or FPG 6.1–6.9; HbA1c 5.7 -6.4 or 6.0–6.4; IFG/HbA1c = 'prediabetes'
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; HbA1c ≥ 6.5%; self-reported clinician-diagnosed diabetes
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes

Heianza 2012 *(Continued)*

Study confounding: important confounders measured	Low risk	Yes
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox regression, multivariate model

Inoue 1996

Name of study	None
Inclusion criteria	Non-obese participants with IGT and 22 normal control persons were selected from the participants of a health screening programme
Exclusion criteria	People with liver or kidney diseases
Notes	Baseline data for the IGT cohort (N = 37)
Risk of bias	

Inoue 1996 *(Continued)*

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Unclear risk	Participants of a health screening programme
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Scarce data
Study participation: adequate description of period & recruitment place	Unclear risk	Scarce data
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IGT
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: ≥ 7.8 to < 11.1 (presumed WHO 1985)
Glycaemic status measurement: same method and setting of measure-	Low risk	Yes

Inoue 1996 *(Continued)*

ment of the glycaemic status for all study participants		
Outcome measurement: clear definition of the outcome provided	Low risk	IGT: ≥ 11.1 (presumed WHO 1985)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Not reported, cumulative incidence data
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported, cumulative incidence data
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical	Low risk	Kruskal-Wallis test

Inoue 1996 *(Continued)*

model is adequate for the design of the study	

Janghorbani 2015

Name of study	Isfahan Diabetes Prevention Study (IDPS)
Inclusion criteria	Participants with a family history of type 2 diabetes, being non-diabetic
Exclusion criteria	Type 1 diabetes, pregnancy
Notes	Baseline data for i-IFG, i-IGT and IFG/IGT cohort (N = 770); first-degree relatives of people with T2DM; data on the cohort without hypertension at baseline

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Ongoing cohort in central Iran to assess the various potential risk factors for diabetes in people with a family history of T2DM
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Description of inclusion and exclusion criteria
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes

Janghorbani 2015 *(Continued)*

Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	i-IGT: FPG < 5.6 and 2-h PG 7.8–11.1; i-IFG: 5.6–6.9 and 2-h PG < 7.8; IFG/IGT: 5.6–6.9 and 2-h PG 7.8–11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 11.1; antihyperglycaemic medication; 2nd FPG ≥ 7.0; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported

Janghorbani 2015 *(Continued)*

Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates measured (age, sex, BMI, triglycerides, total cholesterol) (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates measured (age, sex, BMI, triglycerides, total cholesterol) (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards model

Jaruratanasirikul 2016

Name of study	None
Inclusion criteria	Obese Thai children and adolescents aged 8–15 years, Pediatric Endocrine Clinic at Songklanagarind Hospital (Hat Yai, Songkhia Thailand)
Exclusion criteria	No clinical findings of secondary obesity, not on corticosteroids
Notes	Baseline data for IGT cohort (N = 27)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes

Jaruratanasirikul 2016 *(Continued)*

Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data
Study attrition: reasons for loss to follow-up provided	High risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	(i)-IGT: FPG < 5.6 and 2-h PG 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG > 7.0; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes

Jaruratanasirikul 2016 *(Continued)*

Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox regression analysis for ROC curves (cut-off FPG levels)

Jeong 2010

Name of study	None
Inclusion criteria	People older 20 years living in the rural area of Dalseong County near Daegu visiting community health centres
Exclusion criteria	Not reported
Notes	1287 participants were re-evaluated in 2008 and 187 new participants "added to the study"; baseline data for participants with incident diabetes (N = 135)
Risk of bias	

Jeong 2010 *(Continued)*

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Population-based survey to determine the prevalence and incidence of 'prediabetes' and diabetes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	High risk	Several surveys plus new recruitment; follow-up rate 80.5%; no description of dropouts
Study attrition: reasons for loss to follow-up provided	High risk	Not reported
Study attrition: adequate description of participants lost to follow-up	High risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG ≥ 5.6 to < 7.0; IGT: 2-h PG ≥ 7.8 to < 11.1; 'prediabetes': IFG or IGT
Glycaemic status measurement: same method and setting of measure-	Low risk	Yes

Jeong 2010 *(Continued)*

ment of the glycaemic status for all study participants		
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Several covariates were measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Unclear risk	Odds ratio
Statistical analysis & reporting: the statistical	Low risk	Logistic regression models

Jeong 2010 *(Continued)*

model is adequate for the design of the study	

Jiamjarasrangsi 2008a

Name of study	None	
Inclusion criteria	Individuals 35 years or older participating in the annual physical checkup at least twice during the years 2001–2005	
Exclusion criteria	People with diabetes	
Notes	Baseline data for total cohort becoming diabetic at follow-up (N = 48)	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Study participation: description of source population or population of interest	Low risk	University hospital employees
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported

Jiamjarasrangsi 2008a *(Continued)*

Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG ≥ 5.6 to < 7.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Logistic regression on hepatic enzymes; incidence rate: few covariates (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Unclear risk	Logistic regression on hepatic enzymes
Study confounding: measurement of confounders valid & reliable	Unclear risk	Logistic regression on hepatic enzymes
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Logistic regression on hepatic enzymes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Logistic regression on hepatic enzymes

Jiamjarasrangsi 2008a *(Continued)*

Study confounding: important potential confounders accounted for in study design	Unclear risk	lLogistic regression on hepatic enzymes
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Logistic regression on hepatic enzymes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression (independent variables: hepatic enzymes) and Poisson regression analyses

Kim 2005

Name of study	None
Inclusion criteria	People visiting the Health Promotion Centre of Samsung Medical Center for a physical health check-up
Exclusion criteria	Diabetes
Notes	Baseline data for FPG group 4 (6.1–7.0) with baseline and follow-up (N = 276)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes (FPG categories)
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described

Kim 2005 *(Continued)*

Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Participation rate 20.9% in group 4; scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1 to < 7.0 (group 4)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; antihyperglycaemic treatment
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Several covariates measured (see Appendix 16 and Appendix 17)

Kim 2005 *(Continued)*

Study confounding: clear definitions of important confounders provided	Unclear risk	Scarce data
Study confounding: measurement of confounders valid & reliable	Unclear risk	Scarce data
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox regression analysis

Kim 2008

Name of study	None
Inclusion criteria	Individuals undergoing a medical examination at Inha University Hospital with a follow-up medical examination 2 years later
Exclusion criteria	Individuals diagnosed with diabetes at baseline
Notes	Baseline data for $IFG_{5.6}$/$IFG_{6.1}$ cohort (N = 1335/N = 494)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source popula-	Low risk	Participants who underwent a medical examination at Inha University Hospital and had either NGT or IFG

Kim 2008 *(Continued)*

tion or population of interest		
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Participants diagnosed with diabetes in 2002 were excluded
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	$IFG_{5.6}$: FPG 5.6–7.0; $IFG_{6.1}$: FPG 6.1–7.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Kim 2008 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Measurement of cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Measurement of cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	ROC curves for predicting the future onset of diabetes

Kim 2014

Name of study	None
Inclusion criteria	Pre-screened individuals with 'prediabetes' visiting the diabetes clinic at Seoul National University Bundang Hospital (SNUB) in 2005/06 after they were diagnosed with prediabetes at their health check-up or primary clinic
Exclusion criteria	Taking oral hypoglycaemic agents or insulin
Notes	Baseline data for i-IFG (N = 158)/i-IGT (N = 65)/IFG/IGT (N = 119)/i-HbA1c (N = 64); total: N = 406

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Pres-screened individuals with 'prediabetes'
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Pre-defined participants with intermediate hyperglycaemia
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Kim 2014 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	i-IFG: FPG 5.6–6.9 and 2-h PG < 7.8; i-IGT: 2-h PG 7.8–11.1 and FPG < 5.6; IFG/IGT: combined glucose intolerance; HbA1c: 5.7–6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; HbA1c ≥ 6.5
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	For C-peptide
Study confounding: clear definitions of important confounders provided	Unclear risk	For C-peptide
Study confounding: measurement of confounders valid & reliable	Unclear risk	For C-peptide
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	For C-peptide
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	For C-peptide

Kim 2014 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	For C-peptide
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression for association of T2DM development and C-peptide levels

Kim 2016a

Name of study	None
Inclusion criteria	Medical examinations at the Health Screening and Promotion Center at Asan Medical Center (Seoul, Korea)
Exclusion criteria	History of diabetes mellitus, taking antihyperglycaemic medications, FPG ≥ 7.0 mmol/L or HbA1c ≥ 6.5% at baseline
Notes	2 baseline data cohorts: 'prediabetes' by FPG and HbA1c (N = 3544 and N = 1713)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Unclear risk	Participants who underwent medical examinations in a health screening and promotion centre
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Unclear risk	Not reported

Kim 2016a *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FPG 5.6–6.9; HbA1c 5.7–6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	FPG ≥ 7.0; HbA1c ≥ 6.5; antihyperglycaemic medications
Outcome measurement: clear definition of the outcome provided	Low risk	Yes
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Several covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Kim 2016a *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate logistic regression

Kleber 2010

Name of study	None
Inclusion criteria	Obese children and adolescents aged 10-17 years with IGT attending the outpatient centre (Department of Paediatric Nutrition Medicine, Witten/Herdecke Germany)
Exclusion criteria	Not reported
Notes	Baseline data for IGT cohort (N = 79)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Obese white children and adolescents with IGT attending an outpatient centre

Kleber 2010 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Unclear risk	Time of recruitment unclear
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	No exclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Probably no dropouts
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG > 7.7: IFG: FPG ≥ 5.5
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Kleber 2010 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	T2DM by ADA 2000 guidelines
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple linear regression

Kleber 2011

Name of study	None
Inclusion criteria	Obese white children with IGT without medication or endocrine/syndromal disorders, aged 10-17 years not participating in the intervention part of the study
Exclusion criteria	Children in the intervention part of the study
Notes	Baseline data for IFG cohort (N = 128)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Obese children and adolescents with IGT not attending an intervention trial
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Unclear risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Kleber 2011 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: not reported (presumed 7.8–11.1)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	"ADA" (2000 criteria - 2-h PG ≥ 11.1)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Measurement of cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Npt reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported

Kleber 2011 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple linear regression

Ko 1999

Name of study	None
Inclusion criteria	Chinese participants with IGT
Exclusion criteria	Not reported
Notes	Letter to the editor

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Chinese participants with IGT
Study participation: description of glycaemic status at baseline	Low risk	WHO/NDGG 1979
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Scarce data
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported (IGT cohort)

Ko 1999 *(Continued)*

Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported (IGT cohort)
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported (IGT cohort)
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not applicable (IGT cohort)
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	IGT (WHO/NDDG 1979 definition)
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	Yes
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	Assumed WHO/NDDG 1979 definition
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence

Ko 1999 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Cox regression analysis (to predict the progression to diabetes with age, sex, BMI, blood pressure, HbA1c, FPG, 1-h PG and 2-h PG as predictor variables)

Ko 2001

Name of study	None
Inclusion criteria	The Diabetes and Endocrine Centre of the prince of Wales Hospital in Hong Kong screened individuals with risk factors for glucose intolerance (family history of diabetes, history of gestational diabetes, overweight, hypertension) by OGTT
Exclusion criteria	Diabetes at baseline
Notes	Baseline data for IFG cohort (N = 55)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Individuals with risk factors for glucose intolerance undergoing screening for diabetes

Ko 2001 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Ko 2001 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Measurement of cumulative incidence
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	No ratios reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	No ratios reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Kaplan-Meier analysis, Cox regression analysis (to predict the progression to diabetes with age, sex, BMI, blood pressure, FPG, gestational diabetes, HbA1c, smoking habit and IFG status being independent variables - no hazard ratios provided)

Larsson 2000

Name of study	None
Inclusion criteria	Postmenopausal women aged 55–57 years in a health screening programme; random sample of 265/1843 invited for follow-up (new OGTT); 1843 women were grouped according to WHO and ADA glucose tolerance criteria
Exclusion criteria	Not reported
Notes	Baseline data for (i)-IGT (N = 66)/(i)-IFG (N = 42)/IFG/IGT (N = 30); 265 follow-up participants were randomly sampled from each glucose tolerance group of the original cohort and invited for follow-up; NGT at baseline vs follow-up: FPG < 5.3 vs < 6.1; FPG 5.3: 15% conversion factor as recommended by the WHO (blood glucose > plasma glucose)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Unclear risk	Postmenopausal women participating in a health screening programme; follow-up: a random sample of the original cohort
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	No exclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported

Larsson 2000 *(Continued)*

Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	(i)-IFG: BG 5.3–5.9 and 2-h BG < 7.8; (i)-IGT: FPG < 5.3 and 2-h BG 7.8–11.0; IFG/IGT: BG 5.3–5.9 and 2-h BG 7.8–11.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Measurement of cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported

Larsson 2000 *(Continued)*

Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Chi-squared test

Latifi 2016

Name of study	None
Inclusion criteria	Residents aged over 20 years
Exclusion criteria	Not reported
Notes	Baseline for prediabetic cohort becoming diabetic at follow-up

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	First phase of prevalence study of the metabolic syndrome and its related factors in Ahvaz Diabetes Research Centre, Iran
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	No exclusion criteria reported

Latifi 2016 *(Continued)*

Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	5.6 ≤ FPG < 7.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Several covariates measured (see Appendix 16 and Appendix 17)

Latifi 2016 *(Continued)*

Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Unclear risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Multiple logistic regression of factors affecting the incidence of diabetes and prediabetes among healthy people in phase 1 (baseline)

Lecomte 2007

Name of study	None
Inclusion criteria	People with IFG recruited from medical check-ups by the French social security system in the 9 preventive health centres of IRSA (Institut Interrégional pur la Santé)
Exclusion criteria	No personal history of diabetes, no hypoglycaemic drug treatment
Notes	Baseline data for IFG cohort attending both examinations (N = 743)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source popula-	Low risk	Yes

Lecomte 2007 *(Continued)*

tion or population of interest		
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Yes
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9; no personal history of diabetes; no hypoglycaemic treatment
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Lecomte 2007 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; personal history of diabetes; antihyperglycaemic treatment
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Measurement of cumulative incidence
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Univariate analyses, some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates, univariate analyses (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression, univariate analyses on risk factors for developing diabetes

Lee 2016

Name of study	None
Inclusion criteria	Individuals undergoing health checkups at a single medical institution (Gangneung Asian Hospital)
Exclusion criteria	Previously diagnosed with diabetes, history of diabetes medication use, only 1 measurement
Notes	Baseline data for the total cohort (N = 3497)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Lee 2016 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	HbA1c 5.7–6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	HbA1c ≥ 6.5
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Measurement of cumulative incidence
Study confounding: clear definitions of important confounders provided	Low risk	Yes for coffee consumption
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	1 covariate

Lee 2016 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	No ratios reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Unclear risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Kaplan-Meier survival analysis for progression to diabetes according to coffee consumption

Leiva 2014

Name of study	Programa de Investigación de Factores de Riesgo de Enfermedad Cardiovascular (PIFRECV)
Inclusion criteria	Study participants were recruited in 2005 by the 'Programa de Investigación de Factores de Riesgo de Enfermedad Cardiovascular' (PIFRECV); participants had to have an FPG 5.6–6.9 mmol/L
Exclusion criteria	Diabetes, individuals on corticosteroid treatment, pregnant women, individuals with cardiovascular complications
Notes	Most baseline data for cohort becoming diabetic at follow-up (N = 94 with IFG)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Low risk	Yes

Leiva 2014 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: 5.6–7.0 (low range: 5.6–6.1; high range: 6.1–6.9)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0 (on 2 consecutive days); HbA1c ≥ 6.5
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates were measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Leiva 2014 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates planned (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox regression analysis (comparing 'high range' glycaemia (> 6.1 mmol/L) with 'low range' glycaemia (< 6.1 mmol/L)

Levitzky 2008

Name of study	Framingham Heart Study
Inclusion criteria	Participants were drawn from the Framingham Offspring cohort; participants who attended examinations (referred to as index examinations)
Exclusion criteria	Participants with CHD or diabetes
Notes	Baseline data for individuals on first exam, free of CVD (N = 4058)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Levitzky 2008 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	$IFG_{5.6}$: FPG 5.6–6.9; $IFG_{6.1}$: FPG 6.1–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Levitzky 2008 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Pooled logistic regression, multivariable models

Li 2003

Name of study	Kinmen Study (study in Kin-Chen, Kinmen, Taiwan)
Inclusion criteria	Individuals aged ≥ 30 years in Kin-Chen; FPG 5.6–7.0 and 2-h PG < 11.1
Exclusion criteria	Diabetes
Notes	Baseline data for i-IGT (N = 118)/i-IFG (N = 42)/IFG/IGT (N = 49) cohorts

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes, series of community-based epidemiological surveys of diabetes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Li 2003 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	i-iFG: FPG 6.1–7.0 and 2-h PG < 7.8; i-IGT: FPG < 6.1 and 2-h PG 7.8–11.1; IFG/IGT: FPG 6.1–7.0 and 2-h PG 7.8–11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.0; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)

Li 2003 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazard model (hazard ratios of T2DM for relative insulin resistance, beta-cell dysfunction and varying degrees of glucose intolerance)

Ligthart 2016

Name of study	Rotterdam study, targeting cardiovascular, endocrine, hepatic, neurological, ophthalmic, psychiatric, dermatological, oncological and respiratory diseases
Inclusion criteria	Community dwelling population aged 45/55 years and older in Rotterdam, no diabetes at baseline
Exclusion criteria	No valid baseline fasting glucose measurement, no informed consent
Notes	Baseline data for prediabetic cohort (N = 1382)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Unclear risk	Not reported

Ligthart 2016 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FBG > 6.0 and < 7.0; non-fasting BG > 7.7 and < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FBG ≥ 7.0; non-fasting BG ≥ 11.1; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates for lifetime risk of diabetes (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Ligthart 2016 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	For lifetime risk of diabetes
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	For lifetime risk of diabetes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Modified version of survival analysis to calculate the lifetime risk of diabetes

Lipska 2013

Name of study	Health, Aging, and Body Composition study (Health ABC)
Inclusion criteria	Aged 70–79 years from Pittsburgh (PA) and Memphis (TN); no difficulty performing activities of daily living, walking 0.25 mile (402 m) or climbing 10 steps without resting; no reported need of assistive devices (e.g. cane, walker); no active treatment for cancer in the prior 3 years; no life-threatening illness; and no plans to leave the area for 3 years
Exclusion criteria	Not surviving baseline, diagnosed diabetes, missing HbA1c or FPG values at baseline, without adequate follow-up after baseline
Notes	Baseline data for i-IFG (N = 189)/i-HbA1c$_{5.7}$ (N = 207)/IFG/HbA1c (N = 169) cohorts

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source popula-	Low risk	Yes

Lipska 2013 *(Continued)*

tion or population of interest		
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	i-IFG: FPG 5.6–6.9 and HbA1c < 5.7; i-HbA1c: 5.7–6.4 and FPG > 5.6; IFG and HbA1c: FPG 5.6–6.9 and HbA1c 5.7–6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Lipska 2013 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	Single HbA1c ≥ 6.5 (years 2,6,7); self-report of physician diagnosis (annually); antihyperglycaemic medication (years 1,2,4,6,7)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Multiple covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariable logistic regression

Liu 2008

Name of study	None
Inclusion criteria	Individuals from the JiangSu province of China, aged 35–74 years, to trace the incidence of CVD and diabetes; individuals participating twice in the study
Exclusion criteria	Individuals suffering from cancer, severe disability, severe psychiatric disturbances; individuals with diabetes, missing data
Notes	Baseline data for non-diabetic participants (N = 1844); men (N = 788)/women (N = 1056)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Liu 2008 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG 5.6–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.0; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)

Liu 2008 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, relative risk
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards regression

Liu 2014

Name of study	None
Inclusion criteria	Shanghai residents
Exclusion criteria	Not reported
Notes	Baseline data for the prediabetic cohort converting to T2DM (N = 78)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes

Liu 2014 *(Continued)*

Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Unclear risk	"WHO criteria"
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Unclear risk	Scarce data
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Unclear risk	Scarce data; IFG or GT
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Unclear risk	"WHO criteria"
Outcome measurement: method of outcome measurement used valid & reliable	Unclear risk	Scarce data
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported

Liu 2014 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Analysis of variance

Liu 2016

Name of study	Beijing Longitudinal Study on Aging (BLSA)
Inclusion criteria	Chinese elders free of diabetes at baseline
Exclusion criteria	Diabetes at baseline
Notes	Baseline data for participants without diabetes at baseline (N = 1857)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Liu 2016 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FPG 6.1–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Liu 2016 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; self-reported; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Subdistribution hazards model

Liu 2017

Name of study	China Multicenter Collaborative Study of Cardiovascular Epidemiology (ChinaMUCA)
Inclusion criteria	2 studies: China Multicenter Collaborative Study of Cardiovascular Epidemiology (ChinaMUCA) study and the China Cardiovascular Health Study
Exclusion criteria	Individuals with missing baseline glucose information, individuals from Deyang, Sichuan (earthquake) and individuals with ASCVD at baseline
Notes	Baseline data for IFG cohort at baseline (N = 3607)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Participants lost to follow-up e.g. were younger, had lower BMI levels and higher physical activity levels
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Liu 2017 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FBG 5.6–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FBG ≥ 7.0; using insulin/antihyperglycaemic medications; self-reported
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)

Liu 2017 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazard regression

Lorenzo 2003

Name of study	San Antonio Heart Study (SAHS)
Inclusion criteria	Mexican-Americans and non-Hispanic whites participating in a study of type 2 diabetes and cardiovascular disease
Exclusion criteria	Phase 1 participants (waist circumference was not measured), and those in phase 2 with diabetes at baseline
Notes	Baseline data for cohort converting to T2DM (N = 195)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Unclear risk	Scarce data

Lorenzo 2003 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9; IGT: 2-h PG 7.8 to < 11.1 (WHO 1999)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG: ≥ 7.0; 2-h PHG: ≥ 11.1 (WHO 1999/1985)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Lorenzo 2003 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression (diabetes risk of the metabolic syndrome and components of the metabolic syndrome)

Lyssenko 2005

Name of study	Botnia Study
Inclusion criteria	People with type 2 diabetes in western Finland were invited to participate together with their family members; nondiabetic individuals were invited (family members or 'controls' (spouses), aged 18–73 years; prospective visits every 2–3 years; at least 2 OGTTs
Exclusion criteria	MODY, individuals with missing data
Notes	Baseline data for IFG-IGT individuals who converted to T2DM (N = 86)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Lyssenko 2005 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Description of inclusion and exclusion criteria
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG ≥ 6.1 (WHO 1999 criteria)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Lyssenko 2005 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	WHO 1999 criteria
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Univariate analyses
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Univariate analyses
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Univariate analyses
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Univariate Cox proportional hazards model (adjusted for BMI)

Magliano 2008

Name of study	Australian Diabetes, Obesity and Lifestyle Study (AusDiab)
Inclusion criteria	National population-based survey in adults aged ≥ 25 years
Exclusion criteria	Participants refusing further contact, deceased, moved overseas or into a nursing facility classified for high care, had a terminal illness
Notes	Baseline data for cohort becoming diabetic at follow-up (N = 224/5842)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Magliano 2008 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9 and 2-h PG < 7.8; IGT: FPG < 7.0 and 2-h PG ≤ 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; current antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Multiple covariates included (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes

Magliano 2008 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Low risk	ORs per SD changes in FPG and HbA1c
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate per year, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate logistic regression (logFRPG and logHbA1c)

Man 2017

Name of study	Singapore Malay Eye Study (SIMES)
Inclusion criteria	Malay adults in Singapore aged 40–80 years; SIMES aims to assess the prevalence, incidence, progression, associated factors and impact of major eye disease as well as access to eye care by Asian Malays
Exclusion criteria	Diabetes, missing data
Notes	Baseline data for incident diabetes cohort (N = 127)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Unclear risk	Scarce data

Man 2017 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	HbA1c 5.7–6.4; no self-reported diabetes or antihyperglycaemic medication
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	Random glucose ≥ 11.1 or HbA1c > 6.4; self-reported history or antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Man 2017 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, risk ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate analyses using modified Poission regression models to estimate adjusted risk ratios

Marshall 1994

Name of study	San Luis Valley Diabetes Study
Inclusion criteria	The San Luis Valley Diabetes Study determined the prevalence and incidence of NIDDM among Hispanic and non-Hispanic white adults; sample without prior diabetes diagnosis aged 30–74 years; IGT at the initial visit
Exclusion criteria	Unavailability of complete data
Notes	Baseline data for IGT cohort converting to T2DM (N = 20)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Marshall 1994 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG ≥ 7.8 to < 11.1 (WHO 1985)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Marshall 1994 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG ≥ 11.1 (WHO 1985)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression (baseline dietary risk factors to predict the development of diabetes; glucose levels as continuous variables)

McNeely 2003

Name of study	Japanese American Community Diabetes Study
Inclusion criteria	Second-generation (Nisei) and third-generation (Sansei) Japanese-American participants residing in Kong County, Washington
Exclusion criteria	Individuals with diabetes at baseline
Notes	Baseline data for cohort converting to T2DM at 5–6 years (N = 50)/10 years (N = 74)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Scarce data
Study participation: adequate description of period & recruitment place	Unclear risk	Scarce data
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Some difference reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

McNeely 2003 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG ≥ 6.1 to < 7.0; IGT: 2-h PG ≥ 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; antihyperglycaemic medication prescribed by a physician
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence

McNeely 2003 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression (ROC-curves, clinical model)

Meigs 2003

Name of study	Baltimore Longitudinal Study of Aging (BLSA)
Inclusion criteria	Community dwelling volunteers, largely from the Baltimore (MD) and Washington, D.C. areas; primarily white middle- and upper-middle socioeconomic class aged 21–96 years, being examined approximately every 2 years; open cohort design with dropouts replaced (around 1000 persons at each study cycle); attending at least 3 examinations and an OGTT within an 8-year period
Exclusion criteria	2 or fewer OGTTs or > 4 years elapsed between any 2 OGTTs
Notes	Baseline data for the IFG-IGT cohort (N = 265); follow-up time: at least 6 years 77%, at least 10 years 44%, at least 16 years 16%, at least 20 years 4.5%

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described

Meigs 2003 *(Continued)*

Study attrition: description of attempts to collect information on participants who dropped out	High risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9 and 2-h PG ≤ 7.8; IGT: FPG < 6.1 and 2-h PG 7.8–11.0; IFG/IGT
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1 (IFG-IGT: diabetes defined by OGTT)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence, incidence rates

Meigs 2003 *(Continued)*

Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence, incidence rates
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence, incidence rates
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence, incidence rates
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence, incidence rates
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence, incidence rates
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence, incidence rates
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Kaplan-Meier product limit estimates

Mohan 2008

Name of study	Chennai Urban Population Study-19 (CUPS-19)
Inclusion criteria	Participants of 2 residential colonies in Chennai, India, representing the middle and lower income groups ≥ 20 years of age
Exclusion criteria	Individuals with diabetes
Notes	Baseline data for cohort becoming diabetic at follow-up (N = 64/476)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Study participation: description of source popula-	Low risk	Yes

Mohan 2008 *(Continued)*

tion or population of interest		
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG ≥ 6.1 to < 7; IGT: 2-h PG ≥ 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Mohan 2008 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence, incidence rate
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence, incidence rate
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence, incidence rate
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence, incidence rate
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence, incidence rate
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence, incidence rate
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox regression analysis (effects of various risk factors but not intermediate hyperglycaemia on diabetes)

Motala 2003

Name of study	None
Inclusion criteria	South African Indians, mainly living in Durban (1984); survey to determine the prevalence of NIDDM among South African Indians; non-pregnant participants > 15 years of age
Exclusion criteria	Not reported
Notes	Baseline data for responders (both baseline and follow-up examination) (N = 563)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Motala 2003 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: FPG < 7.8 and 2-h PG 7.8 to < 11.1 (WHO 1985)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.8; 2-h PG ≥ 11.1 (WHO 1985)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence

Motala 2003 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression (to evaluate the effect of various predictor variables for type 2 diabetes)

Motta 2010

Name of study	Italian Longitudinal Study on Aging (ILSA)
Inclusion criteria	Elderly participants aged 65–84 years involved in ILSA studies
Exclusion criteria	Not reported
Notes	No baseline characteristics provided

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported

Motta 2010 *(Continued)*

Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: 6.1 to < 7.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence

Motta 2010 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	t-test

Mykkänen 1993

Name of study	None
Inclusion criteria	Participants from Kuopio, Finland
Exclusion criteria	Diabetes at baseline, incomplete OGTT at the follow-up examination
Notes	Baseline data for cohort developing T2DM (N = 69)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Mykkänen 1993 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: FPG < 7.8 and 2-h PG 7.8–11.1 (WHO 1985)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Mykkänen 1993 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.8; 2-h PG ≥ 11.1 (WHO 1985)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	ANCOVA, odds ratios (risk of developing diabetes associated with various risk factors)

Nakagami 2016

Name of study	Kurihashi Lifestyle Cohort Study
Inclusion criteria	Baseline health check-ups at Kurihashi Hospital
Exclusion criteria	People < 30 years or ≥ 80 years, diabetes at baseline, people with chronic diseases, missing covariate data
Notes	Baseline data for cohort converting to T2DM (N = 99)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Nakagami 2016 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FPG 5.5–6.9; HbA1c 5.7–6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0, HbA1c ≥ 6.5; physician diagnosis of diabetes
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)

Nakagami 2016 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, hazard ratio (associated with a 1 SD increase in the levels of FPG or HbA1c)
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards models

Nakanishi 2004

Name of study	None
Inclusion criteria	Employees of Company A, one of the largest building contractors in Japan (in major cities around Japan); Japanese men aged 35–59 years with no prior history of coronary heart disease or stroke
Exclusion criteria	Not participating in all the consecutive annual health examinations
Notes	Baseline characteristics for IFG cohort (N = 246)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Unclear risk	Scarce data

Nakanishi 2004 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Nakanishi 2004 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, relative risk (adjusted for all other components and clustering of components of the metabolic syndrome at study entry)
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards model

Noda 2010

Name of study	Japanese Public-Health Center-based prospective (Diabetes) Study (JPHC Study)
Inclusion criteria	All registered Japanese inhabitants in 11 public health center areas aged 40–59 years old in cohort I and 40–69 years old in cohort II; inhabitants who received annual health-checkups; authors included those who were 51–70 years of age at the time of the baseline survey of diabetes
Exclusion criteria	Missing data, casual blood samples in any of the 2 health check-ups; known diabetes or an FPG of 125 mg/dL or more at baseline
Notes	Baseline characteristics for the total cohort (N = 2207)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Noda 2010 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	Taken from table 2: FPG levels: IFG 5.6 and 6.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Noda 2010 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; HbA1c ≥ 6.1%; self-reported
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Crude incidence, ROC curves

Park 2006

Name of study	None
Inclusion criteria	Korean men employed at a semiconductor manufacturing facility in Korea participating in an annual health examination at a university hospital
Exclusion criteria	Diabetes, failing to undergo subsequent examinations within 2 years; missing data
Notes	Baseline data for incident diabetic participants with IFG at baseline (N = 40)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Park 2006 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG ≥ 5.6
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence, incidence rate
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence, incidence rate

Park 2006 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards models (for sequential changes in FPG levels)

Peterson 2017

Name of study	Follow-up of a cohort originally from the population-based Västerbotten Intervention Program (VIP), a strategy to reach all middle-aged persons individually at ages 40, 50 and 60 years, by inviting them to participate in systematic risk factor screening and individual counselling about healthy lifestyle habits; neuropathy study part of the VIP
Inclusion criteria	All individuals who became 40, 50 or 60 years and who belonged to the list for a specific primary care centre or lived within the area for that centre
Exclusion criteria	People not participating in the neuropathy study
Notes	Baseline data for IGT cohort (N = 29)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described

Peterson 2017 *(Continued)*

Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: FPG < 7.0 and 2-h PG ≥ 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	Yes
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence

Peterson 2017 *(Continued)*

Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	ANOVA, regression analyses
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Cumulative incidence

Qian 2012

Name of study	None
Inclusion criteria	Shanghai residents
Exclusion criteria	Not reported
Notes	Baseline data for cohort progressing to T2DM (N = 377)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source popula-	Low risk	Yes

Qian 2012 *(Continued)*

tion or population of interest		
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	i-IFG: 6.1–6.9 and 2-h PG < 7.8; i-IGT: < 6.1 and 2-h PG 7.8–11.0; IFG/IGT: 6.1–6.9 and 2-h PG 7.8–11.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Qian 2012 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression (to assess the potential contributing factors to diabetes incidence)

Rajala 2000

Name of study	None
Inclusion criteria	Inhabitants in Oulu (northern Finland) recruited from the official population register to investigate the prevalence of diabetes and IGT, reasons for early retirement and the prevalence of depression
Exclusion criteria	Previoulsy diagnosed diabetic people
Notes	Only few baseline data for IGT cohort (N = 171); new cases identified by OGTTs in 1994 and 1996–8

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Prevalence of hypertension was higher among people lost to follow-up
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Rajala 2000 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG ≥ 11.1; 2 × FPG ≥ 6.7
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence, incidence rate
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence, incidence rate
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence, incidence rate

Rajala 2000 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression (for effects of hypertension and antihypertensive medications)

Ramachandran 1986

Name of study	None
Inclusion criteria	Indian individuals with IGT
Exclusion criteria	Not reported
Notes	Baseline data for the diabetic cohort at follow-up (N = 39)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	High risk	Not reported
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Scarce data
Study participation: adequate description of period & recruitment place	Unclear risk	Scarce data
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported

Ramachandran 1986 *(Continued)*

Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 7.8–11.0 (presumed NDDG 1979)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG > 11.0 (presumed NDDG 1979)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence

Ramachandran 1986 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Not reported

Rasmussen 2008

Name of study	Anglo-Danish-Dutch study of Intensive Treatment in People with Screen Detected Diabetes in Primary Care (ADDITION)
Inclusion criteria	Population-based high-risk screening and intervention study for type 2 diabetes; persons aged 40–69 years registered with the participating practices in 5 counties in Denmark with a risk score of 5 points or more; measurement of fasting capillary blood glucose and OGTT; annual glucose measurement recommended for individuals with IFG and IGT; individuals with 2 diabetic glucose values on separate days were included in the intervention programme
Exclusion criteria	Severe concurrent illness, alcohol abuse or subsequently treated by general practitioners not in the addition study; individuals with diabetes
Notes	Baseline data for IFG (N = 607)/IGT cohort (N = 903)
Risk of bias	

Bias	**Authors' judgement**	**Support for judgement**

Rasmussen 2008 *(Continued)*

Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Unclear risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG (i-IFG): FBG 5.6 to < 6.1 and 2-h BG < 7.8; IGT (i-IGT): FBG < 6.1 and 2-h BG 7.8 to < 11.1; IFG/IGT
Glycaemic status measurement: same method and setting of measurement of the glycaemic sta-	Unclear risk	Yes

Rasmussen 2008 *(Continued)*

tus for all study participants		
Outcome measurement: clear definition of the outcome provided	Low risk	FBG ≥ 6.1 or 2-h BG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence, incidence rate
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence, incidence rate
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Regression models (for sequential changes in some covariates)

Rathmann 2009

Name of study	Kooperative Gesundheitsforschung in der Region Augsburg (KORA S4/F4)
Inclusion criteria	People living in Augsburg and surroundings; KORA was follow-up of MONICA WHO-Project (Monitoring Trends and determinants in Cardiovascular Disease); S1: 25–64 years, S2/S3/S4: 25–74 years
Exclusion criteria	People with known diabetes
Notes	Baseline characteristics for total cohort (participants of the follow-up; age-group 55–74 years; N = 887)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Some differences reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Rathmann 2009 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9; IGT: 2-h PG 7.8 to < 11.1; 'prediabetes': i-IFG, i-IGT and IFG/IGT
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; validated physician diagnosis
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)

Rathmann 2009 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analyses (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression models

Rijkelijkhuizen 2007

Name of study	Hoorn Study
Inclusion criteria	General Dutch population (Hoorn) aged 50–75 years at baseline; participants completing both measurements in 1989 and 1996
Exclusion criteria	People using antihyperglycaemic medications or diet for diabetes were marked as known diabetes mellitus; missing information of plasma glucose values
Notes	Baseline data for $IFG_{6.1}$ (N = 149)/$IFG_{5.6}$ (N = 488)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Low risk	Yes

Rijkelijkhuizen 2007 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	No substantial differences
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	$IFG_{5.6}$: FPG 5.6–7.0; $IFG_{6.1}$: FPG 6.1–7.0; IGT: 2-h PG 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG: ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Rijkelijkhuizen 2007 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards models

Sadeghi 2015

Name of study	Isfahan Cohort Study (ICS), baseline survey of the Isfahan Healthy Heart Program (IHHP)
Inclusion criteria	Participants of the baseline survey of the Isfahan Healthy Heart Program, a community trial for prevention and control of CVD
Exclusion criteria	Diabetes at baseline
Notes	Baseline data for prediabetic cohort at baseline becoming diabetic at follow-up (N = 131)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Sadeghi 2015 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG ≥ 5.5 and < 7.0; IGT: 2-h OGTT ≥ 7.8 and < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Sadeghi 2015 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG > 7.0; 2-h OGTT > 11.1; IFG/IGT; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Low risk	Stochastic regression methods
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate logistic regression

Sasaki 1982

Name of study	None
Inclusion criteria	Epidemiological survey on diabetes mellitus in Osaka, Japan and follow-up study
Exclusion criteria	Not reported
Notes	Baseline data for the IGT cohort (N = 13)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Sasaki 1982 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: FPG < 7.8 and 2-h PG 7.8–11.1 (WHO 1980)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.8 or 2-h PG ≥ 11.1 (WHO 1980)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Scarce data
Study confounding: measurement of confounders valid & reliable	Unclear risk	Scarce data
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Scarce data
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence

Sasaki 1982 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Multiple logistic regression (standardised regression coefficients for single covariates)

Sato 2009

Name of study	Kansai Healthcare Study
Inclusion criteria	Japanese male employees of a company in the area of Kansai, aged 40–55 years, not taking an oral antihyperglycaemic or insulin at study entry and considered to be involved in sedentary jobs
Exclusion criteria	Not reported
Notes	Baseline data for cohort becoming diabetic at follow-up (N = 659/6804); non-standard categories for elevated HbA1c values were used (Table 1, p 645 of the publication)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria reported
Study attrition: description of attempts to col-	Unclear risk	Scarce data

Sato 2009 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	Table 1: IFG: FPG group 6.1–6.9; HbA1c-group: 6.0–6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Yes
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Sato 2009 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression (FPG, HbA1c categories)

Schranz 1989

Name of study	Study within the WHO-assisted National Diabetes Programme
Inclusion criteria	Within the framework of the WHO-assisted National Diabetes Programme a cohort of Maltese people was investigated
Exclusion criteria	Known diabetic persons
Notes	Baseline data for diabetic cohort at follow-up (N = 166)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Schranz 1989 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Scarce data
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Yes
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG ≥ 7.8 to < 11.1 (WHO 1985)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Schranz 1989 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG ≥ 11.1 (WHO 1985)
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Not reported

Sharifi 2013

Name of study	Zanjan Healthy Heart Study
Inclusion criteria	Participants from the Zanjan Healthy Heart Study, aged 21–75 years, individuals with IFG
Exclusion criteria	Not reported
Notes	Baseline data for active participants (N = 123) of the IFG cohort

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	High attrition rate (> 50%)
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Sharifi 2013 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FPG 5.6–7.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG > 7.0 (2 measurements); diabetes diagnosis based on documents
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence

Sharifi 2013 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Logistic regression (BMI and physical activity for prediction of diabetes)

Shin 1997

Name of study	Yonchon study
Inclusion criteria	Individuals living in Yonchon County (South Korea), free of diabetes aged ≥ 30 years
Exclusion criteria	Diabetes
Notes	Baseline data for individuals converting to T2DM (N = 67)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data

Shin 1997 *(Continued)*

Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Unclear risk	Scarce data
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Unclear risk	Scarce data
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Unclear risk	Assumed WHO 1985 criteria
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Unclear risk	Scarce data
Outcome measurement: clear definition of the outcome provided	Low risk	"WHO criteria"; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Unclear risk	Scarce data
Outcome measurement: same method & setting of outcome measurement for all study participants	Unclear risk	Scarce data
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Yes

Shin 1997 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression (1 mmol/L difference for FPG and 2-h plasma glucose)

Song 2015

Name of study	Korean Genome Epidemiology Study-Kangwha Study (KoGES)
Inclusion criteria	People aged ≥ 40 years
Exclusion criteria	Missing key variables, history of stroke, angina pectoris or myocardial infarction, diabetes
Notes	Baseline data for prediabetic cohort (men: N = 154; women: N = 167; total: N = 321); ranges for men - women

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Song 2015 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Responders had relatively low FPG and HbA1c at baseline compared to non-responders
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 5.6–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Song 2015 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; HbA1c ≥ 6.5; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Yes
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Unclear risk	Cumulative incidence, relative risk
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Generalised linear models

Song 2016a

Name of study	None
Inclusion criteria	Survey of the prevalence of T2DM in an urban community; eligible permanent inhabitants 15–74 years
Exclusion criteria	Not reported
Notes	Baseline data for prediabetic cohort (N = 334)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Song 2016a *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FG 5.6–6.9; IGT: 2-h G 7.8–11.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	IFG ≥ 7.0; 2-h G ≥ 11.0; HbA1c ≥ 6.5; self-reported
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence

Song 2016a *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression models (sex-related risk factors associated with the development of diabetes)

Soriguer 2008

Name of study	Pizarra study, evaluating the prevalence of latent autoimmune diabetes of adults (LADA) in the context of the overall prevalence of diabetes in Southern Spain
Inclusion criteria	People aged 18–65 years from Pizarra, Malaga
Exclusion criteria	Institutionalised persons, pregnant women, severe clinical or psychological disorder
Notes	Baseline data for final sample of follow-up (N = 714); diabetes diagnosis according to capillary blood glucose levels > 6.1 mmol/L or post OGTT BG > 11.1 mmol/L

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Low risk	Yes

Soriguer 2008 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Unclear risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: BG 5.6–6.1 and 2-h BG < 7.8; IGT: BG < 5.6 and 2-h BG 7.8–11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	BG > 6.1 or 2-h BG > 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Soriguer 2008 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, relative risk
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate logistic regression

Stengard 1992

Name of study	Finnish Cohorts of the Seven Countries Study
Inclusion criteria	Elderly Finnish men, survivors of the Finnish cohorts of the Seven-Countries Study (studying mortality, morbidity and risk factor levels of cardiovascular diseases in different countries), aged 65–84 years at baseline
Exclusion criteria	Not reported
Notes	Baseline data for IGT cohort converting to T2DM (N = 17)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Stengard 1992 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG 7.8–11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Stengard 1992 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	2-h PG ≥ 11.1 (WHO 1985); antihyperglycaemic medications
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression

Söderberg 2004

Name of study	None
Inclusion criteria	Population based survey in Mauritius, 3 cohorts of nonpregnant participants aged 25–79 years with classifiable data from 2 separate surveys
Exclusion criteria	Not reported
Notes	Baseline data for cohort 1987–1998 (N = 2631), 10 years follow-up; 3 cohorts 1987–1992 (N = 3680), 1992–1998 (N = 4178), 1987–1998 (N = 2631)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria reported
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Söderberg 2004 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG ≥ 6.1 to < 7.0 and 2-h PG < 7.8; IGT: FPF < 7.0 and 2-h PG ≥ 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence, incidence rate
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence, incidence rate
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence, incidence rate
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence, incidence rate
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence, incidence rate
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence, incidence rate

Söderberg 2004 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Calculation of incidence rate ratios, Poisson regression analysis to estimate sex effects between 1987 and 1998 allowing for adjustments

Toshihiro 2008

Name of study	None
Inclusion criteria	Japanese mal workers of a railroad company receiving a health-check at Nishimatsuzono Clinic, IFG and/or IGT cohort
Exclusion criteria	People with type B or C hepatitis virus infections
Notes	Baseline data for cohort becoming diabetic at follow-up (N = 36/128);participants with IFG and/or IGT were given advice about lifestyle modifications once or twice a year

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Unclear risk	Not reported

Toshihiro 2008 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9 and 2-h PG < 7.8; IGT: FPG < 7.0 and 2-h PG 7.8–11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG > 11.1; non-fasting PG > 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Toshihiro 2008 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Unclear risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards model (multivariate analysis of independent risk factors and recovery factors)

Vaccaro 1999

Name of study	None
Inclusion criteria	Telephone company employees in the age range 40–59 years were screened in the province of Naples for major cardiovascular risk factors
Exclusion criteria	Taking antihyperglycaemic medication, previous diabetes diagnosis
Notes	Baseline data for total cohort (follow-up examination; N = 560)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Vaccaro 1999 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Those lost to follow-up were older and more frequently women
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Unclear risk	Unusual thresholds
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Unclear risk	IFG: FPG 5.6–6.0; IGT: 2-h PG 6.7–9.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Vaccaro 1999 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Not reported
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Not reported
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio (probably unadjusted)
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Unclear risk	Quote: "standard methods"

Valdes 2008

Name of study	Asturias Study (Asturias)
Inclusion criteria	Survey of diabetes and cardiovascular risk factors in the principality of Asturias, northern Spain; participants from basic health area
Exclusion criteria	Type 1 diabetes, pregnancy, severe disease, hospitalisation, use of diabetogenic drugs, missing data; diabetes
Notes	Baseline data for IFG 5.6–6.1 (N = 114)/IFG 6.1–6.9 (N = 52)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Valdes 2008 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	$IFG_{5.6}$: 5.6–6.1; $IFG_{6.1}$: 6.1–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; clinical diabetes diagnosis; antihyperglycaemic medication, diet
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)

Valdes 2008 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multivariate logistic regression

Vijayakumar 2017

Name of study	None
Inclusion criteria	Participants were 10–19 years of age at first examination without diabetes, and at least 1 follow-up examination before the 40th birthday
Exclusion criteria	History of possibly taking metformin at baseline
Notes	Baseline data for adults (A)/children (C) with HbA1c 5.7–6.4 (children: N = 62, adults: N = 168)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Unclear risk	Not reported

Vijayakumar 2017 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FPG 5.6–6.9; 2-h PG 7.8–11.9; HbA1c 5.7–6.4
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; previous clinical diagnosis
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence, incidence rate
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence, incidence rate

Vijayakumar 2017 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence, incidence rate
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence, incidence rate
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence, incidence rate
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence, incidence rate
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, incidence rate
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	ROC curves, increments in HbA1c and FPG or 2-h PG to calculate 10-year cumulative incidence

Viswanathan 2007

Name of study	None
Inclusion criteria	Programme on primary prevention of diabetes in the population and in high risk people (positive family history of diabetes); individuals with at least 2 follow-up visits; participants were given advice on preventive measures such as dietary modifications and regular exercise
Exclusion criteria	Known history of diabetes, newly diagnosed diabetes during screening
Notes	Baseline data for IGT group (N = 619); participants were given advice on preventive measures such as dietary modifications and regular exercise

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Viswanathan 2007 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Scarce data
Study participation: adequate description of period & recruitment place	Unclear risk	Scarce data
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Viswanathan 2007 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Unclear risk	Not defined, presumably by OGTT
Outcome measurement: method of outcome measurement used valid & reliable	Unclear risk	Scarce data
Outcome measurement: same method & setting of outcome measurement for all study participants	Unclear risk	Scarce data
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Unclear risk	Not reported
Study confounding: measurement of confounders valid & reliable	Unclear risk	Not reported
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression, Cox regression analysis

Wang 2007

Name of study	Beijing Project as part of the National Diabetes Survey
Inclusion criteria	Inhabitants of Beijing aged 25 years or older
Exclusion criteria	Newly diagnosed diabetes or CHD at baseline, known diabetes
Notes	Baseline data for cohort with incident diabetes and no CHD (N = 67)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Low risk	Yes
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	Yes
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Wang 2007 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 6.1–6.9; IGT: 2-h PG 7.8–11.0
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)

Wang 2007 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, risk ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Multiple logistic regression

Wang 2011

Name of study	Strong Heart Study (SHS)
Inclusion criteria	Data collected from American Indians at the baseline and second exams from those participants who had HbA1c and FPG measured
Exclusion criteria	Antihyperglycaemic medications, renal dialysis, kidney transplant
Notes	No baseline data reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Low risk	Yes

Wang 2011 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Those lost to follow-up had lower BMI
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: 5.6 to < 7.0; HbA1c 6.0 to < 6.5
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; HbA1c ≥ 6.5; FPG/HbA1c: ≥ 6.5 or FPG ≥ 7.0; antihyperglycaemic medication
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Wang 2011 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression

Warren 2017

Name of study	Atherosclerosis Risk in Communities study (ARIC)
Inclusion criteria	Adults aged 45–64 years from the communities of Jackson, MS; Forsyth County, NC; suburban Minneapolis, MN; and Washington County, MD, USA
Exclusion criteria	Participants with prevalent diabetes, chronic kidney disease, atherosclerotic cardiovascular disease, or peripheral arterial disease, those who were missing variables of interest, or those who fasted for < 10 h
Notes	2 different baseline cohorts; 4 prediabetes definitions (visit 2: IFG 5.6–6.9: N = 4112; HbA1c 5.7–6.4: N = 2027; visit 4: IFG 5.6–6.9: N = 2142; IGT: N = 2009)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Warren 2017 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	FPG 5.6–6.9 (ADA); FG 6.1–6.9 (WHO); 2-h 7.8–11.0 (ADA); HbA1c 5.7–6.4 (ADA); 6.0–6.4 (IEC)
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes

Warren 2017 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Unclear risk	Self-report of physician diagnosis; antihyperglycaemic medication reported during a study visit or annual telephone call
Outcome measurement: method of outcome measurement used valid & reliable	Unclear risk	Missing lab measurements
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Low risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards models

Wat 2001

Name of study	Hong Kong Cardiovascular Risk Factor Prevalence Study
Inclusion criteria	Follow-up of the Hong Kong Cardiovascular Risk Factor Prevalence Study in Hong Kong Chinese aged 25–74 years; persons with IGT (matched controls from the same population with normal glucose tolerance), investigation of the development of appropriate population-wide coronary heart disease prevention strategies and monitoring their long-term impact
Exclusion criteria	Diabetes at baseline
Notes	Baseline data for IGT cohort (N = 322)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of	Low risk	Yes

Wat 2001 *(Continued)*

clear definition or description of glycaemic status		
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: FPG < 7.8 and 2-h PG 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.8; 2-h PG ≥ 11.1
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential con-	Unclear risk	Cumulative incidence

Wat 2001 *(Continued)*

founders accounted for in study design		
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression (per unit increase for some covariates)

Weiss 2005

Name of study	None
Inclusion criteria	Obese children and adolescents aged 4–18 years were recruited from the Yale Pediatric Obesity Clinic (New Haven, Conneticut, USA)
Exclusion criteria	Participants with medical conditions, using medications that may affect glucose metabolism before their first OGTT
Notes	Baseline data for IGT cohort (N = 33)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Study participation: description of source population or population of interest	Unclear risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Unclear risk	Scarce data
Study participation: adequate description of period & recruitment place	Unclear risk	Scarce data
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria reported

Weiss 2005 *(Continued)*

Study attrition: description of attempts to collect information on participants who dropped out	Low risk	No dropouts
Study attrition: reasons for loss to follow-up provided	Low risk	No dropouts
Study attrition: adequate description of participants lost to follow-up	Low risk	No dropouts
Study attrition: no important differences between participants who completed the study and those who did not	Low risk	No dropouts
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: FPG < 5.6 and 2-h PG 7.8–11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG > 11.1; presentation of hyperglycaemia (more than 2 random glucose measurements > 11.1), glucosuria, polydipsia, and polyuria
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence

Weiss 2005 *(Continued)*

Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Mann-Whitney U test and linear regression (to identify predictors of 2-h glucose on the second OGTT)

Wheelock 2016

Name of study	Pima Indian Study (Gila River Indian Community - near Phoenix, Arizona)
Inclusion criteria	Gila River Indian Community in Arizona (mostly Pima or Tohono Indians); children and adolescents 5–19 years who were nondiabetic at baseline and had at least 1 follow-up examination
Exclusion criteria	Not reported
Notes	Baseline data for the full cohort (N = 5532); prediabetic cohort = non-overweight (N = 37) + IGT group and overweight + IGT group (N = 132); 5–11 years/12–19 years); age-stratified incidence data on overweight participants + IGT *or* overweight and either hypertension or hypercholesterolaemia + IGT (metabolic set (MSet))

Risk of bias

Bias	Authors' judgement	Support for judgement

Wheelock 2016 *(Continued)*

Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Unclear risk	Only inclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Scarce data
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG ≥ 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic sta-	Low risk	Yes

Wheelock 2016 *(Continued)*

tus for all study participants		
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; previous diagnosis
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Cumulative incidence
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox regression model using each metabolic risk factor as a continuous variable; violation of the proportionality assumption was noted, therefore cumulative incidence rates were calculated from a Poisson regression model

Wong 2003

Name of study	Singapore Impaired Glucose Tolerance Follow-up Study
Inclusion criteria	Representative sample of the Singapore population aged 18–69 years; persons with IGT and matched controls
Exclusion criteria	Antihyperglycaemic medication, venepuncture failure; persons with IFG
Notes	Baseline data for IGT group (N = 291)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Low risk	Yes
Study attrition: reasons for loss to follow-up provided	Unclear risk	Scarce data
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes

Wong 2003 *(Continued)*

Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG ≥ 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; 2-h PG ≥ 11.1; physician diagnosed diabetes
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Cumulative incidence
Study confounding: clear definitions of important confounders provided	Unclear risk	Cumulative incidence
Study confounding: measurement of confounders valid & reliable	Unclear risk	Cumulative incidence
Study confounding: same method & setting for measurements of confounders for all study participants	Unclear risk	Cumulative incidence
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Cumulative incidence
Study confounding: important potential confounders accounted for in study design	Unclear risk	Cumulative incidence

Wong 2003 *(Continued)*

Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Not reported
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	ANCOVA using general linear models (comparisons between continuous variables)

Yeboah 2011

Name of study	Multi-Ethnic Study of Atherosclerosis (MESA)
Inclusion criteria	Persons without known CVD at baseline from 6 US communities aged 45–84 years
Exclusion criteria	Persons with a history of physician-diagnosed myocardial infarction, angina, heart failure, stroke, or transient ischaemic attack, or who had undergone an invasive procedure for CVD (coronary artery bypass graft surgery, angioplasty, valve replacement, pacemaker placement, or other vascular surgeries)
Notes	Baseline data for IFG cohort (N = 940)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes
Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to col-	Low risk	Yes

Yeboah 2011 *(Continued)*

lect information on participants who dropped out		
Study attrition: reasons for loss to follow-up provided	Low risk	Yes
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Scarce data
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Scarce data
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IFG: FPG 5.6–6.9
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Low risk	Yes
Outcome measurement: clear definition of the outcome provided	Low risk	FPG > 6.9; antihyperglycaemic medication during examinations 2,3,4
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Low risk	Yes
Study confounding: clear definitions of important confounders provided	Low risk	Yes

Yeboah 2011 *(Continued)*

Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Low risk	Yes
Study confounding: important potential confounders accounted for in the analysis	Low risk	Yes
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Cumulative incidence, hazard ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Cox proportional hazards model

Zethelius 2004

Name of study	None
Inclusion criteria	All men residing in Uppsala were invited to a health survey in 1970; reinvestigation 20 years later (= baseline) at 70 years of age
Exclusion criteria	Diabetes, antihyperglycaemic medications
Notes	Baseline data for cohort converting to T2DM (N = 26)

Risk of bias

Bias	Authors' judgement	Support for judgement
Study participation: description of source population or population of interest	Low risk	Yes

Zethelius 2004 *(Continued)*

Study participation: description of glycaemic status at baseline	Low risk	Yes
Study participation: adequate description of sampling frame & recruitment	Low risk	Yes
Study participation: adequate description of period & recruitment place	Low risk	Yes
Study participation: adequate description of inclusion & exclusion criteria	Low risk	Inclusion and exclusion criteria described
Study attrition: description of attempts to collect information on participants who dropped out	Unclear risk	Not reported
Study attrition: reasons for loss to follow-up provided	Unclear risk	Not reported
Study attrition: adequate description of participants lost to follow-up	Unclear risk	Not reported
Study attrition: no important differences between participants who completed the study and those who did not	Unclear risk	Not reported
Glycaemic status measurement: provision of clear definition or description of glycaemic status	Low risk	Yes
Glycaemic status measurement: valid and reliable method of glycaemic status measurement	Low risk	Yes
Glycaemic status measurement: continuous variables reported or appropriate cut points used	Low risk	IGT: 2-h PG 7.8 to < 11.1
Glycaemic status measurement: same method and setting of measurement of the glycaemic status for all study participants	Unclear risk	Yes

Zethelius 2004 *(Continued)*

Outcome measurement: clear definition of the outcome provided	Low risk	FPG ≥ 7.0; antihyperglycaemic medications
Outcome measurement: method of outcome measurement used valid & reliable	Low risk	Yes
Outcome measurement: same method & setting of outcome measurement for all study participants	Low risk	Yes
Study confounding: important confounders measured	Unclear risk	Some covariates measured (see Appendix 16 and Appendix 17)
Study confounding: clear definitions of important confounders provided	Low risk	Yes
Study confounding: measurement of confounders valid & reliable	Low risk	Yes
Study confounding: same method & setting for measurements of confounders for all study participants	Low risk	Yes
Study confounding: appropriate methods used if missing confounder data imputed	Unclear risk	Not reported
Study confounding: important potential confounders accounted for in study design	Unclear risk	Some covariates included (see Appendix 16 and Appendix 17)
Study confounding: important potential confounders accounted for in the analysis	Unclear risk	Some covariates analysed (see Appendix 16 and Appendix 17)
Statistical analysis & reporting: sufficient presentation of data to assess adequacy of the analytic strategy	Low risk	Odds ratio
Statistical analysis & reporting: the statistical model is adequate for the design of the study	Low risk	Logistic regression, multivariate models (adjusted for BMI, age at baseline and length of follow-up)

Note: for better readability all IFG/IGT and HbA1c measurements are reported in numerical format only (IFG and IGT were measured in mmol/L, HbA1c was measured in %)
ADA: American Diabetes Association; **ANOVA**: analysis of variance; **BG**: blood glucose; **BMI**: body mass index; **CHD**: coronary heart disease; **CI**: confidence interval; **CVD**: cardiovascular disease; **FG**: fasting glucose; **FBG**: fasting blood glucose; **FINDRISC**: Finnish Diabetes Risk Score; **FPG**: fasting plasma glucose; **G6PD**: glucose-6-P-dehydrogenase test; **HbA1c**: glycosylated haemoglobin A1c; **$HbA1c_{5.7}$**: intermediate hyperglycaemia with HbA1c 5.7% as lower threshold (usually reflecting 5.7%–6.4%); **$HbA1c_{6.0}$**: intermediate hyperglycaemia with HbA1c 6.0% as lower threshold (usually reflecting 6.0%–6.4%); **HOMA-B**: homeostatic model assessment beta-cell function; **HOMA-IR**: homeostatic model assessment for insulin resistance; **HR**: hazard ratio; **IEC**: International Expert Committee; **IFG**: impaired fasting glucose; **$IFG_{5.6}$**: impaired fasting glucose with 5.6 mmol/L as lower threshold; **$IFG_{6.1}$**: impaired fasting glucose with 6.1 mmol/L as lower threshold; **IFG/IGT**: both IFG and IGT; **i-IFG**: isolated IFG; **IGT**: impaired glucose tolerance; **i-IGT**: isolated IGT; **JDS**: Japanese Diabetes Society; **MSet**: metabolic set; **NDDG**: National Diabetes Data Group; **NGSP**: National Glycohemoglobin Standardization Program; **NGT**: normal glucose tolerance; **OGTT**: oral glucose tolerance test; **OR**: odds ratio; **PG**: postload glucose; **ROC**: receiver operating characteristics; **RR**: risk ratio, relative risk; **T2DM**: type 2 diabetes mellitus; **WHO**: World Health Organization.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Abdul-Ghani 2011	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Alvarsson 2009	Intervention study
Alyass 2015	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Amoah 2002	Not a prospective cohort study
Andreou 2017	No data on transition from intermediate hyperglycaemia to type 2 diabetes (prevalence data)
Bancks 2015	Only self-reported diabetes, frequency matched population
Birmingham Diabetes Survey Working Party 1976	Non-standard thresholds for intermediate hyperglycaemia
Bjornholt 2000	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Bodicoat 2017	Long-term follow-up of an interventional study
Boned 2016	Hypertensive cohort
Boucher 2015	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Brantsma 2005	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Brateanu 2017	Retrospective cohort study
Braun 1996	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Burchfiel 1995	No cohort with intermediate hyperglycaemia
Chamukuttan 2016	Intervention trial
Chang 2017	Investigation of the association between thyroid function and the development of intermediate hyperglycaemia/diabetes
Chen 1995	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Cheng 2011	Not a prospective cohort study

Study	Reason for exclusion
Cheung 2007	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Choi 2002	Not a prospective cohort study
Cicero 2005	No valid data on transition from intermediate hyperglycaemia to type 2 diabetes
Cosson 2011	Not a prospective cohort study
Costa 2005	Study design paper
Cree-Green 2013	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Cropano 2017	Investigation of the association between gene variants and development of intermediate hyperglycaemia/diabetes
Dagogo-Jack 2011	Evaluation of the transition from normoglycaemia to intermediate hyperglycaemia
Daniel 1999	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Decode 2003	Aggregate data of 22 cohorts; no data on transition from intermediate hyperglycaemia to type 2 diabetes
Deedwania 2013	No data on diabetes incidence
DeFina 2012	Not a prospective cohort study
DeJesus 2016	Not a prospective cohort study
Deschenes 2016	Cohort with depressive symptoms
Dinneen 1998	Not a prospective cohort study
Doi 2007	No cohort with intermediate hyperglycaemia
Du 2016	Cross-sectional study, no cohort with intermediate hyperglycaemia
Edelman 2004	Non-standard thresholds for intermediate hyperglycaemia
Edelstein 1997	Aggregated data on 6 prospective studies, no reliable additional data on transition from intermediate hyperglycaemia to type 2 diabetes
Engberg 2010	Intervention trial
Eskesen 2013	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Feizi 2017	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Feskens 1989	No cohort with intermediate hyperglycaemia
Festa 2003	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Folsom 2000	No cohort with intermediate hyperglycaemia
Gil-Montalban 2015	Diagnosis of type 2 diabetes incidence by database only

Study	Reason for exclusion
Giraldez-Garcia 2015	No data on type 2 diabetes incidence
Glauber 2018	Incidence established by register data
Gonzalez-Villalpando 2014	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Gopinath 2013	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Gu 2015	No data on transition from intermediate hyperglycaemia to type 2 diabetes (database)
Gupta 2011	Intervention trial, hypertensive cohort
Hackett 2014	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Haffner 1997	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Haffner 2000	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Hajat 2012	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Hanai 2005	No data on transition from intermediate hyperglycaemia to type 2 diabetes, OGTTs were unit of analysis
He 2018	Investigation of the association of glycaemic index diets and glycaemic load diets with development of type 2 diabetes
Helmrich 1991	No cohort with intermediate hyperglycaemia
Henninger 2015	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Holbrook 1990	No cohort with intermediate hyperglycaemia
Hong 2016	Not a prospective cohort study
Huang 2014c	Not a prospective cohort study (database)
Hulman 2017	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Inoue 2008	Retrospective cohort study
Invitti 2006	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Jallut 1990	Not a prospective cohort study
James 1998	No cohort with intermediate hyperglycaemia
Jansson 2015	No cohort with intermediate hyperglycaemia
Jarrett 1979	Intervention trial
Jarrett 1982	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Jeanne 2018	No cohort with intermediate hyperglycaemia, investigation of the association between birth weight and physical activity and cardiometabolic health

Study	Reason for exclusion
Jiamjarasrangsi 2008b	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Joshipura 2017	Diabetes incidence data for 'prediabetes' group only
Kadowaki 1984	Non-standard thresholds for intermediate hyperglycaemia
Kametani 2002	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Kanauchi 2003	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Kanaya 2005	Investigation of a prediction model for development of diabetes
Kawahara 2015	Not a prospective cohort study
Khan 2017	Diabetes incidence defined by register data
Khang 2010	Not a prospective cohort study
Kieboom 2017	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Kim 2012a	Not a prospective cohort study
Kim 2012b	Not a prospective cohort study
Kim 2013	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Kim 2016b	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Kim 2017a	Investigation of the association between sleep duration and development of type 2 diabetes
Kim 2017b	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Ko 2000	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Kosaka 1996	Non-standard thresholds, no numerical data on transition from intermediate hyperglycaemia to type 2 diabetes
Kowall 2013	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Krabbe 2017	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Le Boudec 2016	Withdrawn publication
Lee 2014	No cohort with intermediate hyperglycaemia
Lee 2017	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Leite 2009	Intervention trial
Li 2011	Evaluation of a diabetes risk tool
Liatis 2014	Participants of a diabetes prevention programme
Libman 2008	No data on transition from intermediate hyperglycaemia to type 2 diabetes

Study	Reason for exclusion
Liu 2017a	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Liu 2017b	Investigation of the association between the bone resorption marker CTX and incident intermediate hyperglycaemia/diabetes
Malmstrom 2018	Type 2 diabetes incidence measured mainly through registers; nested case-control study; no transition data
Manson 1992	No cohort with intermediate hyperglycaemia
McNeill 2006	No data on transition from intermediate hyperglycaemia to type 2 diabetes
McPhillips 1990	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Medalie 1975	No data on transition from intermediate hyperglycaemia to type 2 diabetes; no common thresholds for diagnosis of intermediate hyperglycaemia and type 2 diabetes
Metcalf 2017	No cohort with intermediate hyperglycaemia
Miranda 2017	Investigation of the association between advanced glycation end products (AGE) and their receptor (RAGE) and type 2 diabetes incidence
Mirbolouk 2016	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Monesi 2012	No cohort with intermediate hyperglycaemia
Morrison 2012	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Nakagami 2017	No cohort with intermediate hyperglycaemia
Nakasone 2017	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Nano 2017	Investigation of the association between liver transaminases and development of intermediate hyperglycaemia/type 2 diabetes
Nguyen 2014	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Nichols 2007	Not a prospective cohort study
Nichols 2010	Not a prospective cohort study
Nichols 2015	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Njolstad 1998	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Norberg 2006	Not a prospective cohort study
Nowicka 2011	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Ohlson 1987	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Oizumi 2011	Non-standard thresholds for intermediate hyperglycaemia
Okada 2017	Diabetes incidence data for prediabetic cohort only (FPG 5.6–6.9 or HbA1c 5.7%–6.4%)

Study	Reason for exclusion
Onat 2007	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Onat 2013a	Non-standard IFG/IGT definition
Onat 2013b	Non-standard IFG/IGT definition
Osei 2004	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Paddock 2017	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Perry 1995	Type 2 diabetes mellitus incidence not established by glucose measurements (questionnaires, reviews of primary care records, reviews of death certificates)
Pinelli 2011	Cross-sectional study
Polakowska 2011	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Pradhan 2007	Intervention trial (Women's Health Study)
Priya 2013	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Qiao 2003	Not a prospective cohort study
Qiu 2015	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Ramachandran 2012	Not a prospective cohort study
Rauh 2017	Development of a prediction model for HbA1c levels after 6 years in the non-diabetic general population
Reynolds 2006	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Rimm 1995	No cohort with intermediate hyperglycaemia
Sacks 2017	Investigation of patient activation to predict the course of type 2 diabetes
Sai 2017	No cohort with intermediate hyperglycaemia
Samaras 2015	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Schmitz 2016	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Schottker 2011	Diabetes incidence by self-report only
Schulze 2008	Evaluation of a diabetes risk score
Schwarz 2007	No individuals with intermediate hyperglycaemia at baseline
Serrano 2013	Study design paper
Shimazaki 2007	Not a prospective cohort study
Song 2007	Mix of old an new participants in 2 study phases, participants with with both IFG and IGT were combined into an IFG group

Study	Reason for exclusion
Song 2016b	Not a prospective cohort study
Sorgjerd 2015	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Soria 2009	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Stampfer 1988	No cohort with intermediate hyperglycaemia
Strauss 1974	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Suvitaival 2018	Evaluation of a new biomarker ('plasma lipidome') model
Tabak 2009	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Tai 2004	Aggregated data from several prevalence and incidence studies
Takkunen 2016	Cohort from intervention trial, no data on cohort with intermediate hyperglycaemia
Tanabe 2009	Not a prospective cohort study
Vaccaro 2005	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Vaidya 2016	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Vazquez 2000	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Vega-Vázquez 2017	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Von Eckardstein 2000	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Wang 2010	New diabetes cases were identified through hospital records only
Warram 1996	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Wei 1999	Investigation of the association between cardiorespiratory fitness and intermediate hyperglycaemia/type 2 diabetes mellitus
Welborn 1979	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Wheeler 2017	Investigation of genetic determinants of HbA1c on the development of type 2 diabetes
Wingard 1993	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Woo 2015	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Wu 2017a	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Wu 2017b	Intermediate hyperglycaemia determined through register data, retrospective study
Wu 2018	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Xu 2014	Investigation of a prediction model for development of diabetes
Yang 2016	No data on transition from intermediate hyperglycaemia to type 2 diabetes

Study	Reason for exclusion
Ye 2014	No data on people with intermediate hyperglycaemia
Yi 2017	No data on type 2 diabetes incidence
Yokota 2017	Retrospective cohort study
Yoshinaga 1996	Non-standard thresholds for intermediate hyperglycaemia
Yoshinaga 1999	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Zargar 2001	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Zethelius 2008	No data on transition from intermediate hyperglycaemia to type 2 diabetes, establishment of a predictive model
Zhang 2012b	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Zhang 2016	No data on transition from intermediate hyperglycaemia to type 2 diabetes
Zimmet 1992	No data on transition from intermediate hyperglycaemia to type 2 diabetes

FPG: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **IFG**: impaired fasting glucose; **IGT**: impaired glucose tolerance.

Characteristics of studies awaiting assessment *[ordered by study ID]*

Li 2001

Study name	Model development of diabetes in adult Chinese
Starting date	1986, follow-up 6 years
Contact information	Guangwei Li, Department of Endocrinology, China-Japan Friendship Hospital, Beijing 100029 China
Notes	Establishment of a model for type 2 diabetes and the roles of insulin resistance and insulin secretion impairment; needs translation

Misnikova 2011

Study name	Risk of diabetes and cardiovascular events in persons with early glucose metabolism impairments
Starting date	2006, follow-up 3 years
Contact information	Misnikova IV, Endocrinology, Moscow Regional Research Clinical Institute, Russian Federation
Notes	Conference abstract, no publication available

NCT00816608

Study name	The effect of maximum body weight in lifetime on the development of type 2 diabetes (MAXWEL)

NCT00816608 *(Continued)*

Starting date	August 2006
Contact information	Professor Soo Lim, Seoul National University Bundang Hospital
Notes	Study completion date: September 2013; no publication available

Characteristics of ongoing studies *[ordered by study ID]*

NCT00786890

Trial name or title	A survey to evaluate the cardiovascular risk status of subjects with pre-diabetes in Hong Kong (JADE-HK2)
Starting date	November 2008
Contact information	Juliana Chan, Professor, Chinese University of Hong Kong
Notes	Estimated study completion date: December 2018

NCT02838693

Trial name or title	Assessing progression to type-2 diabetes (APT-2D): a prospective cohort study expanded from BRITE-SPOT (Bio-bank and Registry for StratIfication and Targeted intErventions in the Spectrum Of Type 2 Diabetes) (APT-2D)
Starting date	March 2016
Contact information	Sue-Anne Toh, MBBChir, MSc, MA; +65 67722195; mdcsates@nus.edu.sg
Notes	Estimated study completion date: December 2021

NCT02958579

Trial name or title	A population based study on metabolic syndrome complications, and mortality (MetSCoM)
Starting date	January 2005
Contact information	Alireza Esteghamati, MD (esteghamati@tums.ac.ir); Zahra Aryan, MD, MPH (aryanzahra@yahoo.com)
Notes	Estimated study completion date: January 2020

Vilanova 2017

Trial name or title	Prevalence, clinical features and risk assessment of pre-diabetes in Spain: the prospective Mollerussa cohort study
Starting date	August 2011

Vilanova 2017 *(Continued)*

Contact information	Dr Didac Mauricio, MD; didacmauricio@gmail.com
Notes	The Mollerussa study completed its recruitment phase in July 2014 and the 12 month follow-up in July 2015. Participants will be followed up long-term through annual extraction of data included in the individual's electronic medical records.

DATA AND ANALYSES

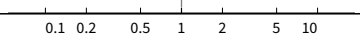
Comparison 1. Hazard ratio as the effect measure for the development of T2DM

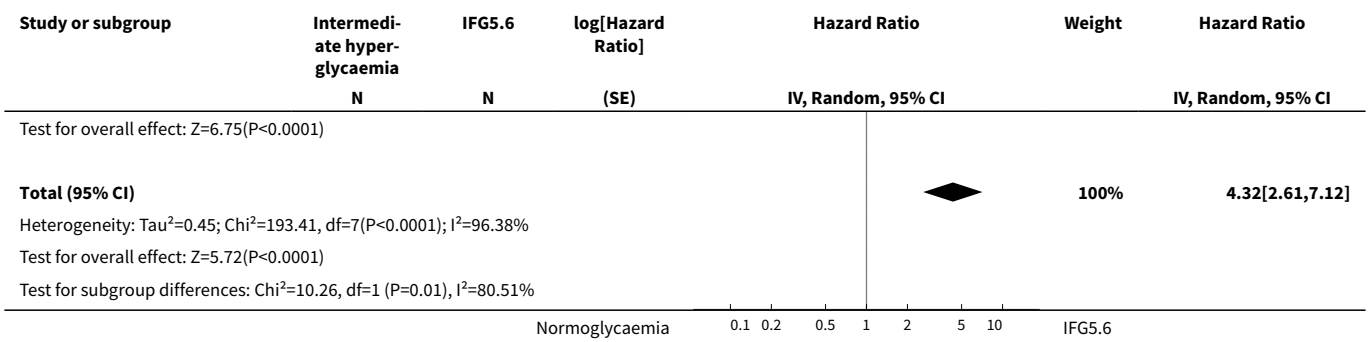
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 T2DM incidence ($IFG_{5.6}$)	8	34867	Hazard Ratio (Random, 95% CI)	4.32 [2.61, 7.12]
1.1 Asia/Middle East	4	14803	Hazard Ratio (Random, 95% CI)	5.07 [3.41, 7.53]
1.2 Australia/Europe/North America	3	18522	Hazard Ratio (Random, 95% CI)	4.15 [1.24, 13.87]
1.3 American Indians/Islands	1	1542	Hazard Ratio (Random, 95% CI)	2.38 [1.85, 3.06]
2 T2DM incidence ($IFG_{6.1}$)	10	21475	Hazard Ratio (Random, 95% CI)	5.47 [3.50, 8.54]
2.1 Asia/Middle East	5	10810	Hazard Ratio (Random, 95% CI)	10.55 [3.61, 30.81]
2.2 Australia/Europe/North America	4	10571	Hazard Ratio (Random, 95% CI)	3.30 [2.32, 4.67]
2.3 Latin America	1	94	Hazard Ratio (Random, 95% CI)	2.06 [1.76, 2.41]
3 T2DM incidence (IGT)	5	16576	Hazard Ratio (Random, 95% CI)	3.61 [2.31, 5.64]
3.1 Asia/Middle East	3	8475	Hazard Ratio (Random, 95% CI)	4.48 [2.81, 7.15]
3.2 Australia/Europe/North America	2	8101	Hazard Ratio (Random, 95% CI)	2.53 [1.52, 4.19]
4 T2DM incidence (IFG + IGT)	5	9757	Hazard Ratio (Random, 95% CI)	6.90 [4.15, 11.45]
4.1 Asia/Middle East	3	7156	Hazard Ratio (Random, 95% CI)	10.20 [5.45, 19.09]
4.2 Australia/Europe/North America	1	1650	Hazard Ratio (Random, 95% CI)	3.80 [2.30, 6.28]
4.3 American Indians/Islands	1	951	Hazard Ratio (Random, 95% CI)	4.06 [3.05, 5.40]
5 T2DM incidence ($HbA1c_{5.7}$)	4	25047	Hazard Ratio (Random, 95% CI)	5.55 [2.77, 11.12]
5.1 Asia	3	16805	Hazard Ratio (Random, 95% CI)	7.21 [5.14, 10.11]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5.2 Australia/Europe/North America	1	8242	Hazard Ratio (Random, 95% CI)	2.71 [2.48, 2.96]
6 T2DM incidence ($HbA1c_{6.0}$)	6	30699	Hazard Ratio (Random, 95% CI)	10.10 [3.59, 28.43]
6.1 Asia/Middle East	4	22734	Hazard Ratio (Random, 95% CI)	13.12 [4.10, 41.96]
6.2 Australia/Europe/North America	2	7965	Hazard Ratio (Random, 95% CI)	5.09 [1.69, 15.37]
7 T2DM incidence (HbA1c + IFG)	1		Hazard Ratio (Fixed, 95% CI)	Subtotals only
7.1 $HbA1c_{5.7}$ + $IFG_{5.6}$	1	4559	Hazard Ratio (Fixed, 95% CI)	32.50 [23.00, 45.92]
7.2 $HbA1c_{5.7}$ + $IFG_{6.1}$	1	5357	Hazard Ratio (Fixed, 95% CI)	37.90 [28.10, 51.12]
7.3 $HbA1c_{6.0}$ + $IFG_{5.6}$	1	4628	Hazard Ratio (Fixed, 95% CI)	53.70 [38.40, 75.09]
7.4 $HbA1c_{6.0}$ + $IFG_{6.1}$	1	5802	Hazard Ratio (Fixed, 95% CI)	52.30 [37.80, 72.37]

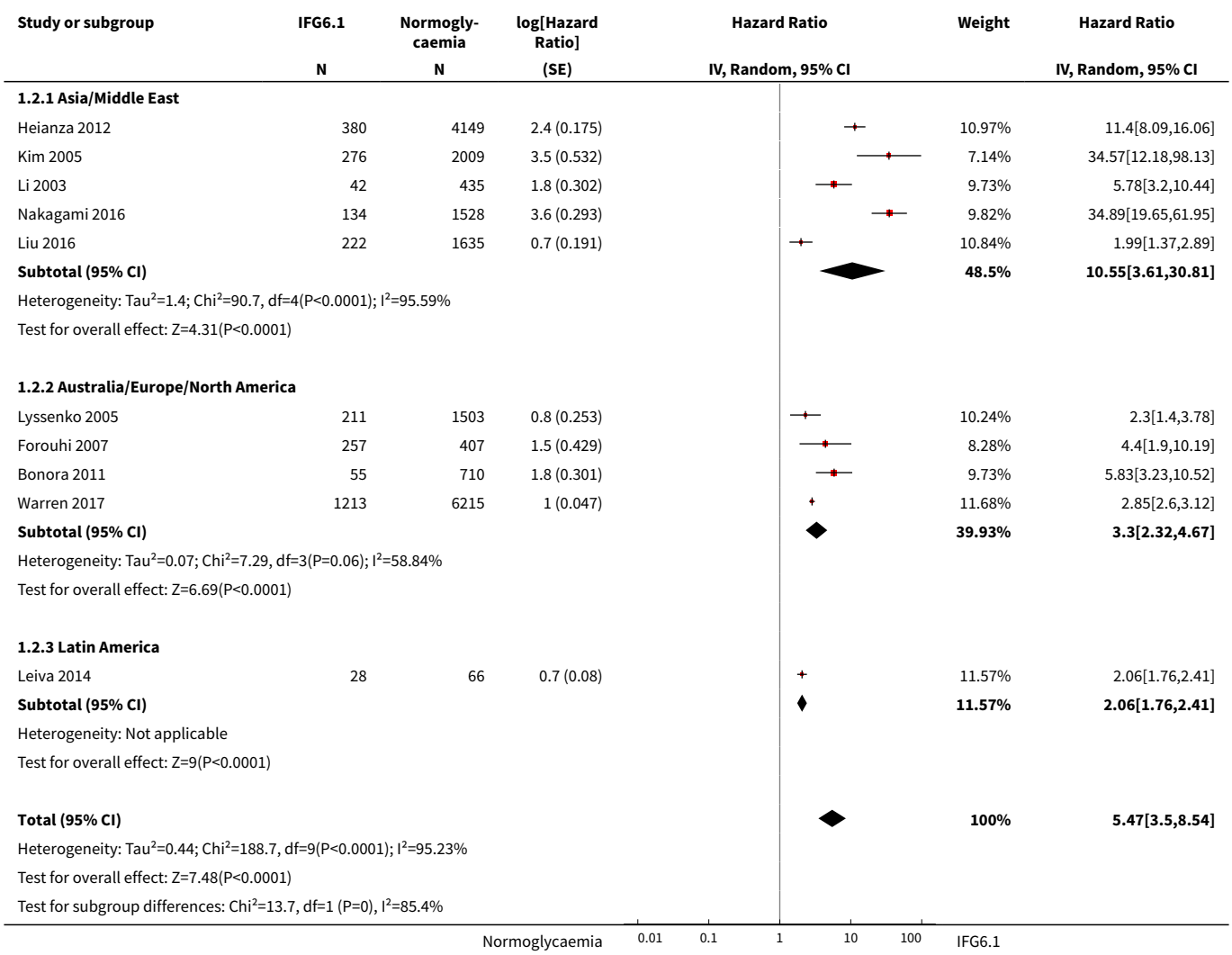
Analysis 1.1. Comparison 1 Hazard ratio as the effect measure for the development of T2DM, Outcome 1 T2DM incidence ($IFG_{5.6}$).

Study or subgroup	Intermediate hyperglycaemia N	IFG5.6 N	log[Hazard Ratio] (SE)	Hazard Ratio IV, Random, 95% CI	Weight	Hazard Ratio IV, Random, 95% CI
1.1.1 Asia/Middle East						
Heianza 2012	1680	4149	1.8 (0.18)		13.44%	6.18[4.34,8.8]
Kim 2005	276	2009	1.6 (0.557)		8.55%	4.77[1.6,14.22]
Janghorbani 2015	230	627	2 (0.354)		11.29%	7.4[3.7,14.8]
Han 2017	199	5633	1.3 (0.121)		13.95%	3.61[2.85,4.57]
Subtotal (95% CI)					**47.24%**	**5.07[3.41,7.53]**
Heterogeneity: Tau^2=0.09; Chi^2=8.41, df=3(P=0.04); I^2=64.33%						
Test for overall effect: Z=8.04(P<0.0001)						
1.1.2 Australia/Europe/North America						
Yeboah 2011	940	6215	2.4 (0.114)		14%	10.5[8.4,13.13]
Forouhi 2007	633	407	1.1 (0.409)		10.52%	2.9[1.3,6.47]
Warren 2017	4112	6215	0.8 (0.042)		14.34%	2.26[2.08,2.46]
Subtotal (95% CI)					**38.87%**	**4.15[1.24,13.87]**
Heterogeneity: Tau^2=1.08; Chi^2=159.84, df=2(P<0.0001); I^2=98.75%						
Test for overall effect: Z=2.31(P=0.02)						
1.1.3 American Indians/Islands						
Wang 2011	947	595	0.9 (0.129)		13.9%	2.38[1.85,3.06]
Subtotal (95% CI)					**13.9%**	**2.38[1.85,3.06]**
Heterogeneity: Not applicable						



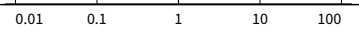


Analysis 1.2. Comparison 1 Hazard ratio as the effect measure for the development of T2DM, Outcome 2 T2DM incidence ($IFG_{6.1}$).



Analysis 1.3. Comparison 1 Hazard ratio as the effect measure for the development of T2DM, Outcome 3 T2DM incidence (IGT).

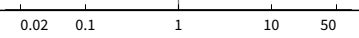
Study or subgroup	IGT N	Normoglycaemia N	log[Hazard Ratio] (SE)	Hazard Ratio IV, Random, 95% CI	Weight	Hazard Ratio IV, Random, 95% CI
1.3.1 Asia/Middle East						
Li 2003	118	435	1.1 (0.248)		18.74%	2.94[1.81,4.78]
Janghorbani 2015	150	627	2.2 (0.343)		15.58%	9.4[4.8,18.41]
Han 2017	1512	5633	1.4 (0.059)		23.68%	4.06[3.62,4.55]
Subtotal (95% CI)					**58%**	**4.48[2.81,7.15]**
Heterogeneity: Tau^2=0.12; Chi^2=7.68, df=2(P=0.02); I^2=73.97%						
Test for overall effect: Z=6.3(P<0.0001)						
1.3.2 Australia/Europe/North America						
Lyssenko 2005	221	1429	1.3 (0.261)		18.3%	3.5[2.1,5.83]
Warren 2017	2009	4442	0.7 (0.058)		23.69%	2.06[1.84,2.31]
Subtotal (95% CI)					**42%**	**2.53[1.52,4.19]**
Heterogeneity: Tau^2=0.1; Chi^2=3.95, df=1(P=0.05); I^2=74.65%						
Test for overall effect: Z=3.59(P=0)						
Total (95% CI)					**100%**	**3.61[2.31,5.64]**
Heterogeneity: Tau^2=0.22; Chi^2=80.52, df=4(P<0.0001); I^2=95.03%						
Test for overall effect: Z=5.63(P<0.0001)						
Test for subgroup differences: Chi^2=2.67, df=1 (P=0.1), I^2=62.49%						



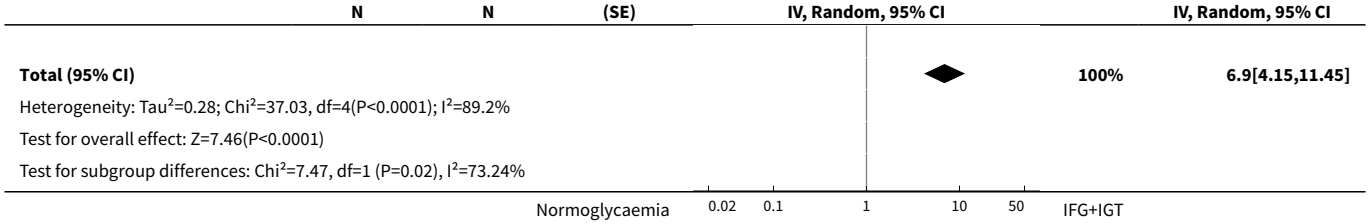
Normoglycaemia IGT

Analysis 1.4. Comparison 1 Hazard ratio as the effect measure for the development of T2DM, Outcome 4 T2DM incidence (IFG + IGT).

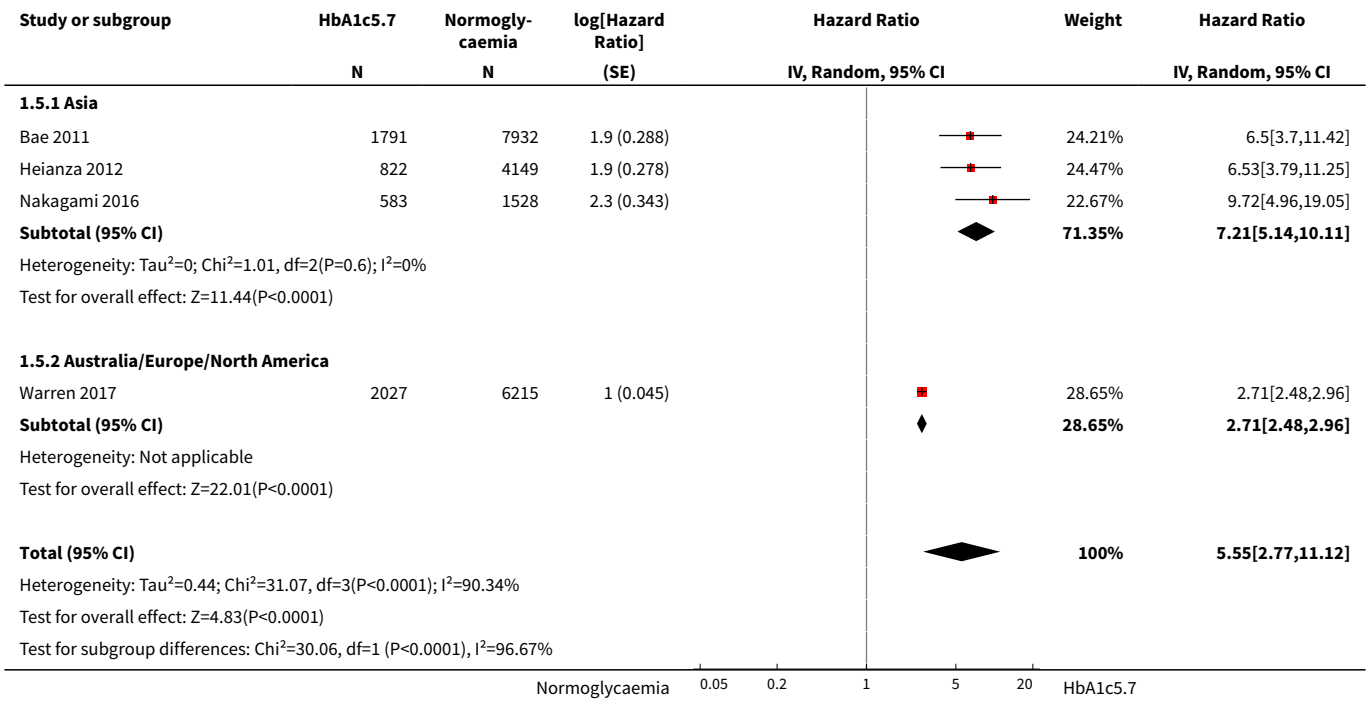
Study or subgroup	IFG+IGT N	Normoglycaemia N	log[Hazard Ratio] (SE)	Hazard Ratio IV, Random, 95% CI	Weight	Hazard Ratio IV, Random, 95% CI
1.4.1 Asia/Middle East						
Li 2003	49	435	1.8 (0.302)		17.92%	6.17[3.41,11.15]
Janghorbani 2015	214	627	3.1 (0.304)		17.86%	22.5[12.4,40.83]
Han 2017	198	5633	2.1 (0.097)		22.94%	8.21[6.79,9.93]
Subtotal (95% CI)					**58.72%**	**10.2[5.45,19.09]**
Heterogeneity: Tau^2=0.25; Chi^2=11.42, df=2(P=0); I^2=82.49%						
Test for overall effect: Z=7.26(P<0.0001)						
1.4.2 Australia/Europe/North America						
Lyssenko 2005	221	1429	1.3 (0.256)		19.23%	3.8[2.3,6.28]
Subtotal (95% CI)					**19.23%**	**3.8[2.3,6.28]**
Heterogeneity: Tau^2=0; Chi^2=0, df=0(P<0.0001); I^2=100%						
Test for overall effect: Z=5.21(P<0.0001)						
1.4.3 American Indians/Islands						
Wang 2011	356	595	1.4 (0.146)		22.04%	4.06[3.05,5.4]
Subtotal (95% CI)					**22.04%**	**4.06[3.05,5.4]**
Heterogeneity: Not applicable						
Test for overall effect: Z=9.6(P<0.0001)						



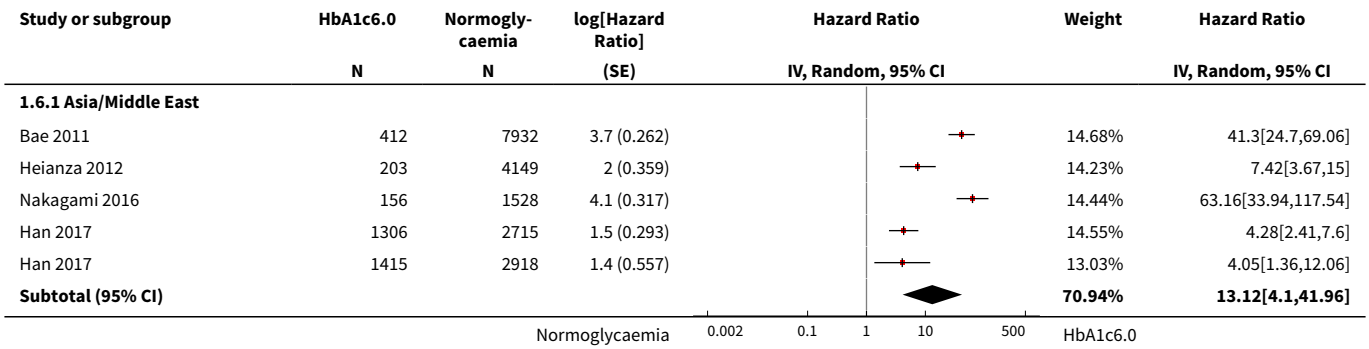
Normoglycaemia IFG+IGT

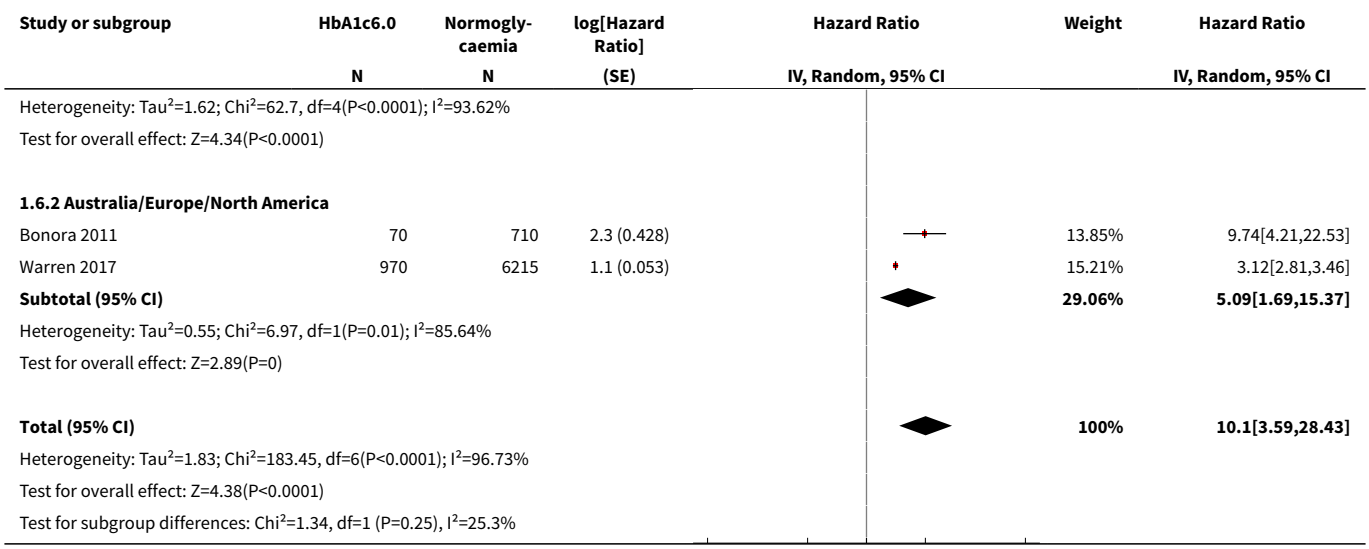


Analysis 1.5. Comparison 1 Hazard ratio as the effect measure for the development of T2DM, Outcome 5 T2DM incidence ($HbA1c_{5.7}$).

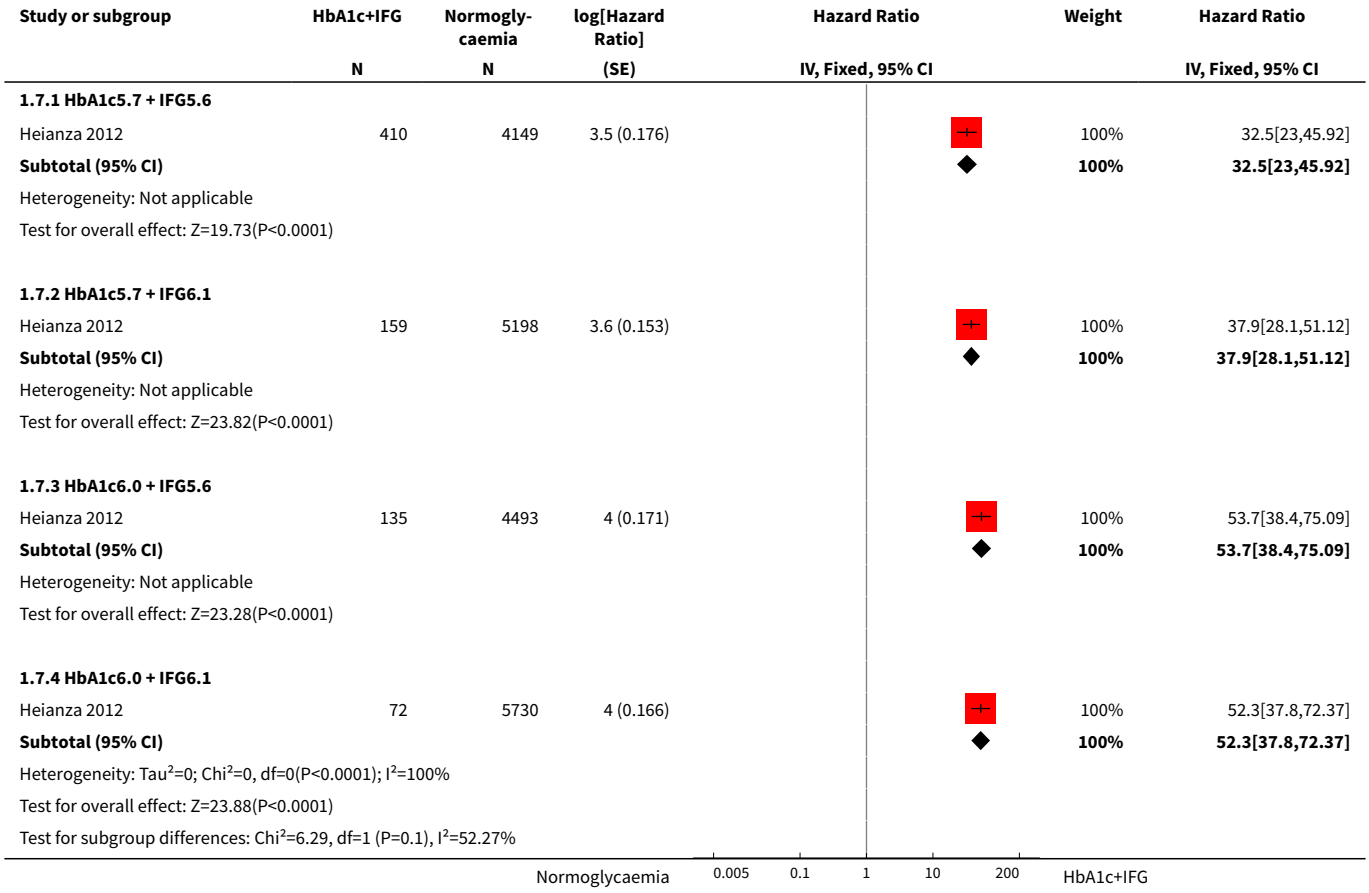


Analysis 1.6. Comparison 1 Hazard ratio as the effect measure for the development of T2DM, Outcome 6 T2DM incidence ($HbA1c_{6.0}$).





Analysis 1.7. Comparison 1 Hazard ratio as the effect measure for the development of T2DM, Outcome 7 T2DM incidence (HbA1c + IFG).



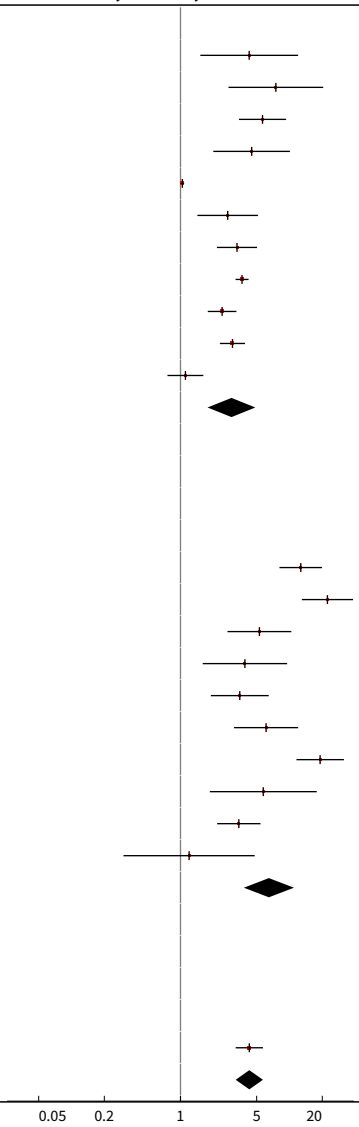
Comparison 2. Odds ratio as the effect measure for the development of T2DM

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 T2DM incidence ($IFG_{5.6}$)	21	47647	Odds Ratio (Random, 95% CI)	4.15 [2.75, 6.28]
1.1 Asia/Middle East	10	34577	Odds Ratio (Random, 95% CI)	2.94 [1.77, 4.86]
1.2 Australia/Europe/North America	9	9869	Odds Ratio (Random, 95% CI)	6.47 [3.81, 11.00]
1.3 Latin America	1	1659	Odds Ratio (Random, 95% CI)	4.28 [3.21, 5.71]
1.4 American Indians/Islands	1	1542	Odds Ratio (Random, 95% CI)	3.12 [2.31, 4.21]
2 T2DM incidence ($IFG_{6.1}$)	15	36866	Odds Ratio (Random, 95% CI)	6.60 [4.18, 10.43]
2.1 Asia/Middle East	7	28921	Odds Ratio (Random, 95% CI)	5.18 [2.32, 11.53]
2.2 Australia/Europe/North America	7	6334	Odds Ratio (Random, 95% CI)	8.69 [4.95, 15.24]
2.3 Latin America	1	1611	Odds Ratio (Random, 95% CI)	3.73 [2.18, 6.38]
3 T2DM incidence (IGT)	20	21552	Odds Ratio (Random, 95% CI)	4.61 [3.76, 5.64]
3.1 Asia/Middle East	6	8643	Odds Ratio (Random, 95% CI)	3.74 [2.83, 4.94]
3.2 Australia/Europe/North America	11	9165	Odds Ratio (Random, 95% CI)	5.20 [3.62, 7.45]
3.3 Latin America	2	3478	Odds Ratio (Random, 95% CI)	4.94 [3.15, 7.76]
3.4 American Indians/Islands	1	266	Odds Ratio (Random, 95% CI)	3.60 [1.40, 9.26]
4 T2DM incidence (IFG + IGT)	9	9656	Odds Ratio (Random, 95% CI)	13.14 [7.41, 23.30]
4.1 Asia/Middle East	3	4202	Odds Ratio (Random, 95% CI)	6.99 [3.09, 15.83]
4.2 Australia/Europe/North America	6	5454	Odds Ratio (Random, 95% CI)	20.95 [12.40, 35.40]
5 T2DM incidence ($HbA1c_{5.7}$)	3	3468	Odds Ratio (Random, 95% CI)	4.43 [2.20, 8.88]
5.1 Asia/Middle East	1	1137	Odds Ratio (Random, 95% CI)	4.54 [2.65, 7.78]
5.2 Europe/North America	2	2331	Odds Ratio (Random, 95% CI)	4.38 [1.36, 14.15]
6 T2DM incidence ($HbA1c_{6.0}$)	3	18317	Odds Ratio (Random, 95% CI)	12.79 [4.56, 35.85]
6.1 Asia/Middle East	1	11866	Odds Ratio (Random, 95% CI)	23.20 [18.70, 28.78]
6.2 Australia/Europe/North America	1	5735	Odds Ratio (Random, 95% CI)	15.60 [6.90, 35.27]
6.3 American Indians/Islands	1	716	Odds Ratio (Random, 95% CI)	5.89 [4.23, 8.20]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
7 T2DM incidence ($HbA1c_{5.7}$ + $IFG_{5.6}$)	2	14006	Odds Ratio (Random, 95% CI)	35.91 [20.43, 63.12]
7.1 Australia/Europe/North America	1	1294	Odds Ratio (Random, 95% CI)	26.20 [16.30, 42.11]
7.2 Asia/Middle East	1	12712	Odds Ratio (Random, 95% CI)	46.70 [33.60, 64.91]

Analysis 2.1. Comparison 2 Odds ratio as the effect measure for the development of T2DM, Outcome 1 T2DM incidence ($IFG_{5.6}$).

Study or subgroup	Intermediate hyperglycaemia N	IFG5.6 N	log[Odds Ratio] (SE)	Odds Ratio IV, Random, 95% CI	Weight	Odds Ratio IV, Random, 95% CI
2.1.1 Asia/Middle East						
Song 2015	167	1092	1.5 (0.527)		3.72%	4.27[1.52,12]
Song 2015	154	666	2 (0.51)		3.77%	7.5[2.76,20.38]
Jeong 2010	495	792	1.7 (0.254)		4.52%	5.66[3.44,9.31]
Liu 2008	169	470	1.5 (0.414)		4.08%	4.5[2,10.12]
Latifi 2016	124	394	0 (0.02)		4.84%	1.04[1,1.08]
Wang 2007	261	400	1 (0.326)		4.34%	2.71[1.43,5.14]
Sadeghi 2015	373	2607	1.2 (0.216)		4.61%	3.3[2.16,5.04]
Liu 2017	3607	15003	1.3 (0.07)		4.81%	3.67[3.2,4.21]
Aekplakorn 2006	223	2444	0.9 (0.155)		4.72%	2.41[1.78,3.26]
Derakhshan 2016	523	3611	1.1 (0.136)		4.75%	3[2.3,3.91]
Bergman 2016	263	739	0.1 (0.193)		4.65%	1.11[0.76,1.62]
Subtotal (95% CI)					**48.81%**	**2.94[1.77,4.86]**
Heterogeneity: Tau^2=0.65; Chi^2=467.3, df=10(P<0.0001); I^2=97.86%						
Test for overall effect: Z=4.19(P<0.0001)						
2.1.2 Australia/Europe/North America						
Levitzky 2008	460	0	2.5 (0.23)		4.58%	12.7[8.1,19.91]
Levitzky 2008	313	0	3.1 (0.275)		4.47%	22.3[13,38.25]
Soriguer 2008	56	1806	1.7 (0.344)		4.29%	5.3[2.7,10.4]
Valdes 2008	114	510	1.4 (0.455)		3.95%	3.9[1.6,9.51]
Lipska 2013	189	1690	1.3 (0.312)		4.38%	3.5[1.9,6.45]
Admiraal 2014	111	354	1.8 (0.345)		4.29%	6.1[3.1,12]
Cugati 2007	229	1512	3 (0.256)		4.52%	19.13[11.59,31.58]
De Abreu 2015	187	342	1.7 (0.576)		3.56%	5.75[1.86,17.77]
Filippatos 2016	279	1206	1.2 (0.234)		4.57%	3.43[2.17,5.42]
Vaccaro 1999	11	500	0.2 (0.707)		3.14%	1.2[0.3,4.8]
Subtotal (95% CI)					**41.74%**	**6.47[3.81,11]**
Heterogeneity: Tau^2=0.59; Chi^2=61.74, df=9(P<0.0001); I^2=85.42%						
Test for overall effect: Z=6.9(P<0.0001)						
2.1.3 Latin America						
Ferrannini 2009	65	1594	1.5 (0.147)		4.73%	4.28[3.21,5.71]
Subtotal (95% CI)					**4.73%**	**4.28[3.21,5.71]**



Study or subgroup	Intermediate hyperglycaemia N	IFG5.6 N	log[Odds Ratio] (SE)	Odds Ratio IV, Random, 95% CI	Weight	Odds Ratio IV, Random, 95% CI
Heterogeneity: Tau²=0; Chi²=0, df=0(P<0.0001); I²=100%						
Test for overall effect: Z=9.9(P<0.0001)						
2.1.4 American Indians/Islands						
Wang 2011	947	595	1.1 (0.153)		4.72%	3.12[2.31,4.21]
Subtotal (95% CI)					**4.72%**	**3.12[2.31,4.21]**
Heterogeneity: Not applicable						
Test for overall effect: Z=7.42(P<0.0001)						
Total (95% CI)					**100%**	**4.15[2.75,6.28]**
Heterogeneity: Tau²=0.92; Chi²=972.07, df=22(P<0.0001); I²=97.74%						
Test for overall effect: Z=6.74(P<0.0001)						
Test for subgroup differences: Chi²=7.19, df=1 (P=0.07), I²=58.26%						

Normoglycaemia 0.05 0.2 1 5 20 IFG5.6

Analysis 2.2. Comparison 2 Odds ratio as the effect measure for the development of T2DM, Outcome 2 T2DM incidence ($IFG_{6.1}$).

Study or subgroup	IFG6.1 N	Normoglycaemia N	log[Odds Ratio] (SE)	Odds Ratio IV, Random, 95% CI	Weight	Odds Ratio IV, Random, 95% CI
2.2.1 Asia/Middle East						
Chen 2003	156	444	1.5 (0.429)		5.64%	4.4[1.9,10.19]
Sato 2009	794	4147	3.1 (0.122)		6.84%	22.52[17.73,28.6]
Wang 2007	112	400	0.6 (0.321)		6.16%	1.8[0.96,3.37]
Kim 2016a	1433	10763	3 (0.116)		6.85%	21.1[16.8,26.5]
Nakanishi 2004	246	5500	0.3 (0.481)		5.37%	1.31[0.51,3.36]
Derakhshan 2016	523	3611	1.4 (0.177)		6.7%	4.1[2.9,5.8]
Bergman 2016	53	739	1.2 (0.307)		6.22%	3.43[1.88,6.26]
Subtotal (95% CI)					**43.78%**	**5.18[2.32,11.53]**
Heterogeneity: Tau²=1.08; Chi²=165.39, df=6(P<0.0001); I²=96.37%						
Test for overall effect: Z=4.02(P<0.0001)						
2.2.2 Australia/Europe/North America						
Levitzky 2008	313	0	3.3 (0.211)		6.59%	26.3[17.4,39.76]
Levitzky 2008	460	0	2.6 (0.167)		6.73%	12.9[9.3,17.89]
Valdes 2008	52	510	2.5 (0.494)		5.31%	12.1[4.6,31.83]
Rijkelijkhuizen 2007	149	1125	2.3 (0.252)		6.44%	10[6.1,16.39]
Lipska 2013	100	1690	2.4 (0.242)		6.48%	11.4[7.1,18.3]
Rathmann 2009	71	649	1.5 (0.387)		5.84%	4.7[2.2,10.04]
Cederberg 2010	40	410	0.9 (0.237)		6.5%	2.37[1.49,3.77]
Bonora 2011	55	710	1.7 (0.363)		5.96%	5.7[2.8,11.6]
Subtotal (95% CI)					**49.87%**	**8.69[4.95,15.24]**
Heterogeneity: Tau²=0.57; Chi²=66.97, df=7(P<0.0001); I²=89.55%						
Test for overall effect: Z=7.54(P<0.0001)						
2.2.3 Latin America						
Ferrannini 2009	17	1594	1.3 (0.274)		6.36%	3.73[2.18,6.38]

Normoglycaemia 0.002 0.1 1 10 500 IFG6.1

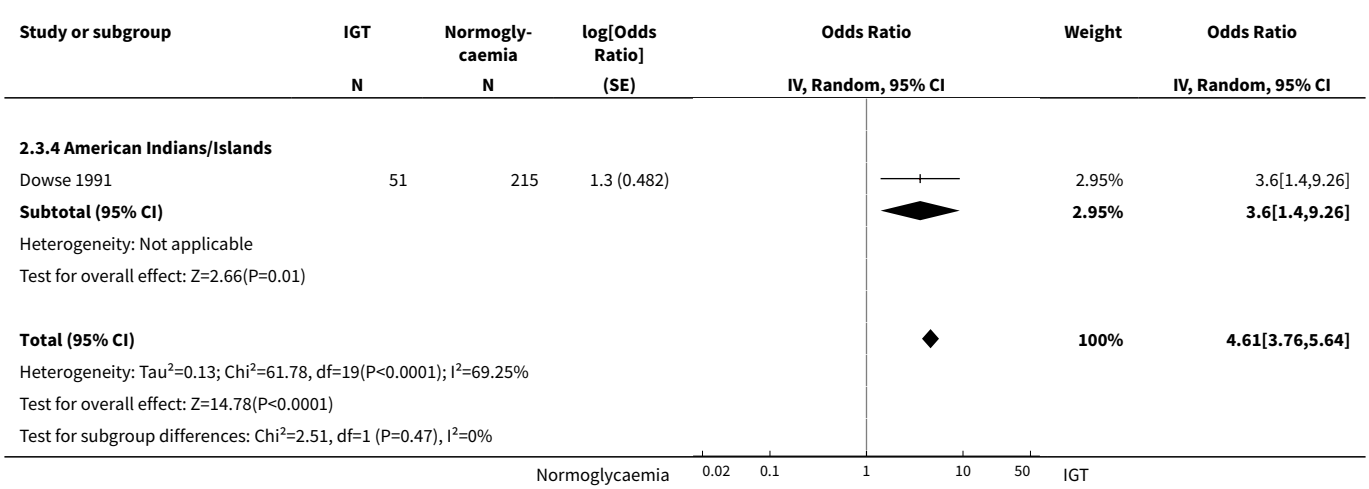
Study or subgroup	IFG6.1 N	Normoglycaemia N	log[Odds Ratio] (SE)	Odds Ratio IV, Random, 95% CI	Weight	Odds Ratio IV, Random, 95% CI
Subtotal (95% CI)					**6.36%**	**3.73[2.18,6.38]**
Heterogeneity: Not applicable						
Test for overall effect: Z=4.8(P<0.0001)						
Total (95% CI)					**100%**	**6.6[4.18,10.43]**
Heterogeneity: Tau²=0.78; Chi²=251.23, df=15(P<0.0001); I²=94.03%						
Test for overall effect: Z=8.09(P<0.0001)						
Test for subgroup differences: Chi²=4.57, df=1 (P=0.1), I²=56.24%						

Normoglycaemia 0.002 0.1 1 10 500 IFG6.1

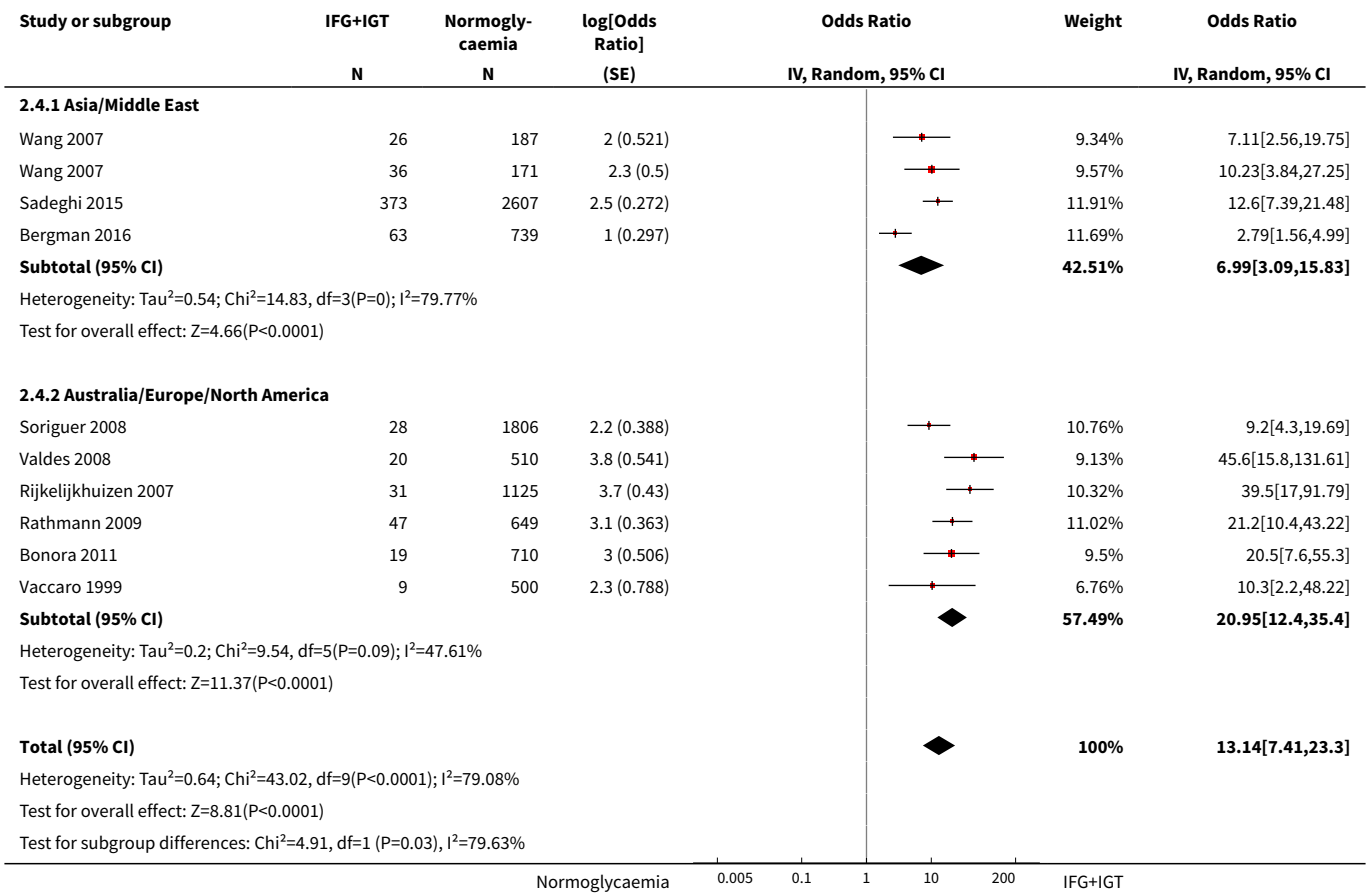
Analysis 2.3. Comparison 2 Odds ratio as the effect measure for the development of T2DM, Outcome 3 T2DM incidence (IGT).

Study or subgroup	IGT N	Normoglycaemia N	log[Odds Ratio] (SE)	Odds Ratio IV, Random, 95% CI	Weight	Odds Ratio IV, Random, 95% CI
2.3.1 Asia/Middle East						
Wang 2007	126	400	1.1 (0.346)		4.27%	3.15[1.6,6.2]
Jeong 2010	495	792	1.8 (0.317)		4.63%	6.01[3.23,11.18]
Li 2003	118	435	1.1 (0.248)		5.57%	2.94[1.81,4.78]
Sadeghi 2015	373	2607	0.9 (0.192)		6.38%	2.52[1.73,3.67]
Aekplakorn 2006	0	2444	1.5 (0.125)		7.3%	4.36[3.41,5.57]
Bergman 2016	114	739	1.7 (0.368)		4.01%	5.64[2.74,11.61]
Subtotal (95% CI)					**32.17%**	**3.74[2.83,4.94]**
Heterogeneity: Tau²=0.06; Chi²=10.39, df=5(P=0.06); I²=51.89%						
Test for overall effect: Z=9.3(P<0.0001)						
2.3.2 Australia/Europe/North America						
Mykkänen 1993	203	689	2.3 (0.241)		5.66%	9.85[6.14,15.8]
Stengard 1992	234	216	1.1 (0.484)		2.93%	3.1[1.2,8.01]
Hanley 2005	274	603	1.7 (0.209)		6.13%	5.42[3.6,8.16]
Soriguer 2008	54	1806	1.5 (0.391)		3.77%	4.3[2,9.25]
Valdes 2008	88	510	1.9 (0.346)		4.27%	6.7[3.4,13.2]
Rijkelijkhuizen 2007	111	1125	2.4 (0.305)		4.78%	10.9[6,19.8]
Rathmann 2009	120	649	2.2 (0.288)		5%	8.8[5,15.49]
Zethelius 2004	201	466	0.8 (0.215)		6.04%	2.18[1.43,3.32]
Bonora 2011	53	710	1.4 (0.455)		3.17%	3.9[1.6,9.51]
Cederberg 2010	103	410	1.1 (0.216)		6.03%	2.9[1.9,4.43]
Vaccaro 1999	40	500	1.8 (0.424)		3.44%	6.2[2.7,14.24]
Subtotal (95% CI)					**51.23%**	**5.2[3.62,7.45]**
Heterogeneity: Tau²=0.27; Chi²=42.09, df=10(P<0.0001); I²=76.24%						
Test for overall effect: Z=8.95(P<0.0001)						
2.3.3 Latin America						
Ferrannini 2009	179	1594	1.4 (0.128)		7.27%	4.01[3.12,5.15]
Lorenzo 2003	202	1503	1.9 (0.192)		6.38%	6.37[4.37,9.29]
Subtotal (95% CI)					**13.65%**	**4.94[3.15,7.76]**
Heterogeneity: Tau²=0.08; Chi²=4.01, df=1(P=0.05); I²=75.09%						
Test for overall effect: Z=6.94(P<0.0001)						

Normoglycaemia 0.02 0.1 1 10 50 IGT

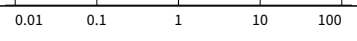


Analysis 2.4. Comparison 2 Odds ratio as the effect measure for the development of T2DM, Outcome 4 T2DM incidence (IFG + IGT).



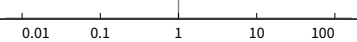
Analysis 2.5. Comparison 2 Odds ratio as the effect measure for the development of T2DM, Outcome 5 T2DM incidence ($HbA1c_{5.7}$).

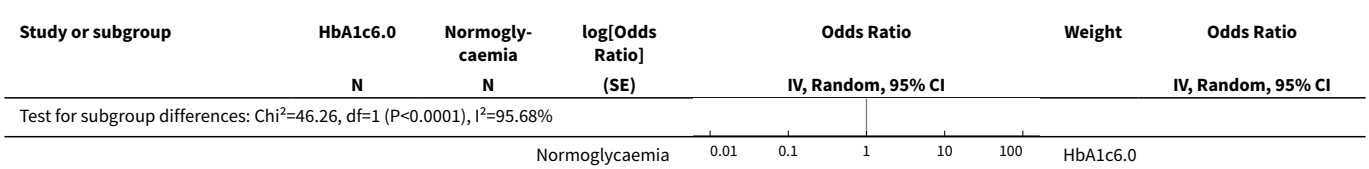
Study or subgroup	HbA1c5.7 N	Normoglycaemia N	log[Odds Ratio] (SE)	Odds Ratio IV, Random, 95% CI	Weight	Odds Ratio IV, Random, 95% CI
2.5.1 Asia/Middle East						
Man 2017	675	462	1.5 (0.275)		32.65%	4.54[2.65,7.78]
Subtotal (95% CI)					**32.65%**	**4.54[2.65,7.78]**
Heterogeneity: Not applicable						
Test for overall effect: Z=5.51(P<0.0001)						
2.5.2 Europe/North America						
Lipska 2013	207	1690	2.1 (0.261)		33.3%	8[4.8,13.33]
Cederberg 2010	24	410	0.9 (0.244)		34.05%	2.42[1.5,3.9]
Subtotal (95% CI)					**67.35%**	**4.38[1.36,14.15]**
Heterogeneity: Tau^2=0.65; Chi^2=11.22, df=1(P=0); I^2=91.08%						
Test for overall effect: Z=2.47(P=0.01)						
Total (95% CI)					**100%**	**4.43[2.2,8.88]**
Heterogeneity: Tau^2=0.31; Chi^2=11.26, df=2(P=0); I^2=82.24%						
Test for overall effect: Z=4.18(P<0.0001)						
Test for subgroup differences: Chi^2=0, df=1 (P=0.96), I^2=0%						



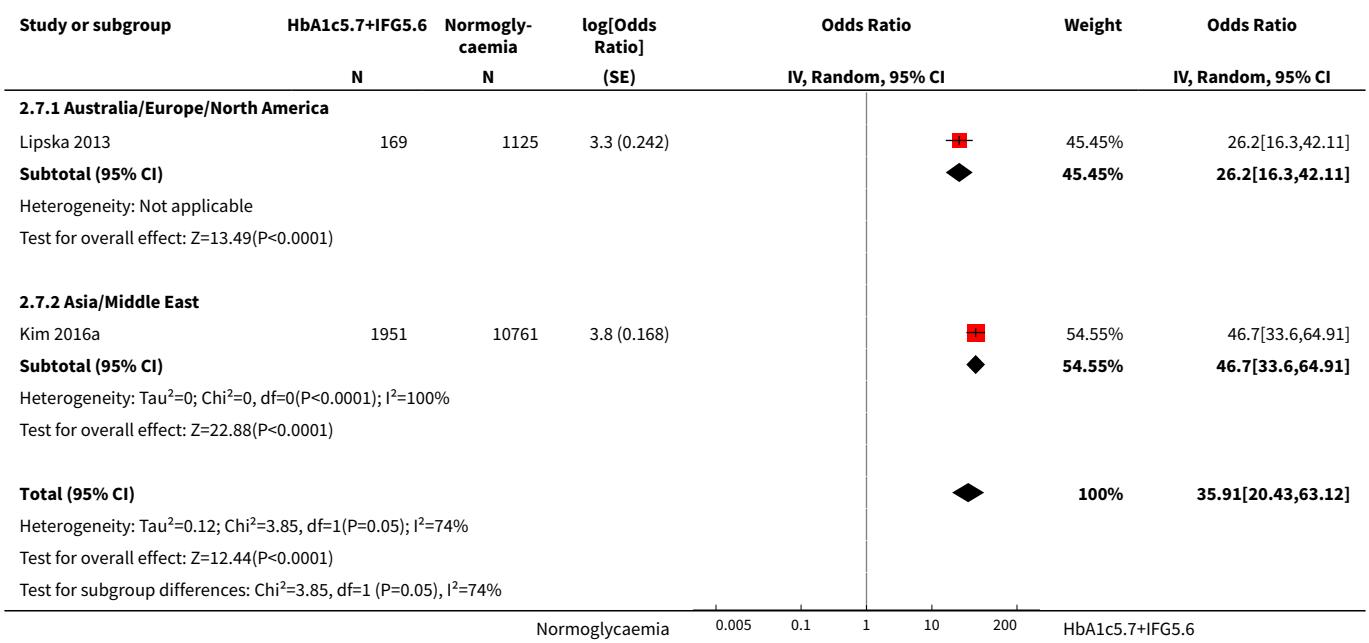
Analysis 2.6. Comparison 2 Odds ratio as the effect measure for the development of T2DM, Outcome 6 T2DM incidence ($HbA1c_{6.0}$).

Study or subgroup	HbA1c6.0 N	Normoglycaemia N	log[Odds Ratio] (SE)	Odds Ratio IV, Random, 95% CI	Weight	Odds Ratio IV, Random, 95% CI
2.6.1 Asia/Middle East						
Kim 2016a	1103	10763	3.1 (0.11)		35.62%	23.2[18.7,28.78]
Subtotal (95% CI)					**35.62%**	**23.2[18.7,28.78]**
Heterogeneity: Tau^2=0; Chi^2=0, df=0(P<0.0001); I^2=100%						
Test for overall effect: Z=28.58(P<0.0001)						
2.6.2 Australia/Europe/North America						
Chamnan 2011	370	5365	2.7 (0.416)		29.5%	15.6[6.9,35.27]
Subtotal (95% CI)					**29.5%**	**15.6[6.9,35.27]**
Heterogeneity: Not applicable						
Test for overall effect: Z=6.6(P<0.0001)						
2.6.3 American Indians/Islands						
Wang 2011	121	595	1.8 (0.169)		34.88%	5.89[4.23,8.2]
Subtotal (95% CI)					**34.88%**	**5.89[4.23,8.2]**
Heterogeneity: Not applicable						
Test for overall effect: Z=10.5(P<0.0001)						
Total (95% CI)					**100%**	**12.79[4.56,35.85]**
Heterogeneity: Tau^2=0.76; Chi^2=46.26, df=2(P<0.0001); I^2=95.68%						
Test for overall effect: Z=4.85(P<0.0001)						





Analysis 2.7. Comparison 2 Odds ratio as the effect measure for the development of T2DM, Outcome 7 T2DM incidence ($HbA1c_{5.7}$ + $IFG_{5.6}$).



ADDITIONAL TABLES

Table 1. Overview: overall prognosis of people with intermediate hyperglycaemia and regression from intermediate hyperglycaemia to normoglycaemia

Follow-up time (years)	% (95% CI) cumulative T2DM incidence [no of studies; no of participants with IH]						% (95% CI) regression from IH to normoglycaemia [no of studies; no of participants with IH]
	$IFG_{5.6}$	$IFG_{6.1}$	IGT	IFG + IGT	$HbA1c_{5.7}$	$HbA1c_{6.0}$	
1	—	—	**13 (5–23)** [3; 671]	**29 (23–36)** [1; 207]	—	—	**59 (54–64)** [2; 375]
2	**2 (1–2)** [1; 1335]	**11 (8–14)** [2; 549]	**16 (9–26)** [9; 1998]	—	—	—	**46 (36–55)** [9; 2852]
3	**17 (6–32)** [3; 1091]	**9 (2–20)** [3; 927]	**22 (18–27)** [3; 417]	**34 (28–41)** [1; 209]	—	**7 (5–10)** [1; 370]	**41 (24–59)** [7; 1356]
4	**17 (13–22)** [3; 800]	**30 (17–44)** [2; 1567]	**22 (12–34)** [5; 1042]	—	**14 (7–23)** [3; 5352]	**44 (40–48)** [2; 627]	**33 (26–40)** [3; 807]
5	**18 (10–27)** [7; 3530]	**26 (19–33)** [11; 3837]	**39 (25–53)** [12; 3444]	**50 (37–63)** [5; 478]	**25 (18–32)** [4; 3524]	**38 (26–51)** [3; 1462]	**34 (27–42)** [9; 2603]
6	**22 (15–31)** [4; 738]	**37 (31–43)** [5; 279]	**29 (25–34)** [7; 775]	**58 (48–67)** [4; 106]	**17 (14–20)** [1; 675]	—	**23 (3–53)** [5; 1328]
7	**18 (8–30)** [5; 980]	**15 (0–45)** [4; 434]	**19 (13–26)** [5; 835]	**32 (20–45)** [4; 753]	**21 (16–27)** [1; 207]	—	**41 (37–45)** [4; 679]
8	**34 (27–40)** [2; 1887]	**48 (31–66)** [1;29]	**43 (37–49)** [4; 1021]	**52 (47–57)** [1; 356]	—	—	**39 (33–44)** [2; 328]
9	**38 (10–70)** [3; 1356]	—	**53 (45–60)** [1; 163]	**84 (74–91)** [1; 69]	—	—	**17 (14–22)** [1; 299]
10	**23 (14–33)**	**29 (17–43)**	**26 (17–37)**	**30 (17–44)**	**31 (29–33)**	—	**42 (22–63)**

Table 1. Overview: overall prognosis of people with intermediate hyperglycaemia and regression from intermediate hyperglycaemia to normoglycaemia *(Continued)*

	[6; 1542]	[6; 537]	[6; 443]	[2; 49]	[2; 2854]		[7; 894]
11	—	**38 (33–43)** [1; 402]	**46 (43–49)** [1; 1253]	—	—	—	**28 (17–39)** [2; 736]
12	**31 (19–34)** [3; 433]	**31 (28–33)** [1; 1382]	**41 (38–43)** [2; 1552]	**70 (63–76)** [2; 207]	—	—	—
15	—	—	—	—	—	**29 (19–40)** [1; 70]	—
20	—	—	**60 (5–68)** [1; 114]	—	—	—	—

CI: confidence interval; **HbA1c**: glycosylated haemoglobin A1c; $HbA1c_{5.7/6.0}$ (threshold 5.7% or 6.0%); **$IFG_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG + IGT**: both IFG and IGT; **IH**: intermediate hyperglycaemia; **T2DM**: type 2 diabetes mellitus

Table 2. Overview: intermediate hyperglycaemia versus normoglycaemia as a prognostic factor for the development of type 2 diabetes

Ratio (95% CI)
95% prediction interval[a,b]

[no of studies; no of participants with IH/no of participants with normoglycaemia]

Hazard ratio

Region	**$IFG_{5.6}$ cohort**	**$IFG_{6.1}$ cohort**	**IGT cohort**	**IFG + IGT cohort**	**$HbA1c_{5.7}$ cohort**	**$HbA1c_{6.0}$ cohort**	**$HbA1c_{5.7}$ + $IFG_{5.6}$ cohort**
Asia/Middle East	**5.07 (3.41-7.53)** 1.07–24.02 [4; 2385/12,837]	**10.55 (3.61–30.81)** NA[b] [5; 1054/9756]	**4.48 (2.81–7.15)** NA[b] [3; 1780/6695]	**10.20 (5.45–19.09)** NA[b] [3; 461/6695]	**7.21 (5.14–10.11)** 0.81–64.52 [3; 3196/13,609]	**13.12 (4.10–41.96)** NA[b] [4; 3492/19,242]	**32.50 (23.00–45.92)**[c] NA[a] [1; 410/4149]

Table 2. Overview: intermediate hyperglycaemia versus normoglycaemia as a prognostic factor for the development of type 2 diabetes *(Continued)*

Australia/Europe/North America	**4.15 (1.24–13.87)** NA[b] [3; 5685/12,837]	**3.30 (2.32–4.67)** 0.84–12.99 [4; 1736/8835]	**2.53 (1.52–4.19)** NA[a] [2; 2230/5871]	**3.80 (2.30–6.28)** NA[a] [1; 221/1429]	**2.71 (2.48–2.96)** NA[a] [1: 2027/6215]	**5.09 (1.69–15.37)** NA[a] [2; 1040/6925]	—
Latin America	—	**2.06 (1.76–2.41)** NA[b] [1; 28/66]	—	—	—	—	—
American Indians/Islands	**2.38 (1.85–3.06)** NA[a] [1; 947/595]	—	—	**4.06 (3.05–5.40)** NA[a] [1; 356/595]	—	—	—
Overall	**4.32 (2.61–7.12)** 0.75–25.01 [8; 9017/25,850]	**5.47 (3.50–8.54)** 1.09–27.56 [9; 2818/18,591]	**3.61 (2.31–5.64)** 0.69–18.97 [5; 4010/12,566]	**6.90 (4.15–11.45)** 1.06–44.95 [5; 1038/8719]	**5.55 (2.77–11.12)** 0.23–141.18 [4; 5223/19,824]	**10.10 (3.59–28.43)** NA[b] [6; 4532/26,167]	**32.50 (23.00–45.92)** NA[a] [1; 410/4149]
Incidence rate ratio							
Region	**IFG$_{5.6}$ cohort**	**IFG$_{6.1}$ cohort**	**IGT cohort**	**IFG + IGT cohort**	**HbA1c$_{5.7}$ cohort**	**HbA1c$_{6.0}$ cohort**	**HbA1c$_{5.7}$ + IFG$_{5.6}$ cohort**
Asia/Middle East	**5.23 (3.77–7.25)** 1.72–15.89 [6; 15,661/145,597]	**3.62 (1.67–7.83)** NA[a] [2; 1677/36,334]	**3.93 (3.03–5.10)** 1.71–9.02 [5; 14,809/73,128]	**11.20 (5.59–22.43)** NA[b] [4; 3166/69,463]	**6.62 (4.18–10.49)** NA[a] [1; 1965/19961]	—	**40.72 (29.30–56.61)** NA[a] [1; 1641/19,961]
Australia/Europe/North America	**4.96 (3.25–7.57)** 0.32–77.24 [3; 6322/8062]	**8.55 (6.37–11.48)** 4.37–16.73 [4; 3438/20,246]	**5.93 (4.11–8.57)** 2.38–14.81 [5; 2572/22,329]	**13.92 (9.99–19.40)** 6.71–28.85 [4; 699/18,966]	—	—	—

Table 2. Overview: intermediate hyperglycaemia versus normoglycaemia as a prognostic factor for the development of type 2 diabetes *(Continued)*

Latin America	—	—	—	—	—	—	—
American Indians/Islands	**2.74 (1.88–3.99)** NA[a] [1; 2374/1613]	—	**4.46 (3.12–6.38)** NA[a] [2; 1087/2952]	**5.18 (3.42–7.83)** NA[a] [1; 605/1613]	—	—	—
Overall	**4.81 (3.67–6.30)** 1.95–11.83 [10; 24,357/155,272]	**6.82 (4.53–10.25)** 2.03–22.87 [6; 5115/56,580]	**4.48 (3.69–5.44)** 2.60–7.70 [12; 18,468/98,409]	**10.94 (7.22–16.58)** 2.58–46.46 [9; 4470/90,072]	**6.62 (4.18–10.5)** NA[a] [1; 1965/19961]	—	**40.72 (29.30–56.61)** NA[a] [1; 1641/19,961]
Odds ratio							
	$IFG_{5.6}$ cohort	**$IFG_{6.1}$ cohort**	**IGT cohort**	**IFG + IGT cohort**	**$HbA1c_{5.7}$ cohort**	**$HbA1c_{6.0}$ cohort**	**$HbA1c_{5.7}$ + $IFG_{5.6}$ cohort**
Asia/Middle East	**2.94 (1.77–4.86)** 0.43–19.93 [10; 6359/28,218]	**5.18 (2.32–11.53)** 0.29–91.37 [7; 3317/25,604]	**3.74 (2.83–4.94)** 1.70–8.21 [6; 1226/7417]	**6.99 (3.09–15.83)** NA[b] [3; 498/3704]	**4.54 (2.65–7.78)** NA[a] [1; 675/462]	**23.20 (18.70–28.78)** NA[a] [1; 1103/10,763]	**46.70 (33.60–64.91)** NA[a] [1; 1951/10,761]
Australia/Europe/North America	**6.47 (3.81–11.00)** 0.99–42.32 [9; 1949/7920]	**8.69 (4.95–15.24)** 1.20–62.69 [7; 1240/5094]	**5.20 (3.62–7.45)** 1.50–18.09 [11; 1481/7684]	**20.95 (12.40–35.40)** 4.93–89.05 [6; 154/5300]	**4.38 (1.36–14.15)** NA[a] [2; 231/2100]	**15.60 (6.90–35.27)** NA[a] [1; 370/5365]	**26.20 (16.30–41.11)** NA[a] [1; 169/1125]
Latin America	**4.28 (3.21–5.71)** NA[a] [1; 65/1594]	**3.73 (2.18–6.38)** NA[a] [1; 17/1594]	**4.94 (3.15–7.76)** NA[a] [2; 381/3097]	—	—	—	—
American Indians/Islands	**3.12 (2.31–4.21)** NA[a]	—	**3.60 (1.40–9.26)** NA[a]	—	—	**5.89 (4.23–8.20)** NA[a]	—

Table 2. Overview: intermediate hyperglycaemia versus normoglycaemia as a prognostic factor for the development of type 2 diabetes *(Continued)*

	[1; 947/595]		[1; 51/215]			[1; 121/595]	
Overall	**4.15 (2.75–6.28)** 0.54–32.00 [21; 9320/38,327]	**6.60 (4.18–10.43)** 0.93–46.82 [15; 4574/32,292]	**4.61 (3.76–5.64)** 2.10–10.13 [20; 3139/18,413]	**13.14 (7.41–23.30)** 1.84–93.66 [9; 652/9004]	**4.43 (2.20–8.88)** NA[b] [3; 906/2562]	**12.8 [4.56–35.9]** NA[b] [3; 1594/16,723]	**35.91 (20.43–63.12)** NA[a] [2; 2120/11,886]

CI: confidence interval; **HbA1c**: glycosylated haemoglobin A1c; **$HbA1c_{5.7/6.0}$** (threshold 5.7% or 6.0%); **$HbA1c_{5.7}$ + $IFG_{5.6}$**: both $HbA1c_{5.7}$ and $IFG_{5.6}$; **$IFG_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG + IGT**: both IFG and IGT; **IH**: intermediate hyperglycaemia; **NA**: not applicable; **T2DM**: type 2 diabetes mellitus; **NR**: not reported

[a]With fewer than 3 studies a prediction interval could not be calculated

[b]Calculation of the 95% prediction interval did not provide a meaningful estimate

[c]Combination of $HbA1c_{6.0}$ plus $IFG_{5.6}$ at baseline showed a hazard ratio for T2DM development of 53.7 (95% CI 38.4–75.1)

APPENDICES

Appendix 1. Glossary of terms

Abbreviation	Explanation
ADA	American Diabetes Association
ALAT	Alanine aminotransferase
ASAT	Aspartate transaminase
BG	Blood glucose
BMI	Body mass index
BW	Body weight
CI	Confidence interval
FG	Fasting glucose
FBG	Fasting blood glucose
FINDRISC	Finnish Diabetes Risk Score
FPG	Fasting plasma glucose
G6PD	Glucose-6-P-dehydrogenase test
HbA1c	Glycosylated haemoglobin A1c
$HbA1c_{5.7}$	Intermediate hyperglycaemia with HbA1c level 5.7%-6.4% at baseline (HbA1c 5.7% threshold)
$HbA1c_{6.0}$	Intermediate hyperglycaemia with HbA1c level 6.0%-6.4% at baseline (HbA1c 6.0% threshold)
h-CRP	High-sensitivity C-reactive protein
HOMA-B(eta)	Homeostatic model assessment beta-cell function
HOMA-IR	Homeostatic model assessment for insulin resistance
HR	Hazard ratio
ICTRP	International Clinical Trials Registry Platform
IEC	International Expert Committee
IFG	Impaired fasting glucose
$IFG_{5.6}$	Intermediate hyperglycaemia with impaired fasting plasma glucose level 5.6–6.9 mmol/L at baseline (IFG 5.6 mmol/L threshold)
$IFG_{6.1}$	Intermediate hyperglycaemia with impaired fasting plasma glucose level 6.1–6.9 mmol/L at baseline (IFG 6.1 mmol/L threshold)

(Continued)

IFG/IGT	Combination of both IFG and IGT
i-IFG	Isolated IFG
IGT	Impaired glucose tolerance (intermediate hyperglycaemia defined by IGT: plasma glucose 7.8–11.1 mmol/L 2 hours after a 75 g OGTT at baseline)
i-IGT	Isolated IGT
IQR	Interquartile range
IRR	Incidence rate ratio
JDS	Japanese Diabetes Society
M	Men
NCEP	National cholesterol education program
NDDG	National Diabetes Data Group
NGSP	National Glycohemoglobin Standardization Program
NGT	Normal glucose tolerance
OGTT	Oral glucose tolerance test
OR	Odds ratio
PG	Postload glucose
QUIPS	Quality In Prognosis Studies tool
ROC	Receiver operating characteristics
RR	Risk ratio, relative risk
SD	Standard deviation
SE	Standard error
T2DM	Type 2 diabetes mellitus
W	Women
WHO	World Health Organization
γ-GT	Gamma-glutamyl transferase/transpeptidase

Appendix 2. Search strategies

Search strategy overview

(Continued)

Tier 1: prediabetes as predictor for CVD, mortality, stroke, cancer, micro/macrovascular complications

(

1. Population block (prediabetes AND prognosis filter)

OR

2. Prediabetes risk factors / diagnostic criteria block ((IFG, IGT, HbA1c) ADJ6 prognosis terms)

)

AND

3. Outcomes block (diabetes complications, micro/macrovascular, mortality)

Tier 2: prediabetes as predictor for diabetes incidence

(

1. Population block (prediabetes AND prognosis filter)

OR

2. Prediabetes risk factors / diagnostic criteria block ((IFG, IGT, HbA1c) ADJ6 prognosis terms)

)

AND

3. Outcomes block (diabetes incidence)

MEDLINE (Ovid SP)

Whole strategy (combining tier 1: 'prediabetes' as predictor for cardiovascular disease, mortality, stroke, cancer, micro/macrovascular complications and tier 2: 'prediabetes' as predictor for diabetes incidence)

1. Prediabetic state/

2. (prediabet* or pre diabet*).tw.

3. intermediate hyperglyc?emi*.tw.

4. or/1-3

5. incidence.sh. or exp mortality/ or follow-up studies.sh. or prognos*.tw. or predict*.tw. or course*.tw. *[*Wilczynski 2004*: MEDLINE prognosis filter sensitivity maximizing]*

6. prognosis/ or diagnosed.tw. or cohort*.mp. or predictor*.tw. or death.tw. or exp models, statistical/ *[*Wilczynski 2004*: MEDLINE prognosis filter best balance]*

7. or/5-6

8. 4 and 7 *[population block (prediabetes + prognosis filter)]*

9. ((impaired fasting adj2 glucose) or IFG or (impaired adj FPG)).tw.

10. (impaired glucose tolerance or IGT).tw.

11. ("HbA(1c)" or HbA1 or HbA1c or "HbA 1c" or ((glycosylated or glycated) adj h?emoglobin)).tw.

12. or/9-11

13. (predict* or associa* or prognos*).tw.

14. ((prognostic or predict*) adj2 model?).tw.

(Continued)

15. predictive value?.tw.

16. (risk adj (predict* or factor? or score)).tw.

17. or/13-16

18. (((impaired fasting adj2 glucose) or IFG or "impaired FPG" or impaired glucose tolerance or IGT or "HbA(1c)" or HbA1 or HbA1c or "HbA 1c" or ((glycosylated or glycated) adj h?emoglobin)) adj3 (predict* or associa* or prognos* or ((prognostic or predict*) adj2 model?) or predictive value? or (risk adj (predict* or factor? or score)))).tw. *[12 adj3 17 // risk factor block]*

19. 8 or 18 *[block 1 or block 2]*

20. complication?.tw.

21. mortality.tw.

22. (CHD or CVD).tw.

23. (coronary adj2 disease).tw.

24. (coronar* adj (event? or syndrome?)).tw.

25. (heart adj (failure or disease? or attack? or infarct*)).tw.

26. (myocardial adj (infarct* or isch?emi*)).tw.

27. cardiac failure.tw.

28. angina.tw.

29. revasculari*.tw.

30. (stroke or strokes).tw.

31. cerebrovascular.tw.

32. ((brain* or cerebr*) adj (infarct* or isch?emi*)).tw.

33. apoplexy.tw.

34. ((vascular or peripheral arter*) adj disease?).tw.

35. cardiovascular.tw.

36. (neuropath* or polyneuropath*).tw.

37. (retinopath* or maculopath*).tw.

38. (nephropath* or nephrotic or proteinuri* or albuminuri*).tw.

39. ((kidney or renal) adj (disease? or failure or transplant*)).tw.

40. ((chronic or endstage or end stage) adj (renal or kidney)).tw.

41. (CRD or CRF or CKF or CRF or CKD or ESKD or ESKF or ESRD or ESRF).tw.

42. (microvascular or macrovascular or ((micro or macro) adj vascular)).tw.

43. (cancer or carcino* or neoplas* or tumo?r?).tw.

44. (amputation? or ulcer* or foot or feet or wound*).tw.

45. or/20-44 *[tier 1 strategy outcomes block]*

46. 19 and 45

47. ((diabet* or type 2 or type II or T2D*) adj4 (progress* or inciden* or conversion or develop* or future)).tw. *[tier 2 strategy outcomes block]*

(Continued)

48. 19 and 47

49. 46 or 48

50. exp animals/ not humans/

51. 49 not 50

52. (gestational or PCOS).tw.

53. 51 not 52

54. (comment or letter or editorial).pt.

55. 53 not 54

56. remove duplicates from 55

Embase (Ovid SP)

Whole strategy (combining tier 1: 'prediabetes' as predictor for cardiovascular disease, mortality, stroke, cancer, micro/macrovascular complications and tier 2: 'prediabetes' as predictor for diabetes incidence)

1. (prediabet* or pre diabet*).tw.

2. intermediate hyperglyc?emi*.tw.

3. or/1-2

4. exp disease course or risk*.mp. or diagnos*.mp. or follow-up.mp. or ep.fs. or outcome.tw. *[*Wilczynski 2005*: Embase prognosis filter sensitivity maximizing]*

5. follow-up.mp. or prognos*.tw. or ep.fs. *[*Wilczynski 2005*: Embase prognosis filter best balance]*

6. or/4-5

7. 3 and 6 *[population block (prediabetes + prognosis filter)]*

8. ((impaired fasting adj2 glucose) or IFG or (impaired adj FPG)).tw.

9. (impaired glucose tolerance or IGT).tw.

10. ("HbA(1c)" or HbA1 or HbA1c or "HbA 1c" or ((glycosylated or glycated) adj h?emoglobin)).tw.

11. or/8-10

12. (predict* or associa* or prognos*).tw.

13. ((prognostic or predict*) adj2 model?).tw.

14. predictive value?.tw.

15. (risk adj (predict* or factor? or score)).tw.

16. or/12-15

17. (((impaired fasting adj2 glucose) or IFG or "impaired FPG" or impaired glucose tolerance or IGT or "HbA(1c)" or HbA1 or HbA1c or "HbA 1c" or ((glycosylated or glycated) adj h?emoglobin)) adj3 (predict* or associa* or prognos* or ((prognostic or predict*) adj2 model?) or predictive value? or (risk adj (predict* or factor? or score)))).tw. *[12 adj3 17 // risk factor block]*

18. 7 or 17 *[block 1 or block 2]*

19. complication?.tw.

20. mortality.tw.

21. (CHD or CVD).tw.

(Continued)

22. (coronary adj2 disease).tw.

23. (coronar* adj (event? or syndrome?)).tw.

24. (heart adj (failure or disease? or attack? or infarct*)).tw.

25. (myocardial adj (infarct* or isch?emi*)).tw.

26. cardiac failure.tw.

27. angina.tw.

28. revasculari*.tw.

29. (stroke or strokes).tw.

30. cerebrovascular.tw.

31. ((brain* or cerebr*) adj (infarct* or isch?emi*)).tw.

32. apoplexy.tw.

33. ((vascular or peripheral arter*) adj disease?).tw.

34. cardiovascular.tw.

35. (neuropath* or polyneuropath*).tw.

36. (retinopath* or maculopath*).tw.

37. (nephropath* or nephrotic or proteinuri* or albuminuri*).tw.

38. ((kidney or renal) adj (disease? or failure or transplant*)).tw.

39. ((chronic or endstage or end stage) adj (renal or kidney)).tw.

40. (CRD or CRF or CKF or CRF or CKD or ESKD or ESKF or ESRD or ESRF).tw.

41. (microvascular or macrovascular or ((micro or macro) adj vascular)).tw.

42. (cancer or carcino* or neoplas* or tumo?r?).tw.

43. (amputation? or ulcer* or foot or feet or wound*).tw.

44. or/19-43 *[tier 1 strategy outcomes block]*

45. 18 and 44

46. ((diabet* or type 2 or type II or T2D*) adj4 (progress* or inciden* or conversion or develop* or future)).tw. *[tier 2 strategy outcomes block]*

47. 18 and 46

48. 45 or 47

[49-53: TSC Portal filter for exclusion of animal references]

49. exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/

50. human/ or normal human/ or human cell/

51. 49 and 50

52. 49 not 51

53. 48 not 52

54. (gestational or PCOS).tw.

(Continued)

55. 53 not 54

56. (comment or letter or editorial or conference).pt.

57. 55 not 56

58. remove duplicates from 57

ClinicalTrials.gov (Expert search)

(prediabetes OR prediabetic OR "pre diabetes" OR "pre diabetic" OR "intermediate hyperglycemia" OR "intermediate hyperglycaemia" OR "intermediate hyperglycemic" OR "intermediate hyperglycaemic" OR "impaired glucose tolerance" OR "impaired fasting glucose") AND (complication OR complications OR mortality OR CHD OR CVD OR coronary OR heart OR myocardial OR infarct OR infarction OR infarcts OR infarctions OR ischemia OR ischemic OR ischaemia OR ischaemic OR failure OR angina OR revascularization OR revascularisation OR revascularizations OR revascularisations OR stroke OR strokes OR cerebrovascular OR apoplexy OR vascular or peripheral OR cardiovascular OR neuropathy OR neuropathies OR polyneuropathy OR polyneuropathies OR retinopathy OR retinopathies OR maculopathy OR maculopathies OR nephropathy OR nephropathies OR nephrotic OR proteinuria OR proteinuric OR albuminuria OR kidney OR renal OR CRD OR CRF OR CKF OR CRF OR CKD OR ESKD OR ESKF OR ESRD OR ESRF OR microvascular OR macrovascular OR "micro vascular" OR "macro vascular" OR cancer OR carcinoma OR neoplasm OR neoplasms OR tumor OR tumors OR tumour OR tumours OR amputation OR amputations OR ulcer OR foot OR feet OR wounds OR (diabetes OR diabetic OR "type 2" OR "type II" OR T2D OR T2DM) AND (progress OR progression OR progressed OR incident OR incidence OR conversion OR developed OR development OR future)) [OUTCOME]

ICTRP Search Portal (Standard search)

prediabet* AND prognos* OR

prediabet* AND predict* OR

prediabet* AND inciden* OR

prediabet* AND mortality OR

prediabet* AND prevent* OR

prediabet* AND progress* OR

prediabet* AND develop* OR

pre diabet* AND prognos* OR

pre diabet* AND predict* OR

pre diabet* AND inciden* OR

pre diabet* AND mortality OR

pre diabet* AND prevent* OR

pre diabet* AND progress* OR

pre diabet* AND develop* OR

impaired glucose tolerance AND prognos* OR

impaired glucose tolerance AND predict* OR

impaired glucose tolerance AND inciden* OR

impaired glucose tolerance AND mortality OR

impaired glucose tolerance AND prevent* OR

impaired glucose tolerance AND progress* OR

(Continued)

impaired glucose tolerance AND develop* OR

impaired fasting glucose AND prognos* OR

impaired fasting glucose AND predict* OR

impaired fasting glucose AND inciden* OR

impaired fasting glucose AND mortality OR

impaired fasting glucose AND prevent* OR

impaired fasting glucose AND progress* OR

impaired fasting glucose AND develop* OR

HbA* AND prognos* OR

HbA* AND predict* OR

HbA* AND inciden* OR

HbA* AND mortality OR

HbA* AND prevent* OR

HbA* AND progress* OR

HbA* AND develop*

Seed publications (for PubMed's 'similar articles'-algorithm)

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27239315[PMID] OR 18226046[PMID] OR 12777437[PMID] OR 12582008[PMID] OR 8314414[PMID] OR 8482427[PMID] OR 6507426[PMID] OR 18535192[PMID] OR 10333940[PMID] OR 16990660[PMID] OR 19046200[PMID] OR 10812323[PMID] OR 10480514[PMID] OR 17536076[PMID] OR 18249214[PMID] OR 20934897[PMID] OR 28632742[PMID] OR 27810987[PMID] OR 18405128[PMID] OR 8680609[PMID] OR 20578203[PMID] OR 16720024[PMID] OR 15451912[PMID] OR 15533586[PMID] OR 21270194[PMID] OR 10333943[PMID] OR 27863979[PMID] OR 11781759[PMID] OR 15175438[PMID] OR 15793193[PMID] OR 11194248[PMID] OR 26913636[PMID] OR 7712700[PMID] OR 14578234[PMID] OR 21718910[PMID] OR 15161800[PMID]

Appendix 3. QUIPS tool signalling questions

Study ID	
Signalling question	**Authors' judgement for 'yes'**
Study participation: yes/no[a]/unclear[b]/NA[c]	
a. Adequate participation in the study by eligible people	NA: usually participants with information on glycaemic status and follow-up data providing information on development of type 2 diabetes are selected from a greater study cohort (e.g. study evaluating several cardiovascular risk factors)
b. Description of the source population or population of interest	Source population for cohort with intermediate hyperglycaemia is clearly described
c. Description of the baseline study sample	Number of people with intermediate hyperglycaemia at baseline is clearly described
d. Adequate description of the sampling frame and recruitment	Way of establishing the source population, selection criteria and key characteristics of the source population clearly described
e. Adequate description of the period and place of recruitment	Time period and place of recruitment for both baseline and follow-up examinations are clearly described
f. Adequate description of inclusion and exclusion criteria	Definiton of people with normoglycaemia, intermediate hyperglycaemia or diabetes mellitus and description of other inclusion and exclusion criteria
Study participation: risk of bias rating (high/low/unclear)	**High**: most items are answered with 'no'; **Low**: all items answered with 'yes'; **Unclear**: most items are answered with 'unclear' Note: potentially a single item may introduce a high risk of bias, depending on study specifics
Study attrition: yes/no/unclear/NA	
a. Adequate response rate for study participants	NA: usually participants with information on glycaemic status and follow-up data providing information on development of type 2 diabetes are selected from a greater study cohort (e.g. study evaluating several cardiovascular risk factors)
b. Attempts to collect information on participants who dropped out described	Attempts to collect information on participants who dropped out are described (e.g. telephone contact, mail, registers)
c. Reasons for loss to follow-up provided	Reasons on participants who dropped out are available (e.g. deceased participants between baseline and follow-up, participants moving to another location)

(Continued)

d. Adequate description of participants lost to follow-up	Key characteristics of participants lost to follow-up are described (age, sex, glucose status at baseline, body mass index)
e. No important differences between participants who completed the study and those who did not	Study authors described differences between participants completing the study and those who did not as not important or information provided to judge the differences
Study attrition: risk of bias rating (high/low/unclear)	**High**: most items are answered with 'no'; **Low**: all items answered with 'yes'; **Unclear**: most items are answered with 'unclear' Note: potentially a single item may introduce a high risk of bias, depending on study specifics
Glycaemic status measurement: yes/no/unclear/NA	
a. Clear definition or description provided	Measurements for glycaemic status are provided (e.g. IFG, IGT, elevated HbA1c)
b. Adequately valid and reliable method of measurement	Ideally measurements for glycaemic status are repeated to ensure diagnosis, single measurements are accepted as well; technique for glucose measurement or HbA1c measurement described
c. Continuous variables reported or appropriate cut points used	Standard categories for intermediate hyperglycaemia (FPG 5.6–6.9 mmol/L ($IFG_{5.6}$), FPG 6.1–6.9 mmol/L ($IFG_{6.1}$), 2-h PG 7.8 to < 11.0 mmol/L (IGT), HbA1c 6.0–6.4% ($HbA1c_{6.0}$), HbA1c 5.7–6.4% ($HbA1c_{5.7}$))
d. Same method and setting of measurement used in all study participants	Measurements of glycaemic status are the same for all study participants
e. Adequate proportion of the study sample had complete data	NA: usually participants with information on glycaemic status and follow-up data providing information on development of type 2 diabetes are selected from a greater study cohort (e.g. study evaluating several cardiovascular risk factors)
f. Appropriate methods of imputation were used for missing data	NA: missing laboratory measurements for glycaemic status cannot be reliably imputed
Glycaemic status measurement: risk of bias rating (high/low/unclear)	**High**: most items are answered with 'no'; **Low**: all items answered with 'yes'; **Unclear**: most items are answered with 'unclear' Note: potentially a single item may introduce a high risk of bias, depending on study specifics
Outcome measurement: yes/no/unclear	
a. Clear definition of the outcome provided	Measurement of type 2 diabetes mellitus has to be defined
b. Use of adequately valid and reliable method of outcome measurement	Measurement of type 2 diabetes mellitus: a glucose (FPG, PG) or HbA1c measurement has to be a part of the diagnosis (self-reported diabetes alone will not be accepted)
c. Use of same method and setting of outcome measurement in all study participants	Measurements of type 2 diabetes mellitus are the same for all study participants
Outcome measurement: risk of bias rating (high/low/unclear)	**High**: most items are answered with 'no'; **Low**: all items answered with 'yes'; **Unclear**: most items are answered with 'unclear'

(Continued)

	Note: potentially a single item may introduce a high risk of bias, depending on study specifics
Study confounding: yes/no/unclear	
a. Measurement of all important confounders	Important confounders are: age, sex, family history of diabetes, 'ethnicity', body mass index, blood pressure and hypertension, smoking and drinking status, socioeconomic status, comedications and comorbidities, physical activity
b. Provision of clear definitions of the important confounders measured	Measurement of confounders has to be clearly described
c. Adequately valid and reliable measurement of all important confounders	Measurement of confounders is valid and reliable
d. Use of same method and setting of confounding measurement in all study participants	Measurements of confounders are the same for all study participants
e. Appropriate imputation methods used for missing confounders (if applicable)	Strategy to impute missing confounder data is described
f. Important potential confounders were accounted for in the study design	Methods section of the publication describes strategy to account for confounders
g. Important potential confounders were accounted for in the analysis	Important confounders are accounted for in multivariable logistic regression and Cox proportional hazards models
Study confounding measurement: risk of bias rating (high/low/unclear)	**High**: most items are answered with 'no'; **Low**: all items answered with 'yes'; **Unclear**: most items are answered with 'unclear' Note: potentially a single item may introduce a high risk of bias, depending on study specifics
Statistical analysis and reporting: yes/no/unclear/NA	
a. Sufficient presentation of data to assess the adequacy of the analytic strategy	Mean or median values, including confidence intervals or standard errors or standard deviations
b. Strategy for model building is appropriate and based on a conceptual framework or model	NA: we do not anticipate conceptual frameworks or explicit model building strategies for this type of research question (focusing on one prognostic factor only)
c. Statistical model is adequate for the study design	Mainly incidence rates, uni- and multivariate logistic regression, Cox proportional hazard model
d. No selective reporting of results	NA: development of type 2 diabetes mellitus and potentially regression to normoglycaemia from intermediate hyperglycaemia are the only outcomes; if missing the study will be excluded
Statistical analysis and reporting: risk of bias rating (high/low/unclear)	**High**: most items are answered with 'no'; **Low**: all items answered with 'yes'; **Unclear**: most items are answered with 'unclear' Note: potentially a single item may introduce a high risk of bias, depending on study specifics

[a]**No**: no or no relevant information to answer the signalling question

(Continued)

[b]**Unclear**: not enough information to answer signalling question with yes or no

[c]**NA** (not applicable): signalling question not appropriate for this type of prognostic review

FPG: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **IFG**: impaired fasting glucose; **IGT**: impaired glucose tolerance; **PG**: postload glucose (after an oral glucose tolerance test)

Appendix 4. Major cohort studies

Cohort study acronym	Full study name
ADDITION	Anglo-Danish-Dutch study of Intensive Treatment in People with Screen Detected Diabetes in Primary Care (Rasmussen 2008)
—	Ansung-Ansan Cohort Study (part of the Korean Genome and Epidemiology Study (KoGES)) - (Han 2017)
Asturias	Asturias Study (Valdes 2008)
ARIC	Atherosclerosis Risk in Communities study (Warren 2017)
ATTICA	Province of Attica, Greece Study (Filippatos 2016)
AusDiab	Australian Diabetes, Obesity and Lifestyle Study (Magliano 2008)
BLSA	Baltimore Longitudinal Study of Aging (Meigs 2003)
BLSA	Beijing Longitudinal Study on Aging (Liu 2016)
—	Beijing Project as part of the National Diabetes Survey (Wang 2007)
BMES	Blue Mountains Eye Study (Cugati 2007)
—	Botnia Study (Lyssenko 2005)
—	Bruneck Study (Bonora 2011)
CUPS-19	Chennai Urban Population Study-19 (Mohan 2008)
CURES	Chennai Urban Rural Epidemiology Study (Anjana 2015)
ChinaMUCA	China Multicenter Collaborative Study of Cardiovascular Epidemiology (Liu 2017)
CODAM	Cohort on Diabetes and Atherosclerosis Maastricht (Den Biggelaar 2016)
DESIR	Data from an Epidemiological Study on the Insulin Resistance Syndrome (Gautier 2010)
—	Ely Study (Forouhi 2007)
EPIC-Norfolk cohort	European Prospective Investigation of Cancer Norfolk cohort (Chamnan 2011)
—	Finnish Cohorts of the Seven Countries Study (Stengard 1992)
None	Framingham Heart Study (Levitzky 2008)

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GOS	Geelong Osteoporosis Study (De Abreu 2015)
Health ABC	Health, Aging, and Body Composition Study (Lipska 2013)
—	Hoorn Study (Rijkelijkhuizen 2007)
None	Hong Kong Cardiovascular Risk Factor Prevalence Study (Wat 2001)
IRAS	Insulin Resistance Atherosclerosis Study (Hanley 2005)
ICS	Isfahan Cohort Study (baseline survey of the Isfahan Healthy Heart Program) (Sadeghi 2015)
IDPS	Isfahan Diabetes Prevention Study (Janghorbani 2015)
Israel GOH Study	Israel Study of Glucose Intolerance, Obesity and Hypertension (Bergman 2016)
ILSA	Italian Longitudinal Study on Aging (Motta 2010)
—	Japanese American Community Diabetes Study (McNeely 2003)
JPHC Study	Japanese Public-Health Center-based prospective (Diabetes) Study (Noda 2010)
—	Kansai Healthcare Study (Sato 2009)
—	Kinmen Study (Li 2003)
KORA S4/F4	Kooperative Gesundheitsfroschung in der Region Augsburg (Rathmann 2009)
KoGES	Korean Genome Epidemiology Study-Kangwha Study (Song 2015)
—	Kurihashi Lifestyle Cohort Study (Nakagami 2016)
—	Mexico City Diabetes Study (Ferrannini 2009)
MESA	Multi-Ethnic Study of Atherosclerosis (Yeboah 2011)
—	Nauru Study (Dowse 1991)
—	Paris Prospective Study (Charles 1997)
—	Pima Indian Study (Gila River Indian Community) (Wheelock 2016)
—	Pizarra study (Soriguer 2008)
PIFRECV	Programa de Investigación de Factores de Riesgo de Enfermedad Cardiovascular (Leiva 2014)
—	Rotterdam study (Ligthart 2016)
SALSA	Sacramento Area Latino Study on Aging (Garcia 2016)
SAHS	San Antonio Heart Study (Lorenzo 2003)
—	San Luis Valley Diabetes Study (Marshall 1994)
—	Singapore Impaired Glucose Tolerance Follow-up Study (Wong 2003)

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SIMES	Singapore Malay Eye Study (Man 2017)
SDPP	Stockholm Diabetes Prevention Programme (Alvarsson 2009a)
SHS	Strong Heart Study (Wang 2011)
—	Study within the WHO-assisted National Diabetes Programme (Schranz 1989)
SUNSET/HELIUS	Surinamese in the Netherlands: study on health and ethnicity/Healthy life in an urban setting (Admiraal 2014)
TLGS	Tehran Lipid and Glucose Study (Derakhshan 2016)
TOPICS	Toranomon Hospital Health Management Center Study (Heianza 2012)
—	Yonchon study (Shin 1997)
—	Zanjan Healthy Heart Study (Sharifi 2013)

Appendix 5. Definition of normoglycaemia, intermediate hyperglycaemia and incident type 2 diabetes

Study ID	Normoglycaemia (mmol/L or %)	Intermediate hyperglycaemia (mmol/L or %)	Incident type 2 diabetes (mmol/L or %)	OGTT measurement (glucose load)	OGTT at baseline	OGTT at follow-up	Notes
Admiraal 2014	—	IFG: FPG 5.7–6.9	FPG ≥ 7.0; HbA1c ≥ 6.5; self-reported diabetes	—	—	—	—
Aekplakorn 2006	—	IFG: FPG ≥ 5.6 to < 7.0; IGT: 2-h PG ≥ 7.8 to < 11.1	FPG ≥ 7.0; 2-h PG ≥ 11; diagnosis and/or receipt of antihyperglycaemic medication	75 g	Yes	No	—
Ammari 1998	—	IGT: 2-h PG 7.8 to < 11.1 (WHO 1985)	2-h PG ≥ 11.1 (WHO 1985)	75 g	Yes	Yes	—
Anjana 2015	FPG < 5.6 and 2-h PG < 7.8	i-IGT: 2-h PG 7.8–11.0 and FPG > 5.6; i-IFG: FPG 5.6–6.9 and 2-h PG < 7.8; prediabetes: FPG 5.6–6.9 or 2-h PG 7.8–11.0 (i-IGT or i-IFG or IFG/IGT)	FPG ≥ 7.0; 2-h PG ≥ 11.1; diagnosed; antihyperglycaemic medication	75 g	Yes	Unclear	—
Bae 2011	—	HbA1c 5.7–6.4, HbA1c 6.0–6.4	FPG ≥ 7.0; HbA1c ≥ 6.5; history of diabetes; antihyperglycaemic medication	None	None	None	—
Baena-Diez 2011	FPG < 6.1	IFG: 6.1–6.9	FPG ≥ 7.0 (measured twice)	—	—	—	—
Bai 1999	—	IGT: 7.8 to < 11.1 (WHO 1985)	2-h PG ≥ 11.1 (WHO 1985)	75 g	Yes	Yes	—
Bergman 2016	FPG < 5.6 + and no antihyperglycaemic medication and 2-h BG < 7.8 (if available)	FPF 5.6–7.8 (7.7?); 2-h BG 7.8–11.0	FPG ≥ 7.8, 2-h BG ≥ 11.1; self-reported	100 g	Yes	Unclear	—
Bonora 2011	—	HbA1: 6.0–6.49; IFG: not defined, probably FPG 5.6–6.9	FPG ≥ 7.0; HbA1c ≥ 6.5; diabetes treatment	75 g	Yes	Unclear	—

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Cederberg 2010	—	IFG: 6.1–6.9, 2-h PG < 7.8; IGT: FPG > 7.0, 2-h PG 7.8 to < 11.1 (WHO 2009); elevated HbA1c: 5.7–6.4	2-h PG: ≥ 11.1, confirmed by 2 OGTTs	—	—	—	Diabetes incidence and IFG/IGT not exactly defined
Chamnan 2011	—	HbA1c 6.0–6.4	HbA1c ≥ 6.5; reported physician-diagnosed diabetes or diabetes medications; antihyperglycaemic medication; diagnosis through registers	—	—	—	—
Charles 1997	—	IGT: 2-h PG ≥ 7.8 to < 11.1 (WHO 1985)	2-h PG ≥ 11.1 (WHO 1985); physician diagnosed diabetes	75 g	Yes	Yes	2nd and 4th examination
Chen 2003	FPG < 6.1	IFG: FPG 6.1–7.0	FPG ≥ 7.0	—	—	—	—
Chen 2017	FPG < 5.6 and 2-h PG < 7.8	IFG: FPG 5.6–6.9 + 2-h PG ≤ 7.8; IGT: FPG < 5.6 + 2-h PG 7.8–11.0; IFG/IGT: FPG 5.6–6.9 + 2-h PG 7.8–11.0	FPG ≥ 7.0; 2-h PG ≥ 11.1; previously diagnosed diabetes	75 g	Yes	Unclear	—
Coronado-Malagon 2009	ADA 2007	ADA 2007 (IFG/IGT: 5.6–6.9/7.8 to < 11.1)	ADA 2007 (≥ 7.0/≥ 11.1)	—	—	—	—
Cugati 2007	—	IFG: FPG 5.6–6.9 (originally FPG ≥ 6.1 to < 7.0)	FPG ≥ 7.0; self-reported diabetes history; antihyperglycaemic medication	—	—	—	—
De Abreu 2015	—	IFG: 5.5–6.9	FPG ≥ 7.0; self-reported; antihyperglycaemic medication	—	—	—	—
Den Biggelaar 2016	FPG < 6.1 and 2-h PG < 7.8	FPG 6.1–6.9; 2-h PG 7.8–11.1	FPG ≥ 7.0; 2-h PG ≥ 11.1	75 g	Yes	Unclear	—
Derakhshan 2016	FPG ≤ 5.55 and 2-h PG ≤ 7.77	5.55 ≤FPG < 7.0; 7.77 ≤ 2-h PG ≤ 11.1; no antihyperglycaemic medication	FPG ≥ 7.0; 2-h PG ≥ 11.1; antihyperglycaemic medication	82.5 g	Yes	Unclear	Glucose monohydrate solution, equivalent to 75 g anhydrous glucose

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Dowse 1991	FPG and 2-h PG < 7.8	IGT: FPG < 7.8 and 2-h PG ≥ 7.8 to < 11.1	2-h PG ≥ 11.1 (WHO 1985); FPG ≥ 7.8	75 g	Yes	Yes	—
Ferrannini 2009	—	IFG: FPG 6.1–6.9; IGT: FPG < 7.0 and 2-h PG 7.8–11.1; i-$IFG_{6.1}$/i-$IFG_{5.6}$: 2-h PG < 7.8 and FPG 6.1–6.9/5.6–6.1; i-IGT/i-$IGT_{6.1}$/i-$IGT_{5.6}$	FPG ≥ 7.0; 2-h PG ≥ 11.1	75 g	Yes	Yes	—
Filippatos 2016	—	$IFG_{5.6}$: FBG 5.6–6.9	FBG > 6.9; antihyperglycaemic medication	None	None	None	—
Forouhi 2007	FPG < 5.6	$IFG_{6.1}$: FPG 6.1–6.9 (FPG < 7.0 and 2-h PG < 11.1) (all) $IFG_{5.6}$: FPG 5.6–6.9	FPG ≥ 7.0; 2-h PG ≥ 11.1; doctor diagnosis or treatment for diabetes	75 g	Yes	Yes	—
Garcia 2016	—	Prediabetes: FBG 5.6–6.9	FPG ≥ 7.0; self-reported; antihyperglycaemic medication; diabetes comedication of death	—	—	—	—
Gautier 2010	—	IFG: FPG 5.6–6.9	FPG ≥ 7.0; treatment for diabetes (at one of the 3-yearly examinations)	—	—	—	—
Gomez-Arbelaez 2015	—	IFG: ≥ 5.6 to < 7.0; IGT: ≥ 7.8 to < 11.1; HbA1c ≥ 5.7 to ≤ 6.4	FPG ≥ 7.0; OGTT ≥ 11.1; HbA1c ≥ 6.5	OGTT	Yes	Yes	OGTTs from hospital's database
Guerrero-Romero 2006	FPG < 6.1 and 2-h PG < 7.8	IGT: 2-h PG ≥ 7.8 to < 11.1	2-h PG: ≥ 11.1	OGTT	Yes	Yes	OGTT: as baseline and each year during the 5-year follow-up
Han 2017	FPG < 5.6 and 2-h PG < 7.8	IFG: FPG 5.6–6.9 and no diagnosis of diabetes IGT: 2-h PG 7.8 to < 11.1 i-$IFG_{5.6}$: IFG without IGT i-IGT: IGT without IFG	FPG ≥ 7.0; 2-h PG ≥ 11.1; HbA1c ≥ 6.5; current antihyperglycaemic treatment	75 g	Yes	Yes	OGTT was performed every 2 years

(Continued)

		IGT, IGT: IFG + IGT 'Prediabetes': IFG or IGT					
Hanley 2005	—	IFG,IGT (WHO 1999)	Unclear	75 g	Yes	No	—
Heianza 2012	Absence of IFG or elevated HbA1c	IFG: FPG 5.6–6.9 or FPG 6.1–6.9; HbA1c 5.7–6.4 or 6.0–6.4; IFG/HbA1c = 'prediabetes'	FPG ≥ 7.0; HbA1c ≥ 6.5%; self-reported clinician-diagnosed diabetes	—	—	—	—
Inoue 1996	—	IGT: ≥ 7.8 to < 11.1 (presumed WHO 1985)	IGT: ≥ 11.1(presumed WHO 1985)	75 g	Yes	Yes	OGGT was performed every year
Janghorbani 2015	FPG < 5.6 and 2-h PG < 7.8	i-IGT: FPG < 5.6 and 2-h PG 7.8–11.1; i-IFG: 5.6–6.9 and 2-h PG < 7.8; IFG/IGT: 5.6–6.9 and 2-h PG 7.8–11.1	FPG ≥ 11.1; antihyperglycaemic medication; 2nd FPG ≥ 7.0; 2-h PG ≥ 11.1	75 g	Yes	Yes	—
Jaruratanasirikul 2016	FPG < 5.6	i-IGT: FPG < 5.6 and 2-h PG 7.8 to < 11.1	FPG > 7.0; 2-h PG ≥ 11.1	1.75 g/kg (maximum 75 g) glucose solution	Yes	No	—
Jeong 2010	—	IFG: FPG ≥ 5.6 to < 7.0; IGT: 2-h PG ≥ 7.8 to < 11.1: 'prediabetes': IFG or IGT	FPG ≥ 7.0; 2-h PG ≥ 11.1	75 g	Yes	Yes	—
Jiamjarasrangsi 2008a	—	IFG: FPG ≥ 5.6 to < 7.0	FPG ≥ 7.0	—	—	—	—
Kim 2005	FPG < 5.0	$IFG_{6.1}$: FPG 6.1 to < 7.0 (group 4, = 276) $IFG_{5.6}$: FPG 5.6 to < 6.1	FPG ≥ 7.0; antihyperglycaemic treatment	—	—	—	—
Kim 2008	—	$IFG_{5.6}$: FPG 5.6–7.0; $IFG_{6.1}$: FPG 6.1–7.0	FPG ≥ 7.0	—	—	—	—
Kim 2014	—	i-IFG: FPG 5.6–6.9 and 2-h PG < 7.8; i-IGT: 2-h PG 7.8–11.1 and FPG < 5.6; IFG/IGT: combined glucose intolerance; HbA1c: 5.7–6.4	FPG ≥ 7.0; 2-h PG ≥ 11.1; HbA1c ≥ 6.5	75 g	Yes	Unclear	—

(Continued)

Kim 2016a	—	FPG 5.6–6.9; HbA1c 5.7–6.4	FPG ≥ 7.0; HbA1c ≥ 6.5; antihyperglycaemic medications	—	—	—	—
Kleber 2010	—	IGT: 2-h PG > 7.7: IFG: FPG ≥ 5.5 (WHO definition)	ADA 2000	1.75 g/kg body weight (maximum 75 g) flavoured glucose		Yes	—
Kleber 2011	—	IGT: not reported (presumed 7.8–11.1)	"ADA" (2000 criteria, 2-h PG ≥ 11.1)	1.75 g/kg body weight (max. 75 g)	Yes	Yes	
Ko 1999	WHO/NDDG 1979	WHO/NDDG 1979	WHO/NDDG 1979	—	Yes	Yes	—
Ko 2001	FPG < 6.1	IFG: FPG 6.1–6.9	FPG ≥ 7.0	75 g	Yes	Yes	Annual OGTTs
Larsson 2000	FPG < 5.3 and 2-h BG < 7.8	i-IFG: BG 5.3–5.9 and 2-h BG < 7.8; i-IGT: FPG < 5.3 and 2-h BG 7.8–11.0; IFG/IGT: BG 5.3–5.9 and 2-h BG 7.8–11.0	FPG ≥ 7.0; 2-h PG ≥ 11.1	75 g	Yes	Yes	NGT at baseline vs follow-up: FPG < 5.3 vs < 6.1; FPG 5.3: 15% conversion factor as recommended by the WHO (blood glucose > plasma glucose)
Latifi 2016	—	5.6 ≤ FPG < 7.0	FPG ≥ 7.0; antihyperglycaemic medication	—	—	—	—
Lecomte 2007	FPG < 6.1; no personal history of diabetes; no hypoglycaemic treatment	$IFG_{6.1}$: FPG 6.1–6.9; no personal history of diabetes; no hypoglycaemic treatment	FPG ≥ 7.0; personal history of diabetes; hypoglycaemic treatment	—	—	—	—
Lee 2016	—	HbA1c 5.7–6.4	HbA1c ≥ 6.5	—	—	—	—
Leiva 2014	—	IFG: 5.6–7.0 (low range: 5.6–6.1; high range: 6.1–6.9)	FPG ≥ 7.0 (2 cons. days), HbA1c ≥ 6.5	—	—	—	—

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Levitzky 2008	—	$IFG_{5.6}$: FPG 5.6–6.9; $IFG_{6.1}$: FPG 6.1–6.9	FPG ≥ 7.0; antihyperglycaemic medication	—	—	—	—
Li 2003	FPG < 6.1 and 2-h PG < 7.8	i-iFG:FPG 6.1–7.0 and 2-h PG < 7.8; i-IGT: FPG < 6.1 and 2-h PG 7.8–11.1; IFG/IGT: FPG 6.1–7.0 and 2-h PG 7.8–11.1	FPG ≥ 7.0; 2-h PG ≥ 11.0; antihyperglycaemic medications	75 g	Yes	Yes	—
Ligthart 2016	FBG ≤ 6.0	FBG > 6.0 and < 7.0; non-fasting BG > 7.7 and < 11.1	FBG ≥ 7.0; non-fasting BG ≥ 11.1; antihyperglycaemic medication	—	—	—	—
Lipska 2013	FPG < 5.6 and HbA1c < 5.7	i-IFG: FPG 5.6–6.9 and HbA1c < 5.7; i-HbA1c: 5.7–6.4 and FPG > 5.6; IFG and HbA1c: FPG 5.6–6.9 and HbA1c 5.7–6.4	Single HbA1c ≥ 6.5 (years 2,6,7); self-report of physician diagnosis (annually); antihyperglycaemic agent (years 1,2,4,6,7)	—	—	—	—
Liu 2008	—	IFG 5.6–6.9	FPG ≥ 7.0; 2-h PG ≥ 11.0; antihyperglycaemic medication	—	—	—	—
Liu 2014	WHO	IFG; IGT (WHO)	WHO	75 g	Yes	Unclear	—
Liu 2016	—	FPG 6.1–6.9	FPG ≥ 7.0; self-reported; antihyperglycaemic medication	—	—	—	—
Liu 2017	FPG 3.9–5.5	FG 5.6–6.9	FG ≥ 7.0; using insulin/hypoglycaemic agents; self-reported	—	—	—	—
Lorenzo 2003	—	IFG: FPG 6.1–6.9; IGT: 2-h PG 7.8 to < 11.1(WHO 1999)	FPG: ≥ 7.0; 2-h PHG: ≥ 11.1 (WHO 1999/1985)	75 g	Yes	Yes	—
Lyssenko 2005	FPG < 6.1	IFG: FPG ≥ 6.1; WHO 1999 criteria	WHO 1999 criteria	75 g	Yes	Yes	—
Magliano 2008	FPG < 6.1 and 2-h PG < 7.8	IFG: FPG 6.1–6.9 and 2-h PG < 7.8; IGT: FPG < 7.0 and 2-h PG ≤ 7.8 to < 11.1	FPG ≥ 7.0; 2-h PG ≥ 11.1; current antihyperglycaemic medication	75 g	Yes	Yes	—
Man 2017	Not 'prediabetes', not diabetes	HbA1c 5.7–6.4; no self-reported diabetes or antihyperglycaemic medication	Random glucose ≥ 11.1 or HbA1c > 6.4; self-reported his-	—	—	—	—

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			tory or antihyperglycaemic medication				
Marshall 1994	—	IGT: 2-h PG ≥ 7.8 to < 11.1 (WHO 1985)	2-h PG ≥ 11.1 (WHO 1985)	75 g	Yes	Yes	—
McNeely 2003	—	IFG: FPG ≥ 6.1 to < 7.0; IGT: 2-h PG ≥ 7.8 to < 11.1	FPG ≥ 7.0; 2-h PG ≥ 11.1; antihyperglycaemic medication prescribed by a physician	75 g	Yes	Yes	—
Meigs 2003	FPG < 6.1 and 2-h PG ≤ 7.8	IFG: FPG 6.1–6.9 and 2-h PG ≤ 7.8; IGT: FPG < 6.1 and 2-h PG 7.8–11.0; IFG/IGT	FPG ≥ 7.0; 2-h PG ≥ 11.1 (IFG-IGT person: diabetes defined by OGTT)	Before 07/1977: 1.75 g glucose/kg BW, average 143 g; from 07/1977: 40 g/kg body surface area, average 78 g (men) and 68 g (women)	Yes	Yes	Serial OGTTs over subsequent biennial examinations
Mohan 2008	—	IFG: FPG ≥ 6.1 to < 7; IGT: 2-h PG ≥ 7.8 to < 11.1	FPG ≥ 7; 2-h PG ≥ 11.1	75 g	Yes	Yes	—
Motala 2003	Both FPG and 2-h PG < 7.8 (WHO 1985)	IGT: FPG < 7.8 and 2-h PG 7.8 to < 11.1 (WHO 1985)	FPG ≥ 7.8; 2-h PG ≥ 11.1 (WHO 1985)	75 g glucose monohydrate dissolved in 250 mL of water (modified OGTT)	Yes	Yes	—
Motta 2010	FPG < 6.1	IFG: 6.1 to < 7.0	FPG ≥ 7.0	—	Yes		—
Mykkänen 1993	FPG and 2-h PG < 7.8	IGT: FPG < 7.8 and 2-h PG 7.8–11.1 (WHO 1985)	FPG ≥ 7.8; 2-h PG ≥ 11.1 (WHO 1985)	75 g	Yes	Yes	—
Nakagami 2016	—	HbA1c 5.7–6.4, FPG 5.5–6.9	FPG ≥ 7.0, HbA1c ≥ 6.5; physician diagnosis of diabetes	—	—	—	—
Nakanishi 2004	FPG < 6.1	IFG: FPG 6.1–6.9	FPG ≥ 7.0; antihyperglycaemic medication	—	—	—	—

(Continued)

Noda 2010	—	Taken from table 2: FPG levels: IFG 5.6 and 6.1	FPG ≥ 7.0; HbA1c ≥ 6.1%; self-reported	—	—	—	—
Park 2006	—	IFG: FPG ≥ 5.6	FPG ≥ 7.0	—	—	—	—
Peterson 2017	FPG < 6.1 and 2-h PG < 7.8	IGT: FPG < 7.0 and 2-h PG ≥ 7.8 to < 11.1	FPG ≥ 7.0; 2-h PG ≥ 11.1	—	Yes	Yes	2 standardised OGTT at baseline with about 1 week's interval to verify glucose status
Qian 2012	FPG < 6.1 and 2-h PG < 7.8	i-IFG: 6.1–6.9 and 2-h PG < 7.8; i-IGT: < 6.1 and 2-h PG 7.8–11.0; IFG/IGT: 6.1–6.9 and 2-h PG 7.8–11.0	FPG ≥ 7.0; 2-h PG ≥ 11.1	75 g	Yes	Unclear	—
Rajala 2000	2-h PG < 7.8	IGT: 2-h PG 7.8 to < 11.1	2-h PG ≥ 11.1; 2x FPG ≥ 6.7	75 g	Yes	Yes	New cases identified by OGTTs in 1994 and 1996–8
Ramachandran 1986	—	IGT: 7.8–11.0 (presumed NDDG 1979)	2-h PG > 11.0 (presumed NDDG 1979)	75 g	Yes	Yes	—
Rasmussen 2008	—	IFG (i-IFG): FBG 5.6 to < 6.1 and 2-h BG < 7.8; IGT (i-IGT): FBG < 6.1 and 2-h BG 7.8 to < 11.1; IFG/IGT	FBG ≥ 6.1 or 2-h BG ≥ 11.1	75 g	Yes	Unclear	—
Rathmann 2009	WHO 1999	IFG: FPG 6.1–6.9; IGT: 2-h PG 7.8 to < 11.1; 'prediabetes': i-IFG, i-IGT and IFG/IGT	FPG ≥ 7.0; 2-h PG ≥ 11.1; validated physician diagnosis	75 g	Yes	Yes	—
Rijkelijkhuizen 2007	ADA 1997/2003	$IFG_{5.6}$: FPG 5.6–7.0; $IFG_{6.1}$: FPG 6.1–7.0; IGT: 2-h PG 7.8 to < 11.1	FPG ≥ 7.0; 2-h PG: ≥ 11.1	75 g	Yes	Yes	—
Sadeghi 2015	—	IFG: FPG ≥ 5.5 and < 7.0; IGT: 2-h OGTT ≥ 7.8 and < 11.1	FPG > 7.0; 2-h OGTT > 11.1; IFG/IGT; antihyperglycaemic medication	—	Yes	Yes	—

(Continued)

Sasaki 1982	FPG < 7.8 and 2-h PG < 7.8 (WHO 1980)	IGT: FPG < 7.8 and 2-h PG 7.8–11.1 (WHO 1980)	FPG ≥ 7.8 or 2-h PG ≥ 11.1 (WHO 1980)	50 g	Yes	Yes	—
Sato 2009	—	(Table 1): IFG: FPG group 6.1–6.9; HbA1c-group: 6.0–6.4	FPG ≥ 7.0; antihyperglycaemic medication	—	—	—	—
Schranz 1989	—	IGT: 2-h PG ≥ 7.8 to < 11.1 (WHO 1985)	2-h PG ≥ 11.1 (WHO 1985)	OGTT	Yes	Yes	—
Sharifi 2013	—	FPG 5.6–7.0	FPG > 7.0 (2 measurements); diabetes diagnosis based on documents	OGTT	Yes (twice)	—	—
Shin 1997	—	Assumed WHO 1985 criteria	"WHO criteria"; antihyperglycaemic medication	75 g	Yes	Yes	—
Söderberg 2004	—	IFG: FPG ≥ 6.1 to < 7.0 and 2-h PG < 7.8; IGT: FPG < 7.0 and 2-h PG ≥ 7.8 to < 11.1	FPG ≥ 7.0; 2-h PG ≥ 11.1	75 g	Yes	Yes	—
Song 2015	—	IFG: FPG 5.6–6.9	FPG ≥ 7.0; HbA1c ≥ 6.5; antihyperglycaemic medication	—	—	—	—
Song 2016a	—	IFG: FG 5.6–6.9; IGT: 2-h G 7.8–11.0	FG ≥ 7.0; 2-h G ≥ 11.0; HbA1c ≥ 6.5; self-reported	75 g	Yes	Yes	100 g steamed bread at follow-up
Soriguer 2008	BG < 5.6 and 2-h BG < 7.8	IFG: BG 5.6–6.1 and 2-h BG < 7.8; IGT: BG < 5.6 and 2-h BG 7.8–11.1	BG > 6.1 or 2-h BG > 11.1	75 g	Yes	Yes	—
Stengard 1992	—	IGT: 2-h PG 7.8–11.1	2-h PG ≥ 11.1 (WHO 1985); antihyperglycaemic medications	75 g	Yes	Yes	—
Toshihiro 2008	FPG < 6.1 and 2-h PG < 7.8	IFG: FPG 6.1–6.9 and 2-h PG < 7.8; IGT: FPG < 7.0 and 2-h PG 7.8–11.1	FPG ≥ 7.0; 2-h PG > 11.1; non-fasting PG > 11.1	75 g	Yes	Yes	Annual OGTT during the observation period (3.2 years)
Vaccaro 1999	FPG < 5.6; 2-h PG < 6.7; 2-h PG < 6.7	IFG: FPG 5.6–6.0; IGT: 2-h PG 6.7–9.9	FPG> 6.1; antihyperglycaemic medications; 2-h PG ≥ 10.0	75 g	Yes	No	Retrospective classification; note thresh-

(Continued)

							olds (whole blood)
Valdes 2008	FPG < 5.6	$IFG_{5.6}$: 5.6–6.1; $IFG_{6.1}$: 6.1–6.9	FPG ≥ 7.0; 2-h PG ≥ 11.1; clinical diabetes diagnosis; antihyperglycaemic medication, diet	75 g	Yes	Yes	—
Vijayakumar 2017	—	FG 5.6–6.9; 2-h PG 7.8–11.9; HbA1c 5.7–6.4	FPG ≥ 7.0; 2-h PG ≥ 11.1; previous clinical diagnosis	75 g	Yes	Yes	HbA1c new method = −0.1916 + (0.9829 × HbA1c old method)
Viswanathan 2007	FPG and 2-h PG < 6.1 and < 7.8	IGT: 2-h PG 7.8 to < 11.1	Not defined, presumably by OGTT	75 g	Yes	Yes	All participants underwent a second OGTT to confirm the diagnosis in order to be included in the study; follow-up: a reminder letter was sent every 6 months to participants to undergo an OGTT
Wang 2007	—	IFG: FPG 6.1–6.9; IGT: 2-h PG 7.8–11.0	FPG ≥ 7.0; 2-h PG ≥ 11.1	75 g	Yes	Unclear	—
Wang 2011	FPG < 5.6; HbA1c < 6.0; no FPG/HbA1c	IFG: 5.6 to < 7.0; HbA1c 6.0 to < 6.5	Diabetes status: FPG ≥ 7.0; antihyperglycaemic medication; HbA1c ≥ 6.5, antihyperglycaemic medication; FPG/HbA1c: ≥ 6.5 or FPG ≥ 7.0 or antihyperglycaemic medication	—	—	—	—

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Warren 2017	—	FPG 5.6–6.9 (ADA); FG 6.1–6.9 (WHO); 2-h 7.8–11.0 (ADA); HbA1c 5.7–6.4 (ADA); 6.0–6.4 (IEC)	Self-report of physician diagnosis; antihyperglycaemic medication reported during a study visit or annual telephone call	75 g	Yes (visit 4)	Unclear	—
Wat 2001	FPG and 2-h PG < 7.8	IGT: FPG < 7.8 and 2-h PG 7.8 to < 11.1	FPG ≥ 7.8; 2-h PG ≥ 11.1	75 g	Yes	Yes	—
Weiss 2005	FPG < 5.6 and 2-h PG < 7.8	IGT: FPG < 5.6 and 2-h PG 7.8–11.1	FPG ≥ 7.0; 2-h PG > 11.1; presentation of hyperglycaemia (more than 2 random glucose measurements > 11.1), glucosuria, polydipsia, and polyuria	1.75 g/kg body weight flavoured glucose orally (up to a maximum of 75 g)	Yes	Yes	OGTT was repeated every 18–24 months
Wheelock 2016	—	IGT: 2-h PG ≥ 7.8 to < 11.1	FPG ≥ 7.0; 2-h PG ≥ 11.1; previous diagnosis	75 g	Yes	Unclear	Modified OGTT
Wong 2003	—	IGT: 2-h PG ≥ 7.8 to < 11.1	FPG ≥ 7.0; 2-h PG ≥ 11.1; physician diagnosed diabetes	75 g	Yes	Yes	—
Yeboah 2011	FPG < 5.6	IFG: FPG 5.6–6.9	FPG > 6.9; antihyperglycaemic medication during examinations 2,3, 4	—	—	—	—
Zethelius 2004	—	IGT: 2-h PG 7.8 to < 11.1	FPG ≥ 7.0; antihyperglycaemic medications	75 g	Yes	No	—

BG: blood glucose; **BW**: body weight; **FPG**: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **i-IFG**: (isolated) impaired fasting glucose; **i-IGT**: (isolated) impaired glucose tolerance; **IFG/IGT**: both impaired fasting glucose and impaired glucose tolerance; **NDDG**: National Diabetes Data Group; **NGT**: normal glucose tolerance; **OGTT**: oral glucose tolerance test; **PG**: postload glucose; **WHO**: World Health Organization

Appendix 6. Number of participants with and without intermediate hyperglycaemia at baseline

Study ID	N participants with/without IH	Definitions of IH at baseline					
		'Prediabetes'[a] (%)	Elevated HbA1c (%)	IFG (%)	IGT (%)	IFG/HbA1c (%)	IFG/IGT (%)
Admiraal 2014	$IFG_{5.6}$ total: 111/456	—	—	$IFG_{5.6}$: Total 24.3 South-Asian Surinamese 34.4 African Surinamese 21.1 "Ethnic Dutch" 22.7	—	—	—
Aekplakorn 2006	$IFG_{5.6}$: 223/2667	—	—	$IFG_{5.6}$: 8.4	—	—	—
Ammari 1998	IGT: 68	—	—	—	100	—	—
Anjana 2015	'Prediabetes' (i-IFG, i-IGT or both): 299/1376	21.7	—	i-$IFG_{5.6}$: 4.9	i-IGT: 11.8	—	5.0
Bae 2011	$HbA1c_{5.7}$: 1791/9723; $HbA1c_{6.0}$: 412/1791	—	$HbA1c_{5.7}$: 18.4 $HbA1c_{6.0}$: 4.2	—	—	—	—
Baena-Diez 2011	$IFG_{6.1}$: 115	—	—	$IFG_{6.1}$: 100	—	—	—
Bai 1999	IGT: 252/696	—	—	—	36.2	—	—
Bergman 2016	IGT: 68/853	—	—	—	8	—	—
Bonora 2011	$HbA1c_{6.0}$: 70/842	—	8.3	—	—	—	—
Cederberg 2010	$IFG_{6.1}$: 40/553 IGT: 103/553 IFG/IGT: 15/553	—	—	$IFG_{6.1}$: 7.2	18.7	—	2.7
Chamnan 2011	$HbA1c_{6.0}$: 370/5735	—	$HbA1c_{6.0}$: 6.5	—	—	—	—
Charles 1997	IGT: 418/4089; i-$IFG_{6.1}$: 476/5042	—	—	i-$IFG_{6.1}$: 9.4	10.2	—	—

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Chen 2003	$IFG_{6.1}$: 156/600	—	—	$IFG_{6.1}$: 26	—	—	—
Chen 2017	i-$IFG_{5.6}$: 329/1347 i-IGT: 192/1347 IFG/IGT: 209/1347	—	—	i-$IFG_{5.6}$: 24.4	i-IGT: 14.2	15.5	—
Corona-do-Malagon 2009	'Prediabetes': 217/656	33.1	—	—	—	—	—
Cugati 2007	$IFG_{5.6}$: 244/2123	—	—	$IFG_{5.6}$: 11.5	—	—	—
De Abreu 2015	$IFG_{5.6}$: 187/1167	—	—	$IFG_{5.6}$: 16	—	—	—
Den Biggelaar 2016	$IFG_{6.1}$ and/or IGT: 122/476	25.6	—	—	—	—	—
Derakhshan 2016	$IFG_{5.6}$ and/or IGT: 523/8231	$IFG_{5.6}$ and/or IGT: 6.4	—	—	—	—	—
Dowse 1991	IGT: 105/1201	—	—	—	8.7	—	—
Ferrannini 2009	i-$IFG_{5.6}$: 65/1941 i-$IFG_{6.1}$: 17/1941 IGT: 179/1941 i-IGT($IFG_{5.6}$): 57/1941 i-IGT($IFG_{6.1}$): 29/1941	—	—	i-$IFG_{5.6}$: 3.3 i-$IFG_{6.1}$: 0.9	IGT: 9.2 i-$IGT_{5.6}$: 2.9 i-$IGT_{6.1}$: 1.5	—	—
Filippatos 2016	$IFG_{5.6}$: 279/1485	—	—	$IFG_{5.6}$: 18.8	—	—	—
Forouhi 2007	$IFG_{6.1}$: 257/1040 $IFG_{5.6}$: 633/1040	—	—	$IFG_{5.6}$: 60.9 $IFG_{6.1}$: 24.7	—	—	—
Garcia 2016	$IFG_{5.6}$: 310/1777	—	—	IFG5.5: 17.5	—	—	—
Gautier 2010	$IFG_{5.6}$: 979	—	—	$IFG_{5.6}$: 100	—	—	—
Gomez-Arbelaez 2015	'Prediabetes': 186/772 (Men: 61/772, women: 125/772)	24.1	—	—	—	—	—

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Guerrero-Romero 2006	IGT: 75/375	—	—	—	20	—	—
Han 2017	i-IFG$_{5.6}$: 199/7542 i-IGT: 1512/7542 IFG/IGT: 198/7542	—	—	i-IFG$_{5.6}$: 2.6	i-IGT: 20.0	—	2.6
Hanley 2005	IGT: 274/882	—	—	—	31.6	—	—
Heianza 2012	IFG$_{5.6}$: 1680/6241 IFG$_{6.1}$: 380/6241 HbA1c$_{5.7}$: 822/6241 HbA1c$_{6.0}$: 203/6241 IFG$_{5.6}$/HbA1c$_{5.7}$: 2092/6241	—	HbA1c$_{5.7}$: 13.2 HbA1c$_{6.0}$: 3.3	IFG$_{5.6}$: 26.9 IFG$_{6.1}$: 6.1	—	33.5	—
Inoue 1996	IGT: 37	—	—	—	100	—	—
Janghorbani 2015	i-IFG$_{5.6}$: 304/1530 i-IGT: 198/1530 IFG/IGT: 268/1530	—	—	i-IFG$_{5.6}$: 19.9	i-IGT: 12.9	—	17.5
Jaruratanasirikul 2016	i-IGT: 27/177	—	—	—	i-IGT: 15.3	—	—
Jeong 2010	IFG$_{5.6}$: 16% IGT: 5.3%	—	—	IFG$_{5.6}$: 16	5.3	—	—
Jiamjarasrangsi 2008a	IFG$_{5.6}$: 320/2370	—	—	IFG$_{5.6}$: 13.5	—	—	—
Kim 2005	IFG$_{6.1}$: 276/2964	—	—	IFG$_{6.1}$: 9.3	—	—	—
Kim 2008	IFG total: 1829/7211 IFG$_{5.6}$: 1335/7211 IFG$_{6.1}$: 494/7211	—	—	IFG total: 25.4 IFG$_{5.6}$: 18.5 IFG$_{6.1}$: 6.9	—	—	—
Kim 2014	i-IFG$_{5.6}$: 158/406 i-IGT: 65/406 IFG/IGT: 119/406 i-HbA1c$_{5.7}$: 64/406	—	i-HbA1c$_{5.7}$: 15.8	i-IFG$_{5.6}$: 38.9	i-IGT: 16	—	29.3

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Kim 2016a	$IFG_{5.6}$: 3544/17971 $HbA1c_{5.7}$: 1713/17971 $IFG_{5.6}$/$HbA1c_{5.7}$: 1951/17971	—	$HbA1c_{5.7}$: 9.5	$IFG_{5.6}$: 19.7	—	10.9	—
Kleber 2010	IGT: 79	—	—	—	100	—	—
Kleber 2011	IGT: 119	—	—	—	100	—	—
Ko 1999	IGT: 123	—	—	—	100	—	—
Ko 2001	$IFG_{6.1}$: 55/319	—	—	$IFG_{6.1}$: 17.2	—	—	—
Larsson 2000	i-$IFG_{6.1}$: 42/265 i-IGT: 66/265 IFG/IGT: 30/265	—	—	i-$IFG_{6.1}$: 15.8	i-IGT: 24.9	—	11.3
Latifi 2016	$IFG_{5.6}$: 124/593	—	—	$IFG_{5.6}$: 20.9	—	—	—
Lecomte 2007	$IFG_{6.1}$: 743	—	—	$IFG_{6.1}$: 100	—	—	—
Lee 2016	$HbA1c_{5.7}$: 3497	—	$HbA1c_{5.7}$: 100	—	—	—	—
Leiva 2014	$IFG_{6.1}$: 28/94	—	—	$IFG_{6.1}$: 29.8	—	—	—
Levitzky 2008	Not reported	—	—	—	—	—	—
Li 2003	i-$IFG_{6.1}$: 42/644 i-IGT: 118/644 IFG/IGT: 49/644	—	—	i-$IFG_{6.1}$: 6.5	i-IGT: 18.3	—	7.6
Ligthart 2016	$IFG_{6.1}$: 1382/10,050	—	—	$IFG_{6.1}$: 13.8	—	—	—
Lipska 2013	$IFG_{5.6}$: 189/1690 i-$HbA1c_{5.7}$: 207/1690 IFG/HbA1c: 169/1690	—	i-HbA1c: 12.2	$IFG_{5.6}$: 11.2	—	10.0	—
Liu 2008	$IFG_{5.6}$: 169/1844	—	—	$IFG_{5.6}$: 9.2	—	—	—
Liu 2014	'Prediabetes' (IFG or IGT): 450/2271	19.8	—	—	—	—	—

(Continued)

Liu 2016	$IFG_{6.1}$: 222/1857	—	—	$IFG_{6.1}$: 12.0	—	—	—
Liu 2017	$IFG_{5.6}$: 3607/18610	—	—	$IFG_{5.6}$: 19.4	—	—	—
Lorenzo 2003	$IFG_{6.1}$: 29/1734 IGT: 202/1734	—	—	$IFG_{6.1}$: 1.7	11.6	—	—
Lyssenko 2005	i-$IFG_{6.1}$: 263/2115 i-IGT: 250/2115 IFG/IGT: 173/2115	—	—	i-$IFG_{6.1}$: 12.4	i-IGT: 11.8	—	8.2
Magliano 2008	Not reported	—	—	—	—	—	—
Man 2017	$HbA1c_{5.7}$: 675/1137	—	$HbA1c_{5.7}$: 59.4	—	—	—	—
Marshall 1994	IGT: 123	—	—	—	100	—	—
McNeely 2003	5–6 years: $IFG_{6.1}$: 30/465 IGT: 178/465 10 years: $IFG_{6.1}$: 28/412 IGT: 157/412	—	—	5–6 years: $IFG_{6.1}$: 6.5 10 years: $IFG_{6.1}$: 6.8	5–6 years: 38.3 10 years: 38.1	—	—
Meigs 2003	i-$IFG_{5.6}$: 126/753 i-IGT($IFG_{5.6}$): 115/753 $IFG_{5.6}$/IGT: 103/753 i-$IFG_{6.1}$: 20/753 i-IGT($IFG_{6.1}$): 218/753 $IFG_{6.1}$/IGT: 27/753	—	—	i-$IFG_{5.6}$: 16.7 i-$IFG_{6.1}$: 2.7	i-$IGT_{5.6}$: 15.3 i-$IGT_{6.1}$: 29	—	$IFG_{5.6}$/IGT: 13.7 $IFG_{6.1}$/IGT: 3.6
Mohan 2008	IGT: 37/513	—	—	—	7.2	—	—
Motala 2003	IGT: 35/563	—	—	—	6.2	—	—
Motta 2010	$IFG_{6.1}$: 295/2603	—	—	$IFG_{6.1}$: 11.3	—	—	—
Mykkänen 1993	IGT: 203/892	—	—	—	22.8	—	—
Nakagami 2016	$IFG_{5.6}$: 467/2267	—	$HbA1c_{5.7}$: 25.7	$IFG_{5.6}$: 20.6	—	—	—

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	$IFG_{6.1}$: 134/2267 $HbA1c_{5.7}$: 583/2267 $HbA1c_{6.0}$: 156/2267		$HbA1c_{6.0}$: 6.9	$IFG_{6.1}$: 5.9			
Nakanishi 2004	$IFG_{6.1}$: 246/5588	—	—	$IFG_{6.1}$: 4.4	—	—	—
Noda 2010	$IGF_{5.6}$: 558/2207 $IFG_{6.1}$: 153/2207	—	—	$IFG_{5.6}$: 25.3 $IFG_{6.1}$: 6.9	—	—	—
Park 2006	$IFG_{5.6}$: 321/5296	—	—	IFG5.6: 6.1	—	—	—
Peterson 2017	IGT: 29/74	—	—	—	39.2	—	—
Qian 2012	i-$IFG_{6.1}$: 46/1042 i-IGT: 120/1042 IFG/IGT: 33/1042	—	—	i-$IFG_{6.1}$: 4.4	i-IGT:11.5	—	3.2
Rajala 2000	IGT: 100	—	—	—	100	—	—
Ramachandran 1986	IGT: 107	—	—	—	100	—	—
Rasmussen 2008	i-$IFG_{5.6}$: 607/1510 i-IGT 903/1510	—	—	i-$IFG_{5.6}$: 40.2	i-IGT: 59.8	—	—
Rathmann 2009	i-$IFG_{6.1}$: 71/887 i-IGT: 120/887 IFG/IGT: 47/887	—	—	i-$IFG_{6.1}$: 8	i-IGT: 13.5	—	5.3
Rijkelijkhuizen 2007	$IFG_{5.6}$: 488/1428 $IFG_{6.1}$: 149/1428	—	—	$IFG_{5.6}$: 34.2 $IFG_{6.1}$: 10.4	—	—	—
Sadeghi 2015	'Prediabetes' ($IFG_{5.6}$ and/or IGT): 373/2980	12.5	—	—	—	—	—
Sasaki 1982	IGT: 13/207	—	—	—	6.3	—	—
Sato 2009	Unclear	—	—	—	—	—	—
Schranz 1989	IGT: 75/2128	—	—	—	3.5	—	—

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Sharifi 2013	$IFG_{5.6}$: 123	—	—	$IFG_{5.6}$: 100	—	—	—
Shin 1997	IGT: 153/1193	—	—	—	12.8	—	—
Söderberg 2004	i-$IFG_{6.1}$: 87–98: 402/6690 87–92: 149/3193 92–98: 253/3437 IGT: 87–98: 1253/6690 87–92: 600/3193 92–98: 662/3437	—	—	i-$IFG_{6.1}$: 87–98: 6 87–92: 4.7 92–98: 7.4	87–98: 18.9 87–92: 18.8 92–98: 19.3	—	—
Song 2015	$IFG_{5.6}$: 321/2467	—	—	$IFG_{5.6}$: 13	—	—	—
Song 2016a	'Prediabetes': 344	100	—	—	—	—	—
Soriguer 2008	$IFG_{5.6}$: 56/714 IGT: 54/714 IFG/IGT: 28/714	—	—	IFG5.5: 7.8	7.6	—	3.9
Stengard 1992	IGT: 234/637	—	—	—	36.7	—	—
Toshihiro 2008	IFG6.1: 14/128 IFG and/or IGT: 114/128	IFG and/or IGT: 89.1	—	$IFG_{6.1}$: 10.9	—	—	—
Vaccaro 1999	i-$IFG_{5.6}$: 36/1141 i-IGT: 861141 IFG/IGT: 11/1141	—	—	i-$IFG_{5.6}$: 3.1	i-IGT: 7.5	—	1.0
Valdes 2008	$IFG_{5.6}$: 114/630 $IFG_{6.1}$: 52/630 IGT: 50/630	—	—	$IFG_{5.6}$: 18.1 $IFG_{6.1}$: 8.3	7.9	—	—
Vijayakumar 2017	$IFG_{5.6}$ adults: 423/2005 $IFG_{5.6}$ children: 193/2095 $HbA1c_{5.7}$ adults: 168/2005 $HbA1c_{5.7}$ children: 62/2095 IGT adults: 347/2005	—	$HbA1c_{5.7}$ adults: 8.4 $HbA1c_{5.7}$ children: 3.0	$IFG_{5.6}$ adults: 21.1 $IFG_{5.6}$ children: 9.2	Adults: 17.3 Children: 8.1	—	IFG/IGT adults: 8.4 IFG/IGT children: 2.5

(Continued)

	IGT children: 170/2095 IFG/IGT adults: 169/2005 IFG/IGT children: 53/2095						
Viswanathan 2007	IGT: 619/1659	—	—	—	37.3	—	—
Wang 2007	IGT: 141/541	—	—	—	26	—	—
Wang 2011	i-IGT total: 135/10 i-IGT men: 29/447 i-IGT women: 106/635	—	—	—	i-IGT total: 12.5 i-IGT men: 6.5 i-IGT women: 16.7	—	—
Warren 2017	$IFG_{5.6}$: 4112/10844 $IFG_{6.1}$: 1213/10844 IGT: 2009/7194 $HbA1c_{5.7}$: 2027/10844 $HbA1c_{6.0}$: 970/10844	—	$HbA1c_{5.7}$: 19 $HbA1c_{6.0}$: 9	$IFG_{5.6}$: 38 $IFG_{6.1}$: 11	28	—	—
Wat 2001	IGT: 322	—	—	—	100	—	—
Weiss 2005	i-IGT($IFG_{5.6}$): 33/117	—	—	—	i-IGT: 28.2	—	—
Wheelock 2016	IGT: 169/5532	—	—	—	3.1	—	—
Wong 2003	IGT: 291	—	—	—	100	—	—
Yeboah 2011	$IFG_{5.6}$: 940/6753	—	—	$IFG_{5.6}$: 13.9	—	—	—
Zethelius 2004	IGT: 201/667	—	—	—	30.1	—	—

[a]Term 'prediabetes' as used by study authors (usually defined by various combinations of glycaemic status measurements, e.g. IFG *and/or* IGT)

FG: fasting glucose; **FPG**: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **$HbA1c_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG; **i-**: isolated;**IFG $_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT; **PG**: postload glucose;**IH**: intermediate hyperglycaemia; **T2DM**: type 2 diabetes mellitus

Appendix 7. Follow-up time and type of outcome measurement of the development of type 2 diabetes

Study ID	Length of follow-up	Time-points of measurements	Outcome measurement of the development of T2DM	Notes
Admiraal 2014	10 years	Baseline, follow-up	Incidence, odds ratio	Data for total population/South-Asian Surinamese/African Surinamese/"Ethnic Dutch"
Aekplakorn 2006	12 years	Baseline, follow-up	Incidence, odds ratio	—
Ammari 1998	2 years	Baseline, follow-up	Incidence	—
Anjana 2015	Median 9.1 years (IQR 2.6)	Baseline, follow-up	Incidence, incidence rate	—
Bae 2011	4 years (mean 47.2 months)	Baseline, follow-up (partially annually/biannually)	Incidence, incidence rate, hazard ratio	—
Baena-Diez 2011	10 years	Baseline, follow-up	Incidence	—
Bai 1999	1 year	Baseline, follow-up	Incidence	—
Bergman 2016	24 years	Baseline, follow-up	Incidence, odds ratio	Also adjusted for fasting blood glucose; 100 g OGTT
Bonora 2011	15 years	Baseline, follow-up (5, 10, 15 years)	Incidence, incidence rate, hazard ratio	HbA1c category used: 6.0% to 6.49%
Cederberg 2010	Mean 9.7 years (SD 0.7)	Baseline, follow-up	Incidence, risk ratio	Total incident cases = mixture of isolated and combined intermediate glycaemic conditions
Chamnan 2011	Median 3 years	Baseline, follow-up	Incidence, odds ratio	Data for HbA1c 6.0% to 6.4% group, focus on clinically and/or biochemically diagnosed diabetes
Charles 1997	2 years	Baseline, follow-up (5 annual clinical examinations)	Incidence	—
Chen 2003	3 years	Baseline, follow-up	Incidence, odds ratio	Also adjusted for apolipoprotein B
Chen 2017	3 years	Baseline, follow-up	Incidence	—
Corona-do-Malagon 2009	1 and 2 years	Baseline, follow-up	Incidence, relative risk	Results are given for year 1/year 2 of follow-up
Cugati 2007	10 years	Baseline, follow-up (5 and 10 years)	Incidence, odds ratio	Odds-ratio, age-and sex-adjusted

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De Abreu 2015	10 years	Baseline, follow-up	Incidence, incidence rate, odds ratio	Age-standardised incidence rate; additional covariates: metabolic syndrome, fasting glucose at baseline
Den Biggelaar 2016	7 years	Baseline, follow-up	Incidence	—
Derakhshan 2016	Median 11.7 years (IQR 8.4–13.2)	Baseline, follow-up	Incidence rate, hazard ratio	—
Dowse 1991	Approx. 5 years	Baseline, follow-up	Incidence, incidence rate, odds ratio	Incidence rates for the periods 1975/76–1982 and 1982–1987
Ferrannini 2009	7 years	Baseline, follow-up	Incidence, relative risk	—
Filippatos 2016	10 years	Baseline, follow-up (intermediate 5 -year follow-up)	Incidence, odds ratio	—
Forouhi 2007	10 years	Baseline, follow-up	Incidence, incidence rate, hazard ratio	Cumulative incidence increased across increasing age groups and was higher in men than in women
Garcia 2016	Approx. 9 years	Baseline, follow-up (every 12–15 months, max. 6 follow-ups)	Incidence	—
Gautier 2010	9 years	Baseline, follow-up (3-yearly examinations)	Incidence	—
Gomez-Arbelaez 2015	Approx. 2 years	Baseline, follow-up	Incidence, incidence rate	Rate was given in terms of per 100 person-years (recalculated to 1000 person-years)
Guerrero-Romero 2006	5 years	Baseline, follow-up	Incidence, incidence rate	—
Han 2017	12 years	Baseline, follow-up (biannually)	Incidence, incidence rate, hazard ratio	—
Hanley 2005	Average 5.2 years (range 4.5–6.6)	Baseline, follow-up	Incidence, odds ratio	—
Heianza 2012	Median 5 years	Baseline, follow-up (annual follow-ups)	Incidence, incidence rate, hazard ratio	Adjusted odds ratios: mean age and sex-adjusted
Inoue 1996	2.5 years	Baseline, follow-up	Incidence	—
Janghorbani 2015	Mean 6.8 years (SD 1.7)	Baseline, follow-up (OGTT at 3-year intervals)	Incidence, incidence rate, hazard ratio	Date for cohort without hypertension
Jaruratanasirikul 2016	3–6 years	Baseline, follow-up	Incidence	—

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Jeong 2010	5 years	Baseline, follow-up	Odds ratio	Also adjusted for ALAT, ASAT, γ-GT, h-CRP
Jiamjarasrangsi 2008a	Mean 2.6 years (SD 0.97)	Baseline, follow-up (annual follow-ups, 1–4 years)	Incidence	—
Kim 2005	5 years	Baseline, follow-up	Incidence, hazard ratio	—
Kim 2008	2 years	Baseline, follow-up	Incidence	—
Kim 2014	Median 46 months	Baseline, follow-up (every 3–6 months, up to 9 years)	Incidence	81 participants were diagnosed with diabetes with a conversion rate of 20% (81/406); conversion rates are given within prediabetes groups (e.g. 24/158 i-IFG converters = 15.2%)
Kim 2016a	Mean 5.2 years (range 3.1–6.7)	Baseline, follow-up	Incidence, odds ratio	—
Kleber 2010	1 year	Baseline, follow-up	Incidence	—
Kleber 2011	Mean 3.9 years (SD 0.6)	Baseline, follow-up	Incidence	—
Ko 1999	Mean 1.4 years (range 0.9–7.6)	Baseline, follow-up (annual OGTTs)	Incidence	—
Ko 2001	Median 1.7 years	Baseline, follow-up (annual OGTTs)	Incidence	—
Larsson 2000	Mean 10 years (SD 1 year 10 months)	Baseline, follow-up	Incidence	—
Latifi 2016	Median 5 years	Baseline, follow-up	Incidence, incidence rate, odds ratio	—
Lecomte 2007	5 years	Baseline, follow-up	Incidence	—
Lee 2016	Mean 3.7 years (SD 2.3)	Baseline, follow-up	Incidence	—
Leiva 2014	6 years	Baseline, follow-up	Incidence, hazard ratio	—
Levitzky 2008	4 years	Baseline, follow-up (approx. 4-year intervals)	Incidence, odds ratio	—
Li 2003	5 years	Baseline, follow-up (examination every 2 years)	Incidence, incidence rate, hazard ratio	Incidence rates for 5-year cumulative incidence; further adjustments for HOMA-IR and HOMA beta-cell
Ligthart 2016	14.7 years	Baseline, follow-up (blood glucose measures approx. every 4 years)	Incidence rate	—

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Lipska 2013	7 years	Baseline (year 4), follow-up (years 5,6,7)	Incidence, odds ratio	$IFG_{6.1}$: sensitivity analysis, analysis for 'ethnicity', sex analysis
Liu 2008	5 years	Baseline, follow-up	Incidence, incidence rate, relative risk	—
Liu 2014	3 years	Baseline, follow-up	Incidence, incidence rate	No exact definition of 'pre-diabetes' and diabetes incidence
Liu 2016	Median 10.9 years (IQR 8.0–15.3)	Baseline, follow-up	Hazard ratio	Subdistribution hazard ratios; also adjusted for self-rated health
Liu 2017	7.8 years	Baseline, follow-up	Odds ratio	—
Lorenzo 2003	7–8 years	Baseline, follow-up	Incidence, odds ratio	Also adjusted for NCEP metabolic syndrome definition, fasting insulin
Lyssenko 2005	Median 6 years (range 2–12)	Baseline, follow-up (every 2–3 years)	Incidence, hazard ratio	1372 persons 1 visit, 392 persons 2 visits, 219 persons 3 visits, 132 persons 4 visits
Magliano 2008	5 years	Baseline, follow-up	Incidence, incidence rate, odds ratio	5-year cumulative incidence rate was standardised to the 1998 Australian population (age and sex-specific incidence rates)
Man 2017	6 years	Baseline, follow-up	Incidence, incidence rate, risk ratio	Male: female, age standardised rate
Marshall 1994	Mean 22.6 months (range 11–40)	Baseline, follow-up	Incidence	—
McNeely 2003	10 years	Baseline, follow-up (5–6 years and 10 years)	Incidence	—
Meigs 2003	5 years, 10 years	Baseline, follow-up (3 to 10 biennial examinations)	Incidence, incidence rate	—
Mohan 2008	Mean 8 years (SD 1.3)	Baseline, follow-up	Incidence, incidence rate	—
Motala 2003	10 years	Baseline, follow-up	Incidence	—
Motta 2010	3 years	Baseline, follow-up	Incidence	—
Mykkänen 1993	Mean 3.5 years (42 months (SD 4))	Baseline, follow-up	Incidence, odds ratio	—

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Nakagami 2016	5 years	Baseline, follow-up	Incidence, hazard ratio	—
Nakanishi 2004	7 years	Baseline, follow-up (annual health examinations)	Incidence, incidence rate, relative risk	Also adjusted for all other components of the metabolic syndrome at study entry
Noda 2010	5 years	Baseline, follow-up	Incidence	—
Park 2006	Mean 4.1 years	Baseline, follow-up (annual examinations)	Incidence, incidence rate	—
Peterson 2017	10 years	Baseline, follow-up	Incidence	—
Qian 2012	5 years	Baseline, follow-up	Incidence	—
Rajala 2000	4.6 years (1.9–6.4)	Baseline, follow-up (including a separate cohort)	Incidence, incidence rate	—
Ramachandran 1986	Reverters: 3.3 years (SD 2) Converters: 5.1 years (SD 3.5)	Baseline, follow-up ("periodically")	Incidence	All individuals were advised a calorie-restricted high carbohydrate high-fibre diet
Rasmussen 2008	3.5 years i-IFG$_{5.6}$: median 2.5 years i-IGT: median 2.1 years	Baseline, follow-up	Incidence, incidence rate	—
Rathmann 2009	7 years	Baseline, follow-up	Incidence, incidence rate, odds ratio	—
Rijkelijkhuizen 2007	Mean 6.4 years	Baseline, follow-up	Incidence, incidence rate	—
Sadeghi 2015	7 years	Baseline, follow-up (biannual)	Incidence, incidence rate	—
Sasaki 1982	7 years	Baseline, follow-up	Incidence,odds ratio	—
Sato 2009	4 years	Baseline, follow-up	Odds ratio	—
Schranz 1989	6 years	Baseline, follow-up	Incidence	—
Sharifi 2013	7 years	Baseline, follow-up	Incidence	—
Shin 1997	2 years	Baseline, follow-up	Incidence	—
Söderberg 2004	11 years	Baseline, follow-up	Incidence, incidence rate	Incidence rates are given for periods 1987–1992 and 1992–1998, stratified by men:women

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Song 2015	Median 3.97 years	Baseline, follow-up	Incidence, relative risk	Also adjusted for glucose
Song 2016a	Mean 10.8 years (range 10.5–12)	Baseline, follow-up (additional follow-up 2014)	Incidence	—
Soriguer 2008	Mean 6 years	Baseline, follow-up	Incidence, incidence rate, relative risk	—
Stengard 1992	5 years	Baseline, follow-up	Incidence, odds ratio	—
Toshihiro 2008	Mean 3.2 years (SD 0.1)	Baseline, follow-up (annual OGTT)	Incidence	—
Vaccaro 1999	11.5 years	Baseline, follow-up	Incidence, odds ratio	Odds ratios probably unadjusted
Valdes 2008	Mean 6.3 years (5.9–6.8)	Baseline, follow-up	Incidence, incidence rate, odds ratio	Also adjusted for 2-h PG
Vijayakumar 2017	Adults median 4.6 years (IQR 2.8–7.9) Children: median 5.2 years (IQR 2.7–9.6)	Baseline, follow-up (examinations every 2 years)	Incidence, incidence rate	Data for adults/children; incidence rate taken from figure 2 (boys:men; girls:women)
Viswanathan 2007	Median 5 years	Baseline, follow-up (reminder to undergo an OGTT every 6 months)	Incidence, odds ratio	Also adjusted for FPG and 2-h PG
Wang 2007	5 years	Baseline, follow-up	Incidence, risk ratio	—
Wang 2011	4 years	Baseline, follow-up	Odds ratio	Unclear which confounders were used in the multivariate model
Warren 2017	Cohort 1 (visit 2): 22 years Cohort 2 (visit 4): 16 years	Baseline, follow-up (3 visits every 3 years, 5th visit 2011–13)	Hazard ratio	Data for $IFG_{5.6}$, $IFG_{6.1}$, $HbA1c_{5.7}$, $HbA1c_{6.0}$, IGT (cohort 2 only)
Wat 2001	2 years	Baseline, follow-up	Incidence	—
Weiss 2005	Mean 20.4 months (SD 10.3)	Baseline, follow-up (biannual)	Incidence	—
Wheelock 2016	Median 12.4 years (IQR 6.0–22.9)	Baseline, follow-up (approx. annual intervals for repeated OGTTs)	Incidence	Non-overweight participants with IGT cohort and overweight participants with IGT group
Wong 2003	8 years	Baseline, follow-up	Incidence	Odds ratios from Tai 2004
Yeboah 2011	7.5 years	Baseline, follow-up (3 examinations)	Incidence, hazard ratio	—

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Zethelius 2004	7 years	Baseline, follow-up	Odds ratio	Also adjusted for (split) proinsulin, intact insulin

ALAT: alanine aminotransferase; **ASAT**: aspartate transaminase; **FG**: fasting glucose; **FPG**: fasting plasma glucose; **h-CRP**: high-sensitivity C-reactive protein; **HOMA-beta**: homeostatic model assessment of beta-cell function; HOMA-IR: homeostatic model assessment of insulin resistance; **HbA1c**: glycosylated haemoglobin A1c; **HbA1c$_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG; **i-**: isolated; **IFG$_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT; **IQR**: interquartile range; **NCEP**: national cholesterol education program; **OGTT**: oral glucose tolerance test; **PG**: postload glucose; **SD**: standard deviation; **T2DM**: type 2 diabetes mellitus; **γ-GT**: gamma-glutamyl transferase/transpeptidase

Appendix 8. Baseline characteristics (I)

Study ID	Setting	N participants in original cohort (several phases of the cohort study)	N study sample (several phases of the cohort study)	Notes
Admiraal 2014	Amsterdam, The Netherlands	2975	456	Baseline data for total cohort included in the analyses (N = 456)/South-Asian Surinamese (N = 90)/ African Surinamese (N = 190)/"ethnic Dutch" (N = 176)
Aekplakorn 2006	Bangkok, Thailand	3499/3245	2667	Baseline data for cohort becoming diabetic (N = 361)
Ammari 1998	Jordan	Unclear	121/68–200/144 (controls)	Few baseline data reported for study population (N = 212)
Anjana 2015	Chennai, India	26,001	3589/2207	Baseline data for cohort becoming diabetic at follow-up (N = 176)
Bae 2011	South Korea	10,959	9723	Baseline data for the total cohort (N = 9723)
Baena-Diez 2011	Barcelona, Spain	2248	168	Baseline data for prediabetic cohort (N = 115)
Bai 1999	Chennai, India	4885/1082	1082/696	Baseline data for the IGT cohort (N = 252)
Bergman 2016	Israel	1970	1037	Baseline data for IGT cohort (N = 24)
Bonora 2011	Bruneck (South Tyrol), Italy	1000	936	No baseline data (except white participants aged > 40 years, N = 919)
Cederberg 2010	Finland	593	553/499	Baseline data for the cohort (total N = 553, men N = 223, women N = 330)
Chamnan 2011	Norfolk (East Anglia), UK	77,630/25,639	6372/5735	Baseline data for HbA1c$_{6.0\text{-}6.4}$ cohort (N = 370)

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Charles 1997	Paris, France	Unclear	7540 (2nd clinical examination)/4089	Baseline data for individuals with IGT converting to T2DM (N = 32)
Chen 2003	Penghu, Taiwan	1601	1306/600	Baseline data for cohort converting to T2DM (N = 26)
Chen 2017	China	8845	1374	Baseline data for i-IFG/i-IGTand IFG/IGT across age groups < 40 years + > 60 years (data indicate range across groups) (i-IFG < 40 years N = 51 and > 60 years N = 278; i-IGT < 40 years N = 41 and > 60 years N = 151; IFG/IGT: < 40 years N = 34 and > 60 years N = 175)
Corona-do-Malagon 2009	Mexico	820	656	Baseline characteristics for the prediabetic cohort (N = 217)
Cugati 2007	Australia, Blue Mountains region	4433/3654	2335 (5 years)/1952 (10 years)/2123 complete data (10 years)	Baseline data for people without diabetes (N = 3437)
De Abreu 2015	Australia	Unclear	1167/395 ($IFG_{5.6}$)	Baseline data for IFG cohort at baseline (N = 187)
Den Biggelaar 2016	The Netherlands	574/491	476	Baseline data for prediabetic group (N = 122)
Derakhshan 2016	Tehran, Iran	12808	8231	Baseline data for prediabetes group with normal blood pressure
Dowse 1991	Nauru, Micronesia	1497/1201	830 (1982/1987-including 143 nondiabetic person from 1975/76)	No baseline data provided
Ferrannini 2009	Mexico	3505	2282/1963	Baseline characteristics: range across different definitions of prediabetes
Filippatos 2016	Attica, Greece	4056/3042/1875	1485	Baseline data for $IFG_{5.6}$ cohort (N = 343)
Forouhi 2007	Ely (Cambridgeshire), UK	1571/1122 (phase 1)/912 (phase 2)	683 (phase 3)	Baseline data for $IFG_{6.1}$ cohort (N = 257)
Garcia 2016	Sacramento (CA), USA	1789	1777	Baseline data for prediabetic cohort (N = 310)
Gautier 2010	France	3817	979	No baseline data
Gomez-Arbelaez 2015	Columbia	2012	772	Baseline data for the total cohort (N = 772)
Guer-rero-Romero 2006	Durango, Mexico	Unclear	375	Baseline data for IGT cohort at baseline progressing to T2DM (N = 20); all individuals were coun-

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				selled on the importance of diet and physical exercise (standard care for the whole cohort)
Han 2017	Ansung-Ansan, South Korea	10,030	7542	Baseline data for i-IFG, i-IGT and IFG/IGT cohort
Hanley 2005	USA	1625	822	Baseline data for diabetic cohort at follow-up (N = 131); participants were recruited from 2 population-based studies: the San Antonio Heart Study and the San Luis Valley diabetes study
Heianza 2012	Japan	32057	6636/6241	Baseline data for total cohort (N = 6241)
Inoue 1996	Gunma (Gyeonggi), Japan	Unclear	Unclear	Baseline data for the IGT cohort (N = 37)
Janghorbani 2015	Isfahan, Iran	3370	1489	Baseline data for i-IFG, i-IGT and IFG/IGT cohort at baseline (N = 770); first-degree relatives of people with T2DM
Jaruratanasirikul 2016	Thailand	181	177 (157)	Baseline data for IGT cohort (N = 27)
Jeong 2010	Dalseong County, South Korea	1806/1599	1474	1287 participants were re-evaluated in 2008 and 187 new participants "added to the study"; baseline data for participants with incident diabetes (N = 135)
Jiamjarasrangsi 2008a	Bangkok, Thailand	3989	3243/2370	Baseline data for total cohort becoming diabetic at follow-up (N = 48)
Kim 2005	Seoul, South Korea	20,203/15,936	2964	Baseline data for FPG group 4 (6.1–7.0) with baseline and follow-up (N = 276)
Kim 2008	Incheon, South Korea	7510	7211	Baseline data for $IFG_{5.6}$/$IFG_{6.1}$ cohort (N = 1335/494)
Kim 2014	Seoul, South Korea	418	418	Baseline data for i-IFG (N = 158)/i-IGT (N = 65)/IFG/IGT (N = 119)/i-HbA1c (N = 64); total (N = 406)
Kim 2016a	Seoul, South Korea	19,356	17,971	2 baseline data cohorts: prediabetes by FPG only and HbA1c only (N = 3544 and N = 1713)
Kleber 2010	Germany	79	79	Baseline data for IGT cohort (N = 79)
Kleber 2011	Germany	128	128	Baseline data for IFG cohort (N = 128)
Ko 1999	Hong Kong	123	123	Baseline data for the IGT cohort (N = 123)
Ko 2001	Hong Kong	657	319	Baseline data for IFG cohort (N = 55)
Larsson 2000	Sweden	1843	265	Baseline data for i-IGT (N = 66)/i-IFG (N = 42)/IFG/IGT (N = 30); 265 follow-up participants were randomly sampled from each glucose tolerance group of the original cohort and invited for follow-up

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Latifi 2016	Ahvaz (Khuzestan), Iran	12,514/6640	Unclear/593	Baseline for prediabetic cohort becoming diabetic at follow-up
Lecomte 2007	France	56,650	4532	Baseline data for IFG cohort attending both examinations (N = 743)
Lee 2016	South Korea	6246	5528	Baseline data for the total cohort (N = 3497)
Leiva 2014	Chile	1007	177	Most baseline data for cohort becoming diabetic at follow-up (N = 94 with IFG)
Levitzky 2008	Framingham (MA), USA	Unclear	3634	Baseline data for individuals on first exam, free of cardiovascular disease (N = 4058)
Li 2003	Kinmen, Taiwan	Unclear	644	Baseline data for i-IGT (N = 118)/i-IFG (N = 42)/IFG/IGT (N = 49)
Ligthart 2016	Rotterdam, The Netherlands	14,926/11,740	11,740/10,050	Baseline data for prediabetic cohort (N = 1382)
Lipska 2013	USA	3075	1690	Baseline data for i-IFG (N = 189)/i-HbA1c$_{5.7}$ (N = 207)/IFG/HbA1c (N = 169)
Liu 2008	Jiang Su province, China	6400/5888	1844	Baseline data for non-diabetic participants (N = 1844); M (N = 788)/W (N = 1056)
Liu 2014	Shanghai, China	4556	3174	Baseline data for the prediabetic cohort converting to T2DM (N = 78)
Liu 2016	Beijing, China	2101	1857	Baseline data for participants without diabetes at baseline (N = 1857)
Liu 2017	China	27,020	23,626/18,610	Baseline data for IFG cohort at baseline (N = 3607)
Lorenzo 2003	San Antonio (TX), USA	2941/2569	1734	Baseline data for cohort converting to T2DM (N = 195)
Lyssenko 2005	Finland	Unclear	2115	Baseline data for IFG-IGT individuals who converted to T2DM (N = 86)
Magliano 2008	Australia	20,347/11,247	6537	Baseline data for cohort becoming diabetic at follow-up (N = 224)
Man 2017	Singapore	3280	1279/1137	Baseline data for incident diabetes cohort (N = 127)
Marshall 1994	Colorado, USA	1321	173/134	Baseline data for IGT cohort converting to T2DM (N = 20)
McNeely 2003	Seattle (WA), USA	518	465 (5 years)/412 (10 years)	Baseline data for cohort converting to T2DM at 5–6 years (N = 50) and 10 years (N = 74)
Meigs 2003	Baltimore (MD) and Washington, D.C., USA	Unclear	815/753	Baseline data for the IFG-IGT cohort (N = 265); follow-up time: at least 6 years 77%, at least 10 years 44%, at least 16 years 16%, at least 20 years 4.5%
Mohan 2008	Chennai, India	1061	513	Baseline data for cohort becoming diabetic at follow-up (N = 64)

(Continued)

Motala 2003	Durban (KwaZulu-Natal), South Africa	2479	563	Baseline data for responders (both baseline and follow-up examination) (N = 563)
Motta 2010	Italy	2603	2603	No baseline data provided
Mykkänen 1993	Kuopio (Northern Savonia), Finland	1300	1054/892	Baseline data for cohort developing T2DM (N = 69)
Nakagami 2016	Japan	6012	2770/2267	Baseline data for cohort converting to T2DM (N = 99)
Nakanishi 2004	Japan	Unclear/6812	5746	Baseline characteristics for IFG cohort (N = 246)
Noda 2010	Japan	22387	2207	Baseline characteristics for the total cohort (N = 2207)
Park 2006	South Korea	6305	5557	Baseline data for incident diabetic participants with IFG at baseline (N = 40)
Peterson 2017	Sweden	119	87/74/29	Baseline data for IGT cohort (N = 29)
Qian 2012	Shanghai, China	1869	1042	Baseline data for cohort progressing to T2DM (N = 377)
Rajala 2000	Oulo (North Ostrobothnia), Finland	1008/768	183 (1st)/193 (2nd, other group)	Few baseline data for IGT cohort (N = 171)
Ramachandran 1986	Madras, India	Unclear	107	Baseline data for the diabetic cohort at follow-up (N = 39)
Rasmussen 2008	Denmark	1821	1510/1002	Baseline data for IFG (N = 607)/IGT cohort (N = 903)
Rathmann 2009	Augsburg (Bavaria), Germany	2656	1202	Baseline data for total cohort (follow-up participants, age-group 55–74 years, N = 887)
Rijkelijkhuizen 2007	The Netherlands	2484/1513	1428	Baseline data for $IFG_{6.1}$ (N = 149)/$IFG_{5.6}$ (N = 488)
Sadeghi 2015	Isfahan, Iran	6323	2980	Baseline data for prediabetic cohort becoming diabetic at follow-up (N = 131)
Sasaki 1982	Osaka, Japan	507	207	Baseline data for the IGT cohort (N = 13)
Sato 2009	Japan	12,647	9116/6804	Baseline data for cohort becoming diabetic at follow-up (N = 659)
Schranz 1989	Malta	2128	1422	Baseline data for diabetic cohort at follow-up (N = 166)
Sharifi 2013	Zanjan, Iran	2941	395	Baseline data for active participants (N = 123)

(Continued)

Shin 1997	Yonchon County, South Korea	2520/2293	2248/1193	Baseline data for individuals converting to T2DM (N = 67)
Söderberg 2004	Mauritius	5083/6616/6291	Unclear	Baseline data for cohort 1987–1998 (N = 2631), 10 years follow-up; 3 cohorts 1987–1992 (N = 3680), 1992–1998 (N = 4178), 1987–1998 (N = 2631)
Song 2015	South Korea	4899	2079	Baseline data for prediabetic cohort (men N = 154; women N = 167; total N = 321)
Song 2016a	Shanghai, China	2132	778/526	Baseline data for prediabetic cohort (N = 334)
Soriguer 2008	Pizarra (Andalusia), Spain	1051	824	Baseline data for final sample of follow-up (N = 714)
Stengard 1992	Finland	1711	716/637	Baseline data for IGT cohort converting to T2DM (N = 17)
Toshihiro 2008	Japan	732	128	Baseline data for cohort becoming diabetic at follow-up (N = 36); participants with IFG and/or IGT were given advice about lifestyle modifications once or twice a year
Vaccaro 1999	Naples, Italy	1285/1245	1141/560	Baseline data for total cohort (follow-up examination N = 560)
Valdes 2008	Spain	1626/1034	943/630	Baseline data for $IFG_{5.6–6.1}$ (N = 114)/$IFG_{6.1–6.9}$ (N = 52)
Vijayakumar 2017	Phoenix (AZ), USA	Unclear	2095 (10–19 years)/2005 (20–39 years)	Baseline data for adults/children with HbA1c 5.7%-6.4% (children N = 62, adults N = 168)
Viswanathan 2007	India (probably Chennai)	4084	1659	Baseline data for IGT group (N = 619); participants were given advice on preventive measures such as dietary modifications and regular exercise
Wang 2007	Beijing, China	20,682/1566	902	Baseline data for cohort with incident diabetes and no coronary heart disease (N = 67)
Wang 2011	Arizona/North/South Dakota/Oklahoma, USA	Unclear	2849/1670 (2nd exam)	No baseline data
Warren 2017	USA, 4 communities	15,792	Cohort 1, N = 10844: 1990–1992 (FG, HbA1c) as baseline Cohort 2, N = 7194: 1996–1998 (FG, 2-h glucose) as baseline	2 different baseline cohorts; 4 prediabetes definitions (visit 2: $IFG_{5.6–6.9}$ N = 4112; $HbA1c_{5.7-6.4}$ N = 2027; visit 4: $IFG_{5.6–6.9}$ N = 2142; IGT N = 2009)
Wat 2001	Hong Kong	2900	434/322	Baseline data for IGT cohort (N = 322)
Weiss 2005	Conneticut, USA	129	117	Baseline data for IGT cohort (N = 33)

(Continued)

Wheelock 2016	Arizona, USA	Unclear	5532	Baseline data for the full cohort (N = 5532); pre-diabetic cohort = non-overweight (N = 37) + IGT group and overweight + IGT group (N = 132); 5–11 years/12–19 years
Wong 2003	Singapore	3568	469/291	Baseline data for IGT group (N = 291)
Yeboah 2011	USA	6814	6814/6753	Baseline data for IFG cohort (N = 940)
Zethelius 2004	Uppsala, Sweden	2322/1221/1010	840/667	Baseline data for cohort converting to T2DM (N = 26)

FG: fasting glucose; **FPG**: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **HbA1c$_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG; **i-**: isolated; **IFG$_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT; **PG**: postload glucose; **T2DM**: type 2 diabetes mellitus

Appendix 9. Baseline characteristics (II)

Study ID	Sex, % women	Age (SD), years	'Ethnicity', % white	'Ethnicity', % Arabian/Asian/(Pima) Indians	'Ethnicity', % Hispanic	'Ethnicity', % Black	Family history of diabetes, %	BMI (SD), kg/m^2	Notes
Admiraal 2014	59 57 68 51	45 44 44 47	39	20	—	42	55 77 59 38	26.4 25.7 27.4 25.6	Total cohort South-Asian Surinamese African Surinamese "Ethnic Dutch" (the Netherlands)
Aekplakorn 2006	19	43.6 (5.0)	—	100	—	—	53	24.8 (3.2)	—
Ammari 1998	—	63% > 40	—	100	—	—	99	—	—
Anjana 2015	61	47 (13.1)	—	100	—	—	47	25.8 (4.3)	—
Bae 2011	25	44.7 (5.4)	—	100	—	—	—	23.8 (2.8)	—
Baena-Diez 2011	52	61.2 (11.8)	—	—	100	—	26	—	—
Bai 1999	35	Mainly 40–60+	—	100	—	—	—	—	—
Bergman 2016	38	50.5 (8.3)	42	29	—	47	—	Men: 26.5 (3.8) Women: 26.8 (5.2)	—
Bonora 2011	—	—	100	—	—	—	—	—	—
Cederberg 2010	—	—	100	—	—	—	—	Men: 27.6 (3.5) Women: 27.9 (4.5)	—

(Continued)

Chamnan 2011	54	62.4 (8.2)	100	—	—	—	14	26.6 (4.0)	—
Charles 1997	0	48.8 (1.8)	100	—	—	—	—	27 (4)	—
Chen 2003	49	59.6	—	100	—	—	21	25.7 (3.1)	—
Chen 2017	54–58	40–67	—	100	—	—	9–37	23.8–24.8	—
Coronado-Malagon 2009	10	47.9 (8.6)	—	—	100	—	—	26.8 (3.0)	—
Cugati 2007	57	67.4	100	—	—	—	19	26	—
De Abreu 2015	100	53.8 (IQR 44.0–64.4)	Mostly white Australians	—	—	—	—	27.7 (IQR 24.3–31.4)	—
Den Biggelaar 2016	39	60.8 (IQR 55.3–64.9)	100	—	—	—	—	28.0 (IQR 26.5–31.2)	—
Derakhshan 2016	56	42.8 (11.7)	—	100	—	—	—	26.9 (4.1)	—
Dowse 1991	—	—	—	100	—	—	—	—	—
Ferrannini 2009	52–70	47–50	—	—	100	—	27–45	29.1–30.5	—
Filippatos 2016	35	46.4 (12.4)	100	—	—	—	22	27.4 (4.7)	—
Forouhi 2007	44	55.5 (7.9)	100	—	—	—	—	27.8 (4.6)	—
Garcia 2016	—	69.8 (6.9)	—	—	49	—	—	31.1 (5.6)	—
Gautier 2010	31	30–64	100	—	—	—	—	—	—
Gomez-Arbelaez 2015	70	58 (12)	—	—	100	—	—	27.4 (4.6)	—
Guerrero-Romero 2006	—	38	—	—	100	—	—	32.9 (5.6)	—
Han 2017	28	50.4 (8.3)	—	100	—	—	15	25.5 (3.4)	i-IFG$_{5.6}$
	60	53.1 (8.9)		100			12	24.9 (3.2)	i-IGT
	33	52.4 (8.7)		100			15	25.4 (3.2)	IFG/IGT

(Continued)

Hanley 2005	60	56.2 (7.9)	38	—	36	26	—	—	—
Heianza 2012	25	49.9 (8.7)	—	100	—	—	—	22.8 (2.8)	—
Inoue 1996	—	—	—	100	—	—	—	23.2	—
Janghorbani 2015	—	44.4 42.9 44.1	—	100	—	—	100	29.2 29.0 30.0	i-IFG i-IGT IFG/IGT
Jaruratanasirikul 2016	37	12.4 (2.3)	—	100	—	—	—	35.3 (5.8) BMI SDS: 3.66 (0.86)	—
Jeong 2010	—	61 (9)	—	100	—	—	7	24.6 (3.2)	—
Jiamjarasrangsi 2008a	67	49.5 (12)	—	100	—	—	15	26.9 (0.6)	—
Kim 2005	15	50.7 (7.2)	—	100	—	—	9	24.6 (2.2)	—
Kim 2008	7 5	41 43	—	100	—	—	9 8	24 25	$IFG_{5.6}$ $IFG_{6.1}$
Kim 2014	49 57 48 56	60.2 (11.3) 63.0 (11.0) 59.1 (10.1) 59.3 (10.1)	—	100	—	—	29 14 22 16	24.7 (3.0) 23.2 (3.5) 25.1 (3.3) 24.9 (4.7)	i-IFG i-IGT IFG/IGT i-HbA1c
Kim 2016a	24 47	49.5 51.2	—	100	—	—	22 22	24.4 23.9	IFG HbA1c
Kleber 2010	51	13.1 (2.1)	100	—	—	—	—	31.8 (6.3) BMI SDS: 2.56 (0.62)	—
Kleber 2011	53	13.5 (2.1)	100	—	—	—	—	31.7 (6.1)	—
Ko 1999	88	22–26	—	100	—	—	—	—	—
Ko 2001	84	37.4 (9.3)	—	100	—	—	38	25.9 (4.0)	—
Larsson 2000	100	66 (2.3)	100	—	—	—	—	24.6	i-IGT

(Continued)

								26.2 26.7	i-IFG IFG/IGT (age at follow-up)
Latifi 2016	38	46.6 (12.5)	—	100	—	—	80	—	—
Lecomte 2007	0	44.5 (7.5)	100	—	—	—	3	26.4 (3.6)	—
Lee 2016	33	46.1 (8.5)	—	100	—	—	24	24.8 (3.1)	—
Leiva 2014	57	25–80	—	—	100	—	—	33.1 (4.3)	—
Levitzky 2008	53	Women: 48 Men: 49	Mainly white	—	—	—	—	Men: 27.3 (3.9) Women: 25.6 (5.4)	—
Li 2003	57 36 53	56.1 48.4 58.9	—	100	—	—	—	24.8 23.8 25.5	i-IGT i-IFG IFG/IGT
Ligthart 2016	51	66.6 (9.4)	92	—	—	—	—	27.9 (4.2)	—
Lipska 2013	33 60 47	76.6 76.7 76.6	82 36 60	—	—	—	—	27.9 27.9 29.0	i-IFG i-HbA1c IFG + HbA1c
Liu 2008	57	Men: 52 Women: 50	—	100	—	—	Men: 6 Women: 8	—	—
Liu 2014	48	68.6 (6.7)	—	100	—	—	—	23.5 (3.0)	—
Liu 2016	-	Men: 70 Women: 69	—	100	—	—	—	—	—
Liu 2017	50	50.9 (9.7)	—	100	—	—	—	24.2 (3.6)	—
Lorenzo 2003	61	47.7 (0.8)	19	—	81	—	46	31.3	—
Lyssenko 2005	50	52 (11)	100	—	—	—	100	—	—
Magliano 2008	49	55.8 (12.0)	85	—	—	—	31	Men: 29.3 (0.4)	—

(Continued)

								Women: 29.7 (0.6)	
Man 2017	57	54.4 (9.7)	—	100	—	—	39	28.5 (5.3)	—
Marshall 1994	75	58.6	40	—	60	—	53	29.2	—
McNeely 2003	52 41	58.9 57.5		100	—	—	60 62	24.9 25.1	5–6 years follow-up 10 years follow-up
Meigs 2003	28	61.8 (14)	95	—	—	—	29	≥ 25: 60%	—
Mohan 2008	—	43 (14)	—	100	—	—	28	24.4 (4.4)	—
Motala 2003	60	36.4 (13.9)	—	100	—	—	45	22.6 (6.0)	—
Motta 2010	—	65–84	100	—	—	—	—	—	—
Mykkänen 1993	57	68.6	100	—	—	—	29	29	—
Nakagami 2016	27	53 (7)	—	100	—	—	19	24.6 (3.5)	—
Nakanishi 2004	0	49 (5.8)	—	100	—	—	16	24.6 (3.0)	—
Noda 2010	63	Men: 62.4 Women: 61.5	—	100	—	—	—	Men: 24.1 (3.0) Women: 24.2 (3.2)	—
Park 2006	0	36.4 (3.9)	—	100	—	—	—	24.8 (3.0)	—
Peterson 2017	48	61.4 (0.8)	100	—	—	—	—	26.9 (5.4)	—
Qian 2012	—	60 (13)	—	100	—	—	—	24.9 (3.7)	—
Rajala 2000	58	—	100	—	—	—	—	—	—
Ramachandran 1986	31	48	—	100	—	—	49	25.2	—
Rasmussen 2008	43 56	59.9 61.2	100	—	—	—	—	29.1 29.6	IFG IGT

(Continued)

Rathmann 2009	49	63.2 (5.4)	100	—	—	—	23	28.1 (4.0)	—
Rijkelijkhuizen 2007	46 53	62.5 61.5	100	—	—	—	—	27.6 27.0	$IFG_{6.1}$ $IFG_{5.6}$
Sadeghi 2015	59	51.3 (9.8)	—	100	—	—	20	29.4 (4.5)	—
Sasaki 1982	54	57.4	—	100	—	—	—	—	—
Sato 2009	0	48.6 (4.2)	—	100	—	—	20	24.7 (3.3)	—
Schranz 1989	56	Women: 59.8 Men: 57.7	100	—	—	—	—	—	—
Sharifi 2013	63	40 (14)	—	100	—	—	—	27.5 (4)	—
Shin 1997	34	59.6	—	100	—	—	6	24.5	—
Söderberg 2004	56	41.2	—	70	—	30	—	23.9	—
Song 2015	52	56–57	—	100	—	—	Men: 10 Women: 22	Men: 25.2 (2.7) Women: 25.8 (3.4)	—
Song 2016a	63	57.2 (10.0)	—	100	—	—	—	—	—
Soriguer 2008	65	45.0 (13.4)	100	—	—	—	58	28.3 (5.2)	—
Stengard 1992	0	70.8 (4.8)	100	—	—	—	—	26.1 (4.2)	—
Toshihiro 2008	0	50.5 (5.8)	—	100	—	—	—	24.9 (3.3)	—
Vaccaro 1999	23	44.1 (4.0)	100	—	—	—	—	26.9 (4.4)	—
Valdes 2008	—	54.8 56.7	100	—	—	—	—	28.2 29.8	$IFG_{5.6}$ $IFG_{6.1}$
Vijayakumar 2017	97 79	29.9 14	—	100	—	—	—	39.1 32.0	Adults Children

(Continued)

Viswanathan 2007	39	42.4 (9.8)	—	100	—	—	—	—	—
Wang 2007	46	47.9 (10.7)	—	100	—	—	—	25.2 (3.5)	—
Wang 2011	—	—	—	100	—	—	—	—	—
Warren 2017	48	57.6 (5.7)	—	—	—	25	25	28.9 (5.2)	Data for cohort 1 ($IFG_{5.6}$)
Wat 2001	57	51		100	—	—	—	25.6	—
Weiss 2005	73	12.5 (2.7)	45	39	12	—	—	36.6 (8.7) BMI z score: 2.42 (0.41)	—
Wheelock 2016	53	11.4 (3.6)	100	100	—	—	—	Percentile: 87.6	—
Wong 2003	53	43.8	—	100	—	—	28	25.2	—
Yeboah 2011	44	64.2 (9.8)	31	15	25	30	—	30.1 (5.7)	—
Zethelius 2004	0	77	100	—	—	—	—	26.7 (3.2)	—

BMI: body mass index; **FG**: fasting glucose; **FPG**: fasting plasma glucose; **i-HbA1c**: (isolated) glycosylated haemoglobin A1c; **$HbA1c_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG; **i-**: isolated; **$IFG_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT; **IQR**: interquartile range; **SD**: standard deviation; **SDS**: standard deviation score

Appendix 10. Baseline characteristics (III)

Study ID	Mean (SD)/ median (IQR)/range systolic BP, mmHg	Mean (SD)/ median (IQR)/ range diastolic BP (SD), mmHg	Smoking: current and/or past, %	Medications, %	Comorbidities, %	Mean (SD)/ median (IQR)/range FPG, mmol/L	Mean (SD)/ median (IQR)/ range 2-h glucose, mmol/L	Mean (SD)/ median (IQR)/ range HbA1c, %	Notes
Admiraal 2014	—	—	38 26 41 41	—	Hypertension: 26 26 32 19	5.2 5.3 5.2 5.3	—	—	Total cohort South-Asian Surinamese African Surinamese "Ethnic Dutch"
Aekplakorn 2006	—	—	42	—	Hypertension: 33	—	—	—	—
Ammari 1998	—	—	—	—	Hypertension: 47	—	—	—	—
Anjana 2015	129 (21)	78 (11)	13	—	—	5.2 (0.6)	8.7 (1.4)	6.2 (0.7)	—
Bae 2011	113 (14)	76 (10)	—	—	—	5.3 (0.5)	—	5.4 (0.3)	—
Baena-Diez 2011	—	—	33	—	Hypercholesterolaemia: 38 Hypertriglyceridaemia: 15 Hypertension: 55	—	—	—	—
Bai 1999	—	—	—	—	—	—	—	—	—
Bergman 2016	128 (16)	84 (10)	38	—	—	5.2 (0.5)	8.6 (1.0)	—	—
Bonora 2011	—	—	—	—	—	—	—	—	—
Cederberg 2010	Men: 142	Men: 80	Men: 18	—	—	Men: 5.0	Men: 6.8	—	—

(Continued)

	Women: 142	Women: 79	Women: 15			Women: 5.0	Women: 7.0		
Chamnan 2011	139 (17)	84 (11)	15	BP lowering: 21 Corticosteroids: 4	—	—	—	—	—
Charles 1997	—	—	—	—	—	6.6 (0.8)	9.3 (0.9)	—	—
Chen 2003	—	—	38	—	Hypertension: 46	—	—	—	—
Chen 2017	—	—	12–24	—	Hypertension: 28–55	5.1–6.1	5.9–9.2	—	Range for i-IFG, i-IGT and IFG/IGT cohorts separated by < 40 years and > 60 years
Coronado-Malagon 2009	—	—	—	—	—	5.9 (0.3)	—	—	—
Cugati 2007	146	83	—	—	—	5	—	—	—
De Abreu 2015	128 (IQR 114–140)	79 (IQR 72–86)	13	—	Hypertension: 43	5.3 (IQR 5.0–5.8)	—	—	—
Den Biggelaar 2016	141 (IQR 132–155)	83 (IQR 78–92)	18	—	—	6.0 (IQR 5.5–6.3)	8.8 (IQR 7.8–9.9)	5.8 (IQR 5.6–6.1)	—
Derakhshan 2016	—	—	26	—	—	—	—	—	—
Dowse 1991	—	—	—	—	—	—	—	—	—
Ferrannini 2009	118–128	71–78	—	—	—	4.9–6.4	6.7–9.5	—	Range for i-$IFG_{5.6}$, i-$IFG_{6.1}$, i-IGT, IGT5.6 and $IGT_{6.1}$ cohorts
Filippatos 2016	127 (17)	82 (10)	62	—	Hypertension: 36 Hypercholesterolaemia: 54	5.9 (0.3)	—	—	—

(Continued)

Forouhi 2007	136 (16)	82 (10)	52	—	—	—	—	—	—
Garcia 2016	—	—	58	—	—	—	—	—	—
Gautier 2010	—	—	—	—	—	—	—	—	—
Gomez-Arbelaez 2015	—	—	—	—	—	5.2 (0.7)	6.0 (1.8)	6.5 (1.3)	—
Guerrero-Romero 2006	—	—	—	—	Dyslipidaemia: 41 Hypertension: 24	6.4 (0.6)	—	—	—
Han 2017	120 (17)	78 (12)	64	—	Hypertension:	5.9 (0.3)	6.1 (1.2)	5.5 (0.4)	i-IFG$_{5.6}$
	119 (18)	76 (12)	34		28	4.8 (0.4)	8.9 (0.9)	5.5 (0.4)	i-IGT
	124 (18)	80 (11)	59		27	5.9 (0.3)	9.3 (0.9)	5.7 (0.4)	IFG/IGT
					36				
Hanley 2005	132 (20)	79 (10)	—	BP lowering: 38 Lipid lowering: 7	—	5.9 (0.7)	8.5 (1.7)	—	—
Heianza 2012	125 (16)	76 (11)	—	—	—	5.3 (0.5)		5.3 (0.3)	—
Inoue 1996	142 (9)	73 (7)	—	—	—	—	—	—	—
Janghorbani 2015	116–117	76–77	—	—	Hypertension: 20–23	5.1–61	5.9–9.2	5.1–5.3	Range for i-IFG, i-IGT and IFG/IGT cohorts
Jaruratanasirikul 2016	124 (15)	77 (9)	—	—	—	—	—	—	—
Jeong 2010	139 (21)	87 (12)	43	—	—	—	—	5.7 (0.5)	—
Jiamjarasrangsi 2008a	—	—	4	—	—	—	—	—	—
Kim 2005	—	—	—	—	—	6.4 (0.2)	—	—	—
Kim 2008	128/132	80/83	—	—	—	5.8/6.4	—	—	—

(Continued)

Kim 2014	127–129	78	20–31	—	—	—	—	—	Range for i-IFG, i-IGT, IFG/IGT and i-HbA1c cohorts
Kim 2016a	116–120	72–75	24–25	—	—	5.1–5.9	—	5.3–5.8	Range for IFG and HbA1c cohorts
Kleber 2010	120 (16)	73 (13)	—	—	—	5.1 (1.1)	8.5	5.6 (0.7)	—
Kleber 2011	120 (14)	73 (12)	—	—	—	4.8 (0.4)	8.4 (0.6)	—	—
Ko 1999	—	—	—	—	—	—	—	—	—
Ko 2001	125 (21)	78 (10)	2	—	—	6.5 (0.3)	9.1 (2.1)	6.2 (0.6)	—
Larsson 2000	—	—	—	—	—	4.7/5.5/5.5	8.6/6.8/8.7	—	—
Latifi 2016	—	—	—	—	Hypertension: 40	—	—	—	—
Lecomte 2007	135 (13)	81 (10)	23	—	Hypertension: 48	6.4 (0.2)	—	—	—
Lee 2016	125 (15)	81 (11)	20	—	Hypertension: 22	—	—	5.9 (0.2)	—
Leiva 2014	134 (16)	77 (10)	—	—	—	—	—	—	—
Levitzky 2008	Women: 122 Men: 127	—	Women: 29 Men: 28	Antihypertensives: Women: 14 Men: 16	Hypertension: Women: 26 Men: 35	—	—	—	—
Li 2003	136–138	85–87	—	—	—	5.4–6.4	6.8–9.1	—	Range for i-IFG, i-IGT and IFG/IGT cohorts
Ligthart 2016	145 (21)	81 (12)	50	BP lowering: 33 Lipid lowering: 18	Stroke: 3 CHD: 8	—	—	—	—

(Continued)

					Hypertension: 64				
Lipska 2013	140–143	—	54–65	—	—	5.1–6.1	—	5.3–5.9	Range for i-IFG, i-HbA1c and IFG/HbA1c cohorts
Liu 2008	Men: 126 Women: 124	Men: 80 Women: 77	—	—	—	Men: 5.3 Women: 5.4	—	—	—
Liu 2014	132 (16)	82 (8)	—	—	—	5.8 (0.8)	9.2 (1.2)	—	—
Liu 2016	—	—	—	—	—	—	—	—	—
Liu 2017	128 (21)	81 (11)	37	—	—	5.9 (0.4)	—	—	—
Lorenzo 2003	124	75	—	—	—	5.3	7.6	—	—
Lyssenko 2005	140	85 (11)	—	—	—	6.3 (IQR 5.8–6.6)	8.3 (1.6)	5.7 (0.4)	—
Magliano 2008	—	—	48	—	—	6	8	5.5	—
Man 2017	145 (20)	80 (12)	13	—	Hypertension: 74	—	—	—	—
Marshall 1994	—	—	—	—	—	6.1	9.5	—	—
McNeely 2003	139 137	80 80	—	—	—	5.5 5.6	9.0 8.8	—	5–6 years follow-up 10 years follow-up
Meigs 2003	—	—	—	—	—	—	—	—	—
Mohan 2008	127 (19)	81 (11)	—	—	—	4.5 (0.6)	—	—	—
Motala 2003	119 (19)	78 (13)	—	—	—	4.6 (1.8)	6.2 (3.8)	—	—
Motta 2010	—	—	—	—	—	—	—	—	—

(Continued)

Mykkänen 1993	159	84	1	Antihypertensives: 24	Hypertension: 47	6.2	8.4	—	—
Nakagami 2016	134 (18)	82 (12)	35	—	—	6.0 (0.6)	—	6.0 (0.3)	—
Nakanishi 2004	133 (16)	81 (11)	53	—	Dyslipidaemia: 40 Proteinuria: 5 Hypertension: 35	6.4 (0.2)	—	—	—
Noda 2010	—	—	—	—	—	Men: 5.4 Women: 5.2	—	Men: 5.0 Women: 5.1	—
Park 2006	—	—	—	—	—	6.0 (0.3)	—	—	—
Peterson 2017	—	75 (11)	—	—	—	—	—	5.5 (0.4)	—
Qian 2012	126 (21)	81 (12)	—	—	—	5.2 (0.7)	6.1 (1.5)	—	—
Rajala 2000	—	—	—	—	Hypertension: 49	—	—	—	—
Ramachandran 1986	—	—	—	—	—	—	—	—	—
Rasmussen 2008	140–142	—	—	—	—	—	—	—	Range for IFG and IGT cohorts
Rathmann 2009	133 (19)	80 (10)	49	Lipid lowering: 11	Hypertension: 49	5.5 (0.5)	6.3 (1.7)	5.6 (0.4)	—
Rijkelijkhuizen 2007	139–145	84–85	—	—	—	—	—	—	Range for $IFG_{5.6}$ and $IFG_{6.1}$ cohorts
Sadeghi 2015	127 (21)	81 (11)	14	—	—	5.7 (0.7)	8.4 (1.5)	—	—
Sasaki 1982	—	—	—	—	—	5.6 (0.9)	9.0 (0.9)	—	—
Sato 2009	—	—	91	—	—	6.0 (0.6)	—	5.6 (0.6)	—

(Continued)

Schranz 1989	—	—	—	—	—	Women: 7.2 Men: 6.2	Women: 10.8 Men: 9.7	—	—
Sharifi 2013	130 (12)	79 (8)	5	—	Hypertriglyceridaemia: 48 Hypertension: 25	—	—	—	—
Shin 1997	130	84	—	—	—	6.1	6.7	—	—
Söderberg 2004	125	77	27	—	—	5.5	6.5	—	—
Song 2015	123–127	76–80	2–27	—	Dyslipidaemia: 64–66 Hypertension: 35–44	—	—	5.7–5.8	Ranges for male and female cohorts
Song 2016a	134 (20)	85 (12)	23	—	—	6.0 (0.4)	5.9 (1.6)	—	—
Soriguer 2008	—	—	—	—	—	—	—	—	—
Stengard 1992	156	88	—	—	Hypertension: 53	5.4 (1.1)	9.7 (0.8)	—	—
Toshihiro 2008	126 (12)	81 (10)	47	—	—	6.1 (0.6)	8.8 (1.3)	—	—
Vaccaro 1999	—	—	—	—	—	4.2 (0.8)	4.5 (1.7)	—	—
Valdes 2008	135–144	84–92	—	—	—	5.8–6.4	6.4–7.3	4.9–5.1	Ranges for $IFG_{5.6}$ and $IFG_{6.1}$ cohorts
Vijayakumar 2017	—	—	—	—	—	A: 5.4/C: 5.2	A: 6.7/C: 6.5	A: 5.8/C: 5.7	—
Viswanathan 2007	—	—	—	—	—	6.1 (0.7)	8.9 (1.0)	—	—
Wang 2007	124 (19)	78 (11)	28	—	Hypertension: 36	5.8 (0.9)	7.4 (1.7)	—	—
Wang 2011	—	—	—	—	—	—	—	—	—

(Continued)

Warren 2017	—	—	22	—	Hypertension: 38	6.0 (0.4)	—	5.6 (0.4)	Data for cohort 1 ($IFG_{5.6}$)
Wat 2001	126	78	—	—	—	5.4	8.9	—	—
Weiss 2005	—	—	—	—	—	5.2	8.9	—	—
Wheelock 2016	—	—	—	—	—	—	5.4 (1.2)	—	—
Wong 2003	125	74	24	—	—	5.7	8.9	—	—
Yeboah 2011	132 (21)	74 (11)	50	BP lowering: 56 Lipid lowering (statins): 17	—	6.0 (0.4)	—	—	—
Zethelius 2004	—	—	—	—	—	5.7 (0.7)	7.9 (1.9)	—	—

2-h: 2-h measurement after an OGTT; **BP**: blood pressure; **CHD**: coronary heart disease; **FG**: fasting glucose; **FPG**: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **$HbA1c_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG; **i-**: isolated; **$IFG_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L);**IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT; **IQR**: interquartile range; **OGTT**: oral glucose tolerance test; **SD**: standard deviation

Appendix 11. Cumulative incidence as the measurement for the development of T2DM

Study ID (years of follow-up)	Diabetes cumulative incidence								
	NGT cohort	$IFG_{5.6}$ cohort	i-$IFG_{5.6}$ cohort	$IFG_{6.1}$ cohort	i-$IFG_{6.1}$ cohort	IGT cohort	i-IGT cohort	IFG/IGT cohort	HbA1c cohort
Admiraal 2014 (10)	Unclear/354	Total cohort: 51/111 (45.9%) Asian 13/31 (41.9%) African 14/40 (35%) "Ethnic Dutch" 3/40 (7.5%)	—	—	—	—	—	—	—
Aekplakorn 2006 (12)	Unclear/2444	65/223 (29.1%)	—	—	—	—	—	—	—
Ammari 1998 (2)	10/144 (6.9%)	—	—	—	—	10/68 (14.7%)	—	—	—
Anjana 2015 (9.1)	209/1077 (19.4%)	—	32/67 (47.8%)	—	—	—	86/163 (52.8%)	58/69 (84.1%)	—
Bae 2011 (4)	228/7932 (2.9%)	—	—	—	—	—	—	—	$HbA1c_{5.7}$: 373/1791 (20.8%) $HbA1c_{6.0}$: 187/412 (45.4%)
Baena-Diez 2011 (10)	0 (IFG cohort)	—	—	33/115 (28.7%)	—	—	—	—	—
Bai 1999 (1)	1/444 (0.2%)	—	—	—	—	14/252 (5.6%)	—	—	—

(Continued)

Bergman 2016 (20)	202/739 (27.3%)	—	—	—	—	68/114 (59.6%)	—	—	—
Bonora 2011 (15)	29/710 (4.1%)	—		10 years: 18/55 (32.7%)	—	—	10 years: 8/53 (15.1%)	10 years: 9/19 (47.4%)	$HbA1c_{6.0}$: 20/70 (28.6%)
Cederberg 2010 (9.7)	11/410 (2.7%)	—	—	15/40 (37.8%)	6.3%	38/103 (37.1%)	23.4%	—	$HbA1c_{5.7}$: 9/24 (37.5%)
Chamnan 2011 (3)	37/5365 (0.7%)	—	—	—	—	—	—	—	$HbA1c_{6.0}$: 26/370 (7%)
Charles 1997 (2)	27/3671 (0.7%)	—	—	—	3 years: 15/476 (3.2%)	2 years: 32/418 (7.7%)	—	—	—
Chen 2003 (3)	11/444 (2.5%)	—	—	15/156 (9.6%)	—	—	—	—	—
Chen 2017 (3)	60/644 (9.3%)	—	40/329 (12.2%)	—	—	—	45/192 (23.4%)	71/209 (34%)	—
Coronado-Malagon 2009[a] **(1, 2)**	Year 1: 3/439 (0.7%) Year 2: 3/439 (0.6%)	—	—	—	—	—	—	—	—
Cugati 2007 (10)	108/1512 (7.1%)	69/229 (30%)	—	—	—	—	—	—	—
De Abreu 2015 (10)	11/342 (3.2%)	21/187 (11.2%)	—	—	—	—	—	—	—
Den Biggelaar 2016[b] **(7)**	17/294 (5.8%)	—	—	—	—	—	—	—	—
Derakhshan 2016[c] **(11.7)**	162/3611 (4.5%)	—	—	—	—	—	—	—	—
Dowse 1991 (6.2)	14/215 (6.5%)	—	—	—	—	13/51 (25.5%)	—	—	—

(Continued)

Ferrannini 2009 (7)	89/1594 (5.6%)	—	11/65 (16.9%)	—	1/17 (5.9%)	—	31/179 (17.3%) 3 years: 44/188 (23.4%)	—	—
Filippatos 2016 (10)	120/1206 (10.0%)	71/279 (25.4%)	—	—	—	—	—	—	—
Forouhi 2007 (10)	8/407 (2%)	53/633 (8.3%)	—	34/257 (24.7%)	—	4.4 years: 17/170 (10%)	—	—	—
Garcia 2016 (9)	132/881 (15.0%)	169/310 (54.5%)	—	—	—	—	—	—	—
Gautier 2010 (9)	0 (IFG cohort)	142/979 (14.5%)	—	—	—	—	—	—	—
Gomez-Arbelaez 2015[d] **(2)**	Unclear/586	—	—	—	—	—	—	—	—
Guerrero-Romero 2006 (5)	1/272 (0.4%)	—	—	—	—	20/67 (29.9%)	—	—	—
Han 2017 (12)	657/5633 (11.7%)	—	81/199 (40.7%)	—	—	—	624/1512 (41.3%)	138/198 (69.7%)	10 years: $HbA1c_{5.7}$: 881/2830 (31.1%)
Hanley 2005 (5.2)	5 years: 47/603 (7.8%)	—	—	—	—	88/274 (32.1%) 5 years: 101/303 (33.3%)	—	—	—
Heianza 2012 (5)	4.7 years: 34/4149 (0.8%)	262/1680 (15.6%)	—	155/380 (40.8%)	—	—	—	—	$HbA1c_{5.7}$: 184/822 (22.4%) $HbA1c_{5.7}$ and $IFG_{5.6}$:

(Continued)

									292/2092 (14%) $HbA1c_{6.0}$: 100/203 (49.3%) $HbA1c_{6.0}$ and $IFG_{5.6}$: 271/1748 (15.5%)
Inoue 1996 (2.5)	1/22 (4.5%)	—	—	—	—	5/37 (13.5%)	—	—	—
Janghorbani 2015 (6.8)	14/627 (2.2%)	—	23/230 (10%)	—	—	—	26/150 (17.3%)	78/214 (36.4%)	—
Jaruratanasirikul 2016 **(3–6)**	12/108 (11.1%)	—	—	—	—	—	9/33 (27.3%)	—	—
Jeong 2010[e] **(5)**	228/792 (28.8%)	—	—	—	—	—	—	—	—
Jiamjarasrangsi 2008a (2.6)	15/2050 (0.7%)	33/320 (10.3%)	—	—	—	—	—	—	—
Kim 2005 (5)	Unclear/2009	—	—	15/276 (5.5%)	—	—	—	—	—
Kim 2008 (2)	21/5382 (0.4%)	22/1335 (1.6%)	—	48/494 (9.7%)	—	—	—	—	—
Kim 2014 (3.8)	0 (cohort with intermediate hyperglycaemia)	—	24/158(15.2%)	—	—	—	12/65 (18.5%)	38/119 (31.9%)	i-$HbA1c_{5.7}$: 7/64 (10.9%)
Kim 2016a (5.2)	43/10,763 (0.4%)	—	—	357/1433 (24.9%)	—	—	—	—	$HbA1c_{6.0}$: 322/1103 (29.2%) $IFG_{5.6}$ and $HbA1c_{5.7}$: 435/1951 (22.3%)

(Continued)

Kleber 2010 (1)	0 (IGT cohort)	—	—	—	—	1/79 (1.3%)	—	—	—
Kleber 2011 (3.9)	0 (IGT cohort)	—	—	—	—	3/119 (2.5%)	—	—	—
Ko 1999 (1.4)	0 (IGT cohort)	—	—	—	—	29/123 (23.6%)	—	—	—
Ko 2001 (1.7)	13/264 (4.9%)	—	—	14/55 (25.5%)	—	—	—	—	—
Larsson 2000 (10)	5/127 (3.9%)	—	—	—	5/42 (11.9%)	—	8/66 (12.1%)	6/30 (20.0%)	—
Latifi 2016 (5)	25/394 (6.3%)	21/124 (16.9%)	—	—	—	—	—	—	—
Lecomte 2007 (5)	0 (IFG cohort)	—	—	127/743 (17.1%)	—	—	—	—	—
Lee 2016 (3.7)	0 (cohort with intermediate hyperglycaemia)	—	—	—	—	—	—	—	$HbA1c_{5.7}$: 390/3497 (11.2%)
Leiva 2014 (6)	0 (IFG cohort)	—	—	11/28 (39.3%)	—	—	—	—	—
Levitzky 2008 (4)	0 (IFG cohort)	—	—	Women: 87/313 (27.8%) Men: 92/460 (20.0%)	—	—	—	—	—
Li 2003 (5)	38/435 (8.7%)	—	—	—	16/42 (38.1%)	2 years: 23/131 (17.6%)	33/118 (28%)	20/49 (40.8%)	—
Ligthart 2016 (14.7)	Unclear/7462	—	—	425/1382 (30.8%)	—	—	—	—	—
Lipska 2013 (7)	38/1690 (2.2%)	20/189 (10.6%)	—	48/100 (48%)	—	—	—	—	i-$HbA1c_{5.7}$:

(Continued)

									44/207 (21.3%) IFG and $HbA1c_{5.7}$: 81/169 (47.9%)
Liu 2008 (5)	9/470 (1.9%)	18/169 (10.7%)	—	—	—	—	—	—	—
Liu 2014[f] **(3)**	153/1821 (8.4%)	—	—	—	—	—	—	—	—
Liu 2016 (10.9)	Unclear/1635	—	—	—	—	—	—	—	—
Liu 2017 (7.8)	Unclear/15003	—	—	—	—	—	—	—	—
Lorenzo 2003 **(7–8)**	Unclear/1503	—	—	14/29 (48.3%)	—	88/202 (43.6%)	—	—	—
Lyssenko 2005[g] **(6)**	41/1429 (2.9%)	—	—	—	—	—	—	—	—
Magliano 2008 (5)	58/4715 (1.2%)	—	—	44/370 (11.9%)	—	122/757 (16.1%)	—	—	—
Man 2017 (6)	15/462 (3.2%)	—	—	—	—	—	—	—	$HbA1c_{5.7}$: 112/675 (16.6%)
Marshall 1994 (1.9)	0 (IGT cohort)	—	—	—	—	20/123 (16.3%)	—	—	—
McNeely 2003 (10)	5–6 years: 5/277 (1.8%) 10 years: 13/277 (4.5%)	5–6 years: 27/125 (21.6%) 10 years: 39/103 (37.9%)	—	5–6 years: 7/30 (23.3%) 10 years: 18/28 (64.3%)	—	5–6 years: 45/178 (25.3%) 10 years: 59/157 (37.6%)	—	—	—
Meigs 2003 (5, 10)	6 (SD 5) years: 55/488 (11.3%)	—	—	—	6 (SD 5) years:	—	6 (SD 5) years:	6 (SD 5) years:	—

(Continued)

					6/20 (30.0%)		81/218 (37.1%)	15/27 (55.6%)	
Mohan 2008 (8)	64/476 (13.4%)	—	—	—	—	15/37 (40.5%)	—	—	—
Motala 2003 (10)	36/482 (7.5%)	—	—	—	—	13/35 (37.1%) 4 years: 16/72 (22.2%)	—	—	—
Motta 2010 (3)	52/2018 (2.6%)	—	—	50/295 (16.9%)	—	—	—	—	—
Mykkänen 1993 (3.5)	21/689 (3.0%)	—	—	—	—	48/203 (23.6%)	—	—	—
Nakagami 2016 (5)	1528	77/467 (16.5%)	—	50/134 (37.3)	—	—	—	—	$HbA1c_{6.0}$: 58/156 (37.2%) $HbA1c_{5.7}$: 87/583 (14.9%)
Nakanishi 2004 (7)	51/5500 (0.9%)	—	—	5/246 (2.0%)	—	—	—	—	—
Noda 2010 (5)	Total: 30/1649 (1.8%) Men: 13/540 (2.4%) Women: 17/1109 (6.4%)	Total: 37/405 (9.1%) Men: 18/202 (8.9%) Women: 19/203 (9.4%)	—	Total: 58/153 (37.9%) Men: 25/79 (31.6%) Women: 33/74 (44.6%)	—	—	—	—	—
Park 2006 (4.1)	116/4975 (2.3%)	40/321 (12.5%)	—	—	—	—	—	—	—
Peterson 2017 (10)	2/39 (5.1%)	—	—	—	—	6/29 (20.7%)	—	—	—

(Continued)

Qian 2012 (5)	59/843 (7.0%)	—	—	—	17/46 (37%)	—	49/120 (41%)	17/33 (51%)	—
Rajala 2000 (4.6)	0 (IGT cohort)	—	—	—	—	32/171 (18.7%) 2.1 years: 14/183 (7.7%)	—	—	—
Ramachandran 1986 (5.1)	0 IGT cohort)	—	—	—	—	39/107 (36.4%)	—	—	—
Rasmussen 2008 **(3.5) (i-IFG$_{5.6}$: 2.5, IGT: 2.1)**	0 (IFG, IGT cohort)	—	141/442 (32%)	—	—	181/442 (41%)	1 year: 35/296 (11.8%)	1 year: 60/207 (29%)	—
Rathmann 2009 (7)	25/649 (3.9%)	—	—	12/71 (16.9%)	—	—	34/120 (28.3%)	22/47 (46.8%)	—
Rijkelijkhuizen 2007 (6.4)	51/1125 (4.5%)	101/488 (20.7%)	—	62/149 (41.6%)	35/106 (33%)	36/111 (32.4%) 2 years: 45/158 (28.5%)	27/80 (33.8%)	20/31 (64.5%)	—
Sadeghi 2015 (7)	141/2607 (5.4%)	—	134/373 (35.9%)	—	—	—	49/373 (13.1%)	65/373 (17.4%)	—
Sasaki 1982 (7)	7/161/4.3%)	—	—	—	—	5/13 (38.5%)	—	—	—
Sato 2009 (4)	118/4147 (2.9%)	—	—	334/794 (42.1%)	—	—	—	—	HbA1c$_{6.0}$: 90/215 (41.9%)
Schranz 1989 (6)	54/1251 (4.3%)	—	—	—	—	23/75 (30.7%)	—	—	—
Sharifi 2013 (7)	0 (IFG cohort)	24/123(19.5%)	—	—	—	—	—	—	—
Shin 1997 (2)	47/1040 (4.5%)	—	—	—	—	20/153 (13.1%)	—	—	—

(Continued)

Söderberg 2004 (11)	Unclear/2522	—	—	5 years: 32/148 (21.6%)	153/402 (38%)	575/1253 (45.9%)	5 years: 103/489 (21.1%)	5 years: 45/118 (38.1%)	—
Song 2015 (4)	74/1758 (4.2%)	—	68/321 (21.2%) Men: 30/154 (19.5%) Women: 38/167 (22.8%)	—	—	—	—	—	—
Song 2016a (10.8)	0 (cohort with intermediate hyperglycaemia)	—	—	—	—	—	—	—	—
Soriguer 2008 (6)	13/1806 (0.7%)	—	23/56 (41.1%)	—	—	14/54 (25.9%)	—	14/28 (50%)	—
Stengard 1992 (5)	6/216 (2.8%)	—	—	—	—	17/234 (7.3%)	—	—	
Toshihiro 2008 **(3.2)[h]**	0 (cohort with IFG and/or IGT)	—	—	—	—	—	—	—	—
Vaccaro 1999 (11.5)	36/500 (7.2%)	—	1/11 (9.1%)	—	—	—	13/40 (32.5%)	4/9 (44.4%)	—
Valdes 2008 (6.3)	16/510 (3.1%)	14/114 (12.3%)	7/32 (21.9%)	19/52 (36.5%)	—	21/88 (23.9%)	9/68 (13.2%)	12/20 (60%)	—
Vijayakumar 2017 **(adults: 4.6,children: 5.2)**	Adults: 58/1466 (3.9) Children: 26/1795 (1.4%) [estimated from figure 2]	Adults: 222/424 (52.4%) Children: 52/193 (26.9%)	—	—	—	Adults: 196/347 (56.5%) Children: 55/169 (32.5%)	—	$IFG_{5.6}$/IGT: Adults: 116/169 (68.7%) Children: 26/53 (49.1%)	$HbA1c_{5.7}$: adults: 75/168 (44.6%) $HbA1c_{5.7}$: children: 18/62 (29%)
Viswanathan 2007 (5)	Total: 154/465 33.1%) M: 99/265 (37.4%)	—	—	—	—	Total: 416/619 (67.2%)	—	—	—

(Continued)

	W: 55/200 (27.5%)					M: 251/391 (64.2%) W: 165/228 (72.4%)			
Wang 2007 (5)	51/358 (14.2%)	—	53/261 (20%)	28/112 (25%)	—	126/141 (89.4%)	31/95 (32.6%)	$IFG_{5.6}$/IGT: 54/109 (49.5%) $IFG_{6.1}$/ IGT: 36/52 (69.2%)	—
Wang 2011 (7.8)	84/595 (14.1%)	Total: 345/947 (36.4%) Men: 137/418 (32.8%) Women: 208/529 (39.3%)	—	—	—	Total: 233/491 (47.5%) Men: 75/154 (48.7%): Women: 158/337 (46.9%) 4 years: Total 198/532 (37.2%)	—	Total: 185/356 (52%%) Men: 66/125 (52.8%) Women: 119/231 (51.5%)	$HbA1c_{6.0}$: 19/121 (15.7%)
Warren 2017 (cohort 1: 22, cohort 2: 16)	22 years: 8322 16 years: 4772	—	—	—	—	—	—	—	—
Wat 2001 (2)	4/333 (0.1%)	—	—	—	—	31/322 (9.6%)	—	—	—
Weiss 2005 (1.7)	8/84 (9.5%)	—	—	—	—	—	8/33 (24.2%)	—	—
Wheelock 2016 (4.3)	Unclear/5363	—	—	5 years: 31%	—	Non-over-weight: 5 years: 9/37 (24%) 10 years: 11/37 (29.7%)	—	5 years: 41.2%	—

(Continued)

						Overweight: 5 years: 49/132 (37%) 10 years: 84/132 (63.6%)			
Wong 2003 (8)	12/278 (4.3%)	—	—	—	—	102/291 (35.1%)	—	—	—
Yeboah 2011 (7.5)	Unclear/4973	273/940 (29.0%)	—	—	—	—	—	—	—
Zethelius 2004 (7)	Unclear/466	—	—	—	—	Not reported/201	—	—	—

[a]Development of T2DM from 'prediabetes' (not defined) at year 1: 11/217 (5.1%), at year 2: 16/217 (7.6%).

[b]Development of T2DM from 'prediabetes' ($IFG_{6.1}$ and/or IGT): 46/122 (37.7%).

[c]Development of T2DM from $IFG_{5.6}$ *and/or* IGT: 11.7 years150/523 (28.7%); 2.3 years: 121/911 (13.3%).

[d]Development of T2DM from $IFG_{5.6}$ *or* IGT *or* $HbA1c_{5.7}$: 20/186 (10.8%).

[e]Development of T2DM from IFG *or* IGT: not reported.

[f]Development of T2DM from IFG *or* IGT: 78/450 (17.3%).

[g]Development of T2DM from IFG *or* IGT:86/686 (12.5%).

[h]Development of T2DM from IFG *and/or* IGT: 36/128 (28.1%).

FPG: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **$HbA1c_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG; **i-**: isolated; **$IFG_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT; **NGT**: normal glucose tolerance; **PG**: postload glucose; **SD**: standard deviation; **T2DM**: type 2 diabetes mellitus

Appendix 12. Diabetes incidence (cases per 1000 person-years)

Study ID	Rate (diabetes cases/1000 person-years (95% CI))								
	Follow-up (years)	NGT cohort	'Prediabetes' cohort	$IFG_{6.1}$ cohort	$IFG_{5.6}$ cohort	IGT cohort	IFG/IGT cohort	Elevated HbA1c cohort	Elevated HbA1c/IFG cohort
Anjana 2015	9.1	22.2 (19.4–25.4)	78.9 (68.0–90.9)	—	61.0 (42.1–85.0)	67.8 (54.6–83.0)	133.6 (103.1–169.3)	—	—
Bae 2011	4	—	—	—	—	—	—	Per 100 person-years: $HbA1c_{5.7}$: 5.6 $HbA1c_{6.0}$: 14.0	—
Bonora 2011	15	10 years: 4.3 (2.7–5.9)	—	10 years: 37.0 (20.2–53.8)	—	10 years: 17.0 (5.3–28.7)	10 years: 49.2 (17.9–80.5)	$HbA1c_{6.0}$: 25.8	—
De Abreu 2015	10	—	—	—	18.1 (10.7–28.2)	—	—	—	—
Derakhshan 2016	11.7	—	30.3	6.5 years: 69.4 (56.0–86.1)	6.5 years: 39.5 (34.4–45.4)	6.5 years: 41.6 (36.1–47.9)	—	—	—
Dowse 1991	6.2	10.5	—	—	—	40.4	—	—	—
Forouhi 2007	10	2.4 (1.2–4.8) 4 years: 2.64 (1.23–4.05)	—	17.5 (12.5–24.5)	10.6 (8.1–13.9) ($IFG_{5.6}$: FPG 5.6–6.9)	4 years: 22.5 (20.4–24.6)	—	—	—
Han 2017	12	12.3	IFG or IGT: 58.0	—	i-$IFG_{5.6}$: 51.3	i-IGT: 53.1	114.4	10 years: $HbA1c_{5.7}$: 43.2	—

(Continued)

Heianza 2012	5	2.3	—	104	34.6	—	—	$HbA1c_{5.7}$: 51.0 $HbA1c_{6.0}$: 129.2	$HbA1c_{5.7}$ and $IFG_{5.6}$: 30.6 $HbA1c_{6.0}$ and $IFG_{5.6}$: 34.4
Janghorbani 2015	6.8	3.1 (1.5–4.7) 2.3 years: 4.6 (1.28–11.7)	—	—	16.3 (10.3–24.4) 2.3 years: i-$IFG_{5.6}$: 50.7 (20.7–102.0)	25.9 (17.0–37.7) 2.3 years: i-IGT: 99.7 (77.1–126.0)	57.9 (46.1–71.7)	—	—
Jiamjaras-rangsi 2008a	2.6	—	—	—	31.5 (11.4–86.8)	—	—	—	—
Latifi 2016	5	21.9	—	—	34.5	—	—	—	—
Li 2003	5	18.8	—	93.7	—	60.7	117	—	—
Ligthart 2016	14.7	—	—	43.0 (39.2–47.2)	—	—	—	—	—
Liu 2008	5	9	—	—	22.5	—	—	—	—
Magliano 2008	5	0.2 (0.2–0.3) (incidence percent per years)	—	$i\text{-}IFG_{6.1}$: 2.6 (1.8–3.4) (incidence percent per years)	—	i-IGT: 3.5 (2.9–4.2) (incidence percent per years)	—	—	—
Meigs 2003	5, 10	Per 100 person-years (annualised rate): FPG ≥ 7.0: 0.64 (0.32–1.13) 2-h PG ≥ 11.1: 2.77 (2.01–3.71)	—	—	—	—	Per 100 person-years (annualised rate): IFG *or* IGT FPG ≥ 7.0: 0.98 (0.65–1.41) 2-h PG ≥ 11.1:	—	—

(Continued)

							4.61 (3.77–5.56)		
Mohan 2008	8	17.5	—	—	—	64.8	—	—	—
Nakagami 2016	5	—	—	1	—	—	—	—	—
Nakanishi 2004	7	1.5	—	3.3	—	—	—	—	—
Park 2006	4.1	5.7	—	—	31.3	—	—	—	—
Rajala 2000	4.6	—	—	—	—	41 (28–57)	—	—	—
Rasmussen 2008	3.5 (i-IFG$_{5.6}$: 2.5 , IGT: 2.1)	—	—	—	i-IFG$_{5.6}$: 11.8 (9.9–13.8) per 100 person-years	17.0 (14.9–19.1) per 100 person-years (i-IGT: 11.8 (9.7–13.9)	27 (22.5–31.7) per 100 person-years	—	—
Rathmann 2009	7	—	—	i-IFG$_{6.1}$: 24.2 (12.5–42.3)	—	i-IGT: 42.0 (29.0–58.7)	77.9 (48.8–117.9)	—	—
Rijkelijkhuizen 2007	6.4	7	—	66.5 (49.9–83.0)	32.7 (26.3–39.1)	i-IGT: 57.9	112.2	—	—
Sadeghi 2015	7	Total: 14.1 (12.5–15.9) Men: 12.8 (10.7–15.3) Women: 15.5 (13.1–18.3)	—	—	Total: 48.4 (35.0–66.7) Men: 46.4 (28.9–74.7) Women: 50.1 (32.3–77.7)	Total: 40.3 (30.2–53.8) Men: 41.4 (25.7–66.6) Women: 39.6 (27.5–57.0)	Total: 137.6 (103.7–182.5) Men: 129.9 (83.0–203.7) Women: 143.1 (99.4–205.9)	—	—
Söderberg 2004	11	—	—	87–92: Men: 54.1 (48.0–60.1) Women: 35.1 (30.3–40.0) 92–98:	—	87–92: Men: 60.7 (54.3–67.1) Women: 47.9 (42.2–53.6) 92–98: Men: 119.6 (110.6–128.6) Women: 81.0 (73.6–88.4)	—	—	—

(Continued)

				Men: 60.5 (54.1–67.0) Women: 74–7 (67.8–81.8)					
Soriguer 2008	6	7.2 (4.2–12.4)	—	—	38.1 (25.3–57.3)	31.1 (18.4–52.5)	66.0 (39.1–111.5)	—	—
Valdes 2008	6.3	3.8 (2.1–6.8) for i-IGT and IFG/IGT: 5.0 (2.8–8)	—	58.0 (37–90.9)	19.5 (11.5–32.9)	37.9 (24.7–58.1) i-IGT: 21 (10.9–40.4)	95.2 (54.1–167.7)	—	—
Vijayakumar 2017	Adults: 4.6 Children: 5.2	—	—	—	Boys: 22 Men: 70 Girls: 55 Women: 101	Boys: 38 Men: 94 Girls: 60 Women: 118	—	Boys: 52 Men: 100 Girls: 100 Women: 118	—
Wang 2011	7.8	21.1	—	—	Total: 66.2 Men: 57.7 Women: 73.4	Total: 95.8 Men: 98.1 Women: 94.8	Total: 109 Men: 109 Women: 109	—	—

CI: confidence interval; **FPG**: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **$HbA1c_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG; **i-**: isolated; **$IFG_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT;**NGT**: normal glucose tolerance; **T2DM**: type 2 diabetes mellitus

Appendix 13. T2DM cases and person-time (for calculation incidence rate ratios)

Study ID	Persons (cases) with diabetes with/without IH at baseline				
	Follow-up (years)	Cases in IH group	Person-years for IH group	Cases in normoglycaemic group	Person-years for normoglycaemic group
Anjana 2015	9.1	i-IFG$_{5.6}$: 32 i-IGT: 86 IFG/IGT: 58	i-IFG$_{5.6}$: 525 i-IGT: 1269 IFG$_{5.6}$/IGT: 434	209	9398
De Abreu 2015	10	IFG$_{5.6}$: 21	IFG$_{5.6}$: 1768	11	—
Bae 2011	4	HbA1c$_{5.7}$: 373 HbA1c$_{6.0}$: 187	HbA1c$_{5.7}$: 6594 HbA1c$_{6.0}$: 1338	—	—
Bonora 2011	10	IFG$_{6.1}$: 18 IGT: 8 IFG/IGT: 9	IFG$_{6.1}$: 486 IGT: 471 IFG/IGT: 183	29	6704
Derakhshan 2016	11.7	IFG$_{5.6}$: 150	IFG$_{5.6}$: 4950	162	39,901
Dowse 1991	6.2	IGT: 13	IGT: 322	14	1339
Forouhi 2007	10 4.44 years:	IFG$_{6.1}$: 34 IFG$_{5.6}$: 53 4.44 years: IGT: 17	IFG$_{6.1}$: 1943 IFG$_{5.6}$: 5000 4.44 years: IGT: 756	8 4.44 years: 9	3333 4.44 years: 3409
Guerrero-Romero 2006	5	IGT: 20	IGT: 343	1	1388
Han 2017	12	i-IFG$_{5.6}$: 81 i-IGT: 624 IFG/IGT: 138	i-IFG$_{5.6}$: 1579 i-IGT: 11,744 IFG/IGT: 1206	657	53,461
Heianza 2012	5	IFG$_{5.6}$: 108 HbA1c$_{5.7}$: 30 HbA1c$_{5.7}$/IFG$_{5.6}$: 154	IFG$_{5.6}$: 5920 HbA1c$_{5.7}$: 1965 HbA1c$_{5.7}$/IFG$_{5.6}$: 1641	46	19,961
Janghorbani 2015	6.8	i-IFG$_{5.6}$: 23 i-IGT: 26 IFG/IGT: 214	i-IFG$_{5.6}$: 1409 i-IGT: 1005 IFG/IGT: 1347	14	4578
Li 2003	5	i-IFG$_{6.1}$: 16 i-IGT: 33	i-IFG$_{6.1}$: 171 i-IGT: 544	38	2026

(Continued)

		IFG/IGT: 20	IFG/IGT: 179		
Ligthart 2016	14.7	$IFG_{6.1}$: 425	$iFG_{6.1}$: 9884	—	—
Meigs 2003	5, 10	IFG *or* IGT T2DM measured by: FPG ≥ 7.0: 26 2-h PG ≥ 11.1: 101	IFG *or* IGT T2DM measured by: FPG ≥ 7.0: 2647 2-h PG ≥ 11.1: 2192	28	1539
Mohan 2008	8	IGT: 15	IGT: 247	64	3665
Nakanishi 2004	7	$IFG_{6.1}$: 5	$IFG_{6.1}$: 1506	51	34,308
Park 2006	4.1	$IFG_{5.6}$: 40	$IFG_{5.6}$: 1278	116	20,298
Rijke-lijkhuizen 2007	6.4	i-$IFG_{6.1}$: 35 i-IGT: 27 IFG/IGT: 20	i-$IFG_{6.1}$: 681 i-IGT: 466 IFG/IGT: 178	51	7286
Soriguer 2008	6	$IFG_{5.6}$: 23 IGT: 14 IFG/IGT: 14	$IFG_{5.6}$: 604 IGT: 450 IFG/IGT: 212	13	1806
Valdes 2008	6.3	$IFG_{5.6}$: 14 $IFG_{6.1}$: 19 i-IGT: 9 IFG/IGT: 12	$IFG_{5.6}$: 718 $IFG_{6.1}$:328 i-IGT: 429 IFG/IGT: 126	11 (16 for i-IGT and IFG/IGT)	2923 (3200 for i-IGT and IFG/IGT)
Wang 2011	7.8	$IFG_{5.6}$: 137 IGT: 75 IFG/IGT: 66	$IFG_{5.6}$: 2374 IGT: 765 IFG/IGT: 605	34	1613

FPG: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **$HbA1c_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG; **i-**: isolated; **$IFG_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT; **IH**: intermediate hyperglycaemia;**T2DM**: type 2 diabetes mellitus

Appendix 14. Odds ratios and hazard ratios as the effect measures for the development of T2DM

Study ID	Adjusted [unadjusted] ratios (95% CI) for the development of diabetes comparing IH with normoglycaemia at baseline								
	Follow-up (years)	$IFG_{6.1}$	$IFG_{5.6}$	IGT	'Prediabetes'	IFG/IGT	HbA1c	HbA1c/IFG	Ratio
Admiraal 2014	10	—	Total cohort: 6.1 (3.1–12.1) [5.7 (3.1–10.5)] South-Asian Surinamese: 11.1 (3.0–40.8) [9.9 (2.9–34.3)] African Surinamese: 5.1 (2.0–13.3) [6.2 (2.6–14.9)] "Ethnic Dutch": 2.2 (0.5–10.2) [2.1 (0.5–9.3)]	—	—	—	—	—	Odds ratio
Aekplakorn 2006	12	—	[2.41 (1.78–3.28)]	[4.36 (3.41–5.57)]	—	—	—	—	Odds ratio
Bae 2011	4	—	—	—	—	—	$HbA1c_{5.7}$: 6.5 (3.7–10.2) $HbA1c_{6.0}$:41.3 (24.7–69.2) [compared with HbA1c < 5.0]	—	Hazard ratio
Bergman 2016	24	20 years: i-$IFG_{6.1}$: 3.43 (1.88–6.28)	20 years: i-$IFG_{5.6}$: 1.11 (0.76–1.61)	5.64 (2.74–12.33) 20 years: 3.03 (1.80–5.09)	—	$IFG_{5.6}$ + IGT: 2.79 (1.56–5.00) $IFG_{6.1}$ + IGT: 3.85 (1.73–8.54)	—	—	Odds ratio

(Continued)

Bonora 2011	15	5.83 (3.23–10.54) 10 years: 5.7 (2.8–11.4) [3.9 (1.56–9.3)]		10 years: [3.9 (1.6–9.3)]	—	10 years: [20.5 (7.6–55.3)]	$HbA1c_{6.0}$: 9.74 (4.21–22.56)	—	Hazard ratio, odds ratio (10 years)
Cederberg 2010	9.7	2.37 (1.49–3.78) [2.56 (1.57–4.16)]	—	2.90 (1.90–4.43) [2.98 (1.94–4.569]	—	—	$HbA1c_{5.7}$: 2.42 (1.50–3.91) [2.78 (1.80–4.31)]	—	Risk ratio
Chamnan 2011	3	—	—	—	—	—	$HbA1c_{6.0}$: 15.6 (6.9–35.7) [15.5 (7.2–33.3)]	—	Odds ratio
Chen 2003	3	4.4 (1.9–10.6)	—	—	—	—	—	—	Odds ratio
Corona-do-Malagon 2009	1, 2	—	—	—	[At 1 year: 7.7 (2.1–27.9)]	—	—	—	Relative risk
Cugati 2007	10	[19.13 (11.59–31.66)]	—	—	—	—	—	—	Odds ratio
De Abreu 2015	10	5.75 (1.86–17.78)	—	—	—	—	—	—	Odds ratio
Der-akhshan 2016	11.7	6.5 years: 4.1 (2.9–5.6)	6.5 years: 3.0 (2.3–3.9)	—	$IFG_{5.6}$ and/or IGT: 4.98 (4.08–6.07)	—	—	—	Hazard ratio, relative risk (6.5 years)
Dowse 1991	6.2	—	—	[3.6 (1.4–9.1)]	—	—	—	—	Odds ratio
Ferrannini 2009	7	[3.73 (2.18–6.39)]	[4.28 (3.21–5.71)]	[4.01 (3.12–5.14)]	—	—	—	—	Relative risk

(Continued)

Filippatos 2016	10	—	3.43 (2.17–5.44)	—	—	—	—	—	Odds ratio
Forouhi 2007	10	4.4 (1.9–10.0)	2.9 (1.3–6.3)	—	—	—	—	—	Hazard ratio
Han 2017	12	—	i-IFG$_{5.6}$: 3.61 (2.85–4.57)	i-IGT: 4.06 (3.62–4.55)	—	8.21 (6.79–9.94)	6 years: HbA1c$_{6.0}$: Men: 4.28 (2.41–7.58) Women: 4.05 (1.36–12.07)	—	Hazard ratio
Hanley 2005	5.2	—	—	5.42 (3.60–8.17)	—	—	—	—	Odds ratio
Heianza 2012	5	11.4 (8.09–16.1)	6.18 (4.34–8.80)	—	—	—	HbA1c$_{5.7}$: 6.53 (3.79–9.64) HbA1c$_{6.0}$: 7.42 (3.67–15.0)	HbA1c$_{5.7}$ + IFG$_{5.6}$: 32.5 (23.0–45.8) HbA1c$_{5.7}$ + IFG$_{6.1}$: 37.9 (28.1–51.1) HbA1c$_{6.0}$ + IFG$_{5.6}$: 53.7 (38.4–75.1) HbA1c$_{6.0}$ + IFG$_{6.1}$: 52.3 (37.8–72.3)	Hazard ratio
Janghorbani 2015	6.8	—	7.4 (3.7–14.8) [8.2 (4.2–16.0)]	9.4 (4.8–18.6)	—	22.5 (12.4–41.0)	—	—	Hazard ratio

(Continued)

				[10.0 (5.2–19.1)]		[26.7 (15.1–47.2)]			
Jeong 2010	5	—	5.66 (3.44–9.31)	6.01 (3.23–11.2)	—	—	—	—	Odds ratio
Kim 2005	5	Total: 34.57 (12.18–98.10) Men: 76.02 (10.42–544.51) Women: 15.46 (4.08–58.61)	Total: 4.77 (1.60–14.15) Men: 9.5 (1.25–72.24) Women: 1.91 (0.45–8.21)	—	—	—	—	—	Hazard ratio
Kim 2016a	5.2	21.1 (16.8–26.3)	—	—	—	—	$HbA1c_{6.0}$: 23.2 (18.7–28.7)	$HbA1c_{5.7}$ + $IFG_{5.6}$: 46.7 (33.5–64.9)	Odds ratio
Latifi 2016	5	—	1.04 (1.00–1.07)	—	—	—	—	—	Odds ratio
Leiva 2014	6	2.06 (1.76-5.14)	-	-	-	-	-	-	Odds ratio
Levitzky 2008	4	Women: 26.3 (17.4–39.8) Men: 12.9 (9.3–18.1)	Women: 22.3 (13.0–38.1) Men: 12.7 (8.1–20.0)	—	—	—	—	—	Odds ratio
Li 2003	5	5.78 (3.20–10.43)	—	i-IGT: 2.94 (1.81–4.76)	—	6.17 (3.41–11.15)	—	—	Hazard ratio
Lipska 2013	7	11.4 (7.1–18.4)	$IFG_{5.6}$: Total: 3.5 (1.9–6.3) Men: 8.6 (3.4–21.9) Women: 1.5 (0.5–4.6) White: 3.2 (1.5–6.6) Black: 4.6 (1.6–13.3)	—	—	—	i-$HbA1c_{5.7}$: Total: 8.0 (4.8–13.2) Men: 24.2 (9.5–61.8) Women: 4.6 (2.4–8.7) White: 10.2 (5.0–20.8) Black:	$HbA1c_{5.7}$ + $IFG_{5.6}$: Total: 26.2 (16.3–42.1) Men: 51.1 (21.2–123.2) Women:	Odds ratio

(Continued)

							5.8 (2.9–11.7)	20.4 (10.9–38.0) White: 34.9 (19.1–63.8) Black: 14.9 (6.8–32.6)	
Liu 2008	5	—	4.5 (2.0–10.1)	—	—	—	—	—	Risk ratio
Liu 2016	10.9	1.99 (1.37–2.90) [2.12 (1.46–3.08)]	—	—	—	—	—	—	Hazard ratio
Liu 2017	7.8	—	3.67 (3.20–4.21) [4.36 (3.83–4.97)]	—	—	—	—	—	Odds ratio
Lorenzo 2003	7–8	—	—	6.37 (4.37–9.28)	—	—	—	—	Odds ratio
Lyssenko 2005	6	[i-IFG$_{6.1}$: 2.3 (1.4–3.7)]	—	[i-IGT: 3.5 (2.1–5.8)]	—	[3.8 (2.3–6.2)]	—	—	Hazard ratio
Man 2017	6	—	—	—	—	4.54 (2.65–7.78)	—	—	Risk ratio
Mykkänen 1993	3.5	—	—	[9.85 (6.14–15.8)]	—	—	—	—	Odds ratio
Nakagami 2016	5	34.89 (19.65–61.95) [37.85 (22.73–63.05)]	—	—	—	—	HbA1c$_{6.0}$: [63.16 (33.94–117.52)] HbA1c$_{5.7}$: 8.77(4.47–17.21)	—	Hazard ratio

(Continued)

							[9.72(4.96–19.05)]		
Nakanishi 2004	7	1.31 (0.51–3.34)	—	—	—	—	—	—	Risk ratio
Rathmann 2009	7	[4.7 (2.2–10.0)]	—	[8.8 (5.0–15.6)]	—	[21.2 (10.4–43.3)]	—	—	Odds ratio
Rijke-lijkhuizen 2007	6.4	i-IFG$_{6.1}$: 10.0 (6.1–16.5)	—	i-IGT: 10.9 (6.0–19.9)	—	39.5 (17.0–92.1)	—	—	Odds ratio
Sadeghi 2015	7	—	i-IFG$_{5.6}$: 3.30 (2.16–5.06)	i-IGT: 2.52 (1.73–3.69)	—	12.6 (7.39–21.4)	—	—	Odds ratio
Sato 2009	4	22.52 (17.73–28.60)		—	—	—	—	—	Odds ratio
Song 2015	4	—	Men: 7.50 (2.76–20.33) Women: 4.27 (1.52–12.00)	—	—	—	—	—	Relative risk
Soriguer 2008	6	—	[5.3 (2.7–10.4)]	4.3 (2.0–9.2)	—	9.2 (4.3–19.5)	—	—	Relative risk
Stengard 1992	5	—	—	3.1 (1.2–8.2)	—	—	—	—	Odds ratio
Vaccaro 1999	11.5		[i-IFG$_{6.1}$: 1.2 (0.3–10.2)]	[i-IGT: 6.2 (2.7–13.8)]	—	[10.3 (2.2–46.8)]	—	—	Odds ratio
Valdes 2008	6.3	12.1 (4.6–31.7) [11.5 (5.6–23.6]	3.9 (1.6–9.8)	[6.7 (3.4–13.3)] [i-IGT: 4.7 (1.9–11.7)]	—	[45.6 (15.8–131.4)]	—	—	Odds ratio
Viswanathan 2007	5	—	—	1.57	—	—	—	—	Odds ratio
Wang 2007	5	2.71 (1.43–5.16) Men: 2.29 (0.95–5.49)	1.80 (0.96–3.40) Men: 1.79 (0.70–4.57) Women: 2.08 (0.93–4.67)	3.15 (1.60–6.19) i-IGT(IFG$_{6.1}$):	—	IGT/IFG$_{6.1}$: Men: 10.23 (3.84–27.30)	—	—	Risk ratio, odds ratio

(Continued)

		Women: 1.95 (0.83–4.61)		Men: 7.33 (2.62–20.51) Women: 1.65 (0.76–3.60) i-IGT(IFG$_{5.}$): Men: 7.50 (1.62–34.63) Women: 2.21 (0.77–6.36)		Women: 7.11 (2.56–19.72) IGT/IFG$_{5.6}$: Men: 9.81 (3.5–27.21) Women: 4.67 (1.87–11.62)			
Wang 2011	7, 8	—	Total: 2.38 (1.85–3.05) [2.68 (2.25–3.63] Men: 2.10 (1.40–3.15) [2.78 (1.91–4.04)] Women: 2.46 (1.78–3.39) [2.92 (2.15–3.98] 4 years: [3.12 (2.31–4.22)]	Total: 3.47 (2.64–4.55) [4.11 (3.20–5.27)] Men: 3.82 (2.41–6.04) [4.72 (3.15–7.09)] Women: 3.16 (2.26–4.43) [3.74 (2.72–5.14)]	—	Total: 4.06 (3.05–5.40) [4.68 (3.62–6.07)] Men: 4.44 (2.75–7.15) [5.28 (3.49–7.99)] Women: 3.80 (2.66–5.42) [4.30 (3.09–5.99)]	4 years: HbA1c$_{6.0}$: 5.89 (4.23–8.19)	—	Hazard ratio, odds ratio (4 years)
Warren 2017	Cohort 1: 22 Cohort 2: 16	Cohort 1: 2.85 (2.60–3.12) Black: 2.66 (2.26–3.13) White: 2.86 (2.57–3.19) Cohort 2:	Cohort 1: 2.26 (2.08–2.45) Black: 2.05 (1.75–2.40) White: 2.30 (2.10–2.53) Cohort 2: 2.70 (2.43–3.00) Black: 2.65 (2.11–3.32)	Cohort 2: 2.06 (1.84-2.31) Black: 2.55 (2.01–3.22) White: 1.95 (1.71–2.21)	—	—	Cohort 1: HbA1c$_{5.7}$: 2.71 (2.48–2.95) Black: 2.24 (1.92–2.61) White: 2.91 (2.63–3.22)	—	Hazard ratio

(Continued)

		3.41 (3.01–3.85) Black: 3.16 (2.47–4.06) White: 3.67 (3.18–4.23)	White: 2.87 (2.54–3.23)				HbA1c$_{6.0}$: 3.12 (2.81–3.46) Black: 2.60 (2.21–3.05) White: 3.64 (3.20–4.14) 6 years: HbA1c$_{6.0}$: 9.24 (7.20–11.86)		
Yeboah 2011	7.5	—	10.5 (8.4–13.1) [13.2 (10.7–16.2)]	—	—	—	—	—	Hazard ratio
Zethelius 2004	7	—	—	[2.18 (1.43–3.34)]	—	—	—	—	Odds ratio

[a]Unreliable adjusted HbA1c$_{6.0}$ interval in publication: 105.47 (29.30–101.86)

CI: confidence interval; **FPG**: fasting plasma glucose; **HbA1c**: glycosylated haemoglobin A1c; **HbA1c$_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG; i-: isolated; **IFG$_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT; **IH**: intermediate hyperglycaemia; **T2DM**: type 2 diabetes mellitus

Appendix 15. Regression from intermediate hyperglycaemia to normoglycaemia

Study ID	Follow-up (years)	Regression to normoglycaemia from IH at baseline
Ammari 1998	2	IGT: 27/68 (39.7%)
Anjana 2015	9.1	i-$IFG_{5.6}$ or i-IGT: 52/299 (17.4%)
Baena-Diez 2011	10	$IFG_{6.1}$: 57/115 (49.6%)
Bai 1999	1	IGT: 162/252 (64.3%)
Charles 1997	2	IGT: 273/418 (65.3%)
Chen 2003	3	$IFG_{6.1}$: 129/156 (82.6%)
Coronado-Malagon 2009	1, 2	'Prediabetes': 76/217 (35%)
Cugati 2007	10	$IFG_{5.6}$: 5 years: 94/229 (27.9%); 10 years: 15/229 (6.6%) $IFG_{6.1}$: 5 years: 34/50 (68%); 10 years: 2/50 (4%)
De Abreu 2015	10	$IFG_{5.6}$: 104/187 (55.6%)
Dowse 1991	6.2	IGT: 20/51 (39%)
Ferrannini 2009	7	IGT: 73/170 (42.9%)
Forouhi 2007	10	$IFG_{6.1}$: 143/257 (55.6%)
Guerrero-Romero 2006	5	IGT: 3/75 (4%)
Heianza 2012	5	$IFG_{5.6}$: 383/1680 (22.8%) $IFG_{6.1}$: 101/380 (26.5%) $HbA1c_{5.7}$: 263/822 (32%) $HbA1c_{6.0}$: 63/203 (31.0%) $HbA1c_{5.7}/IFG_{5.6}$: 428/2092 (20.5%) $HbA1c_{6.0}/IFG_{5.6}$: 392/1748 (22.4%)
Inoue 1996	2.5	IGT: 11/37 (29.7%)
Jiamjarasrangsi 2008a	2.6	$IFG_{5.6}$: 197/320 (61.6%)
Kim 2008	2	IFG total: 908/1829 (49.6%) IFG5.6: 747/1335 (56%) $IFG_{6.1}$: 161/494 (32.6%)
Kleber 2010	1	IGT: 52/79 (65.8%)
Kleber 2011	3.9	IGT: 96/119 (80.1%)
Ko 1999	1.4	IGT: 60/123 (48.8%)
Ko 2001	1.7	$IFG_{6.1}$: 17/55 (30.9%)

(Continued)

Larsson 2000	10	i-IFG$_{6.1}$: 27/42 (64.3%) i-IGT: 36/66 (54.6%) IFG/IGT: 17/30 (56.7%)
Latifi 2016	5	IFG$_{5.6}$: 62/124 (50%)
Lecomte 2007	5	IFG$_{6.1}$: 297/743 (44%)
Leiva 2014	6	IFG$_{6.1}$: 0/28 (0%)
Li 2003	2	IGT: 22/131 (16.8%)
Liu 2014	3	IFG or IGT: 130/450 (28.9%)
Lyssenko 2005	6	IFG or IGT: 379/686 (55.2%)
Marshall 1994	1.9	IGT: 60/123 (48.8%)
Mohan 2008	8	IGT: 6/37 (16.2%)
Motala 2003	10	IGT: 16/35 (45.7%) 4 years: IGT: 28/72 (38.9%)
Mykkänen 1993	3.5	IGT: 72/203 (35.5%)
Peterson 2017	10	IGT: 8/29 (27.6%)
Qian 2012	5	i-IFG$_{6.1}$: 14/46 (30.4%) i-IGT: 45/120 (37.5%) IFG/IGT: 8/33 (24.2%)
Rajala 2000	4.6	IGT: 96/171 (56.1%) (2.1 years) IGT: 115/183 (62.8%)
Ramachandran 1986	3.3	IGT: 34/107 (31.8%)
Rijkelijkhuizen 2007	6.4	IFG$_{6.1}$: 28/149 (18.8%) IFG$_{5.6}$: 33/488 (6.8%) (3 years) IGT: 35/158 (22.2%)
Sadeghi 2015	7	IFG$_{5.6}$ *and/or* IGT: 148/373 (39.7%)
Sasaki 1982	7	IGT: 5/13 (38.5%)
Schranz 1989	6	IGT: 25/75 (33.3%)
Sharifi 2013	7	IFG$_{5.6}$: 53/123 (43.1%)
Söderberg 2004	11	i-IFG$_{6.1}$: 153/402 (38%) IGT: 296/1253 (23.6%)
Song 2016a	10.8	Total: 75/334 (22.5%) Men: 28/125 (22.4%)

(Continued)

		Women: 47/209 (22.5%)
Stengard 1992	5	IGT: 79/234 (33.8%)
Toshihiro 2008	3.2	IFG and/or IGT: 39/128 (30.5%)
Wang 2011	4	IGT: 147/532 (27.6%)
Wat 2001	2	IGT: 174/322 (54%)
Weiss 2005	1.7	i-IGT: 15/33 (45.5%)
Wong 2003	8	IGT: 122/291 (41.9%)

HbA1c: glycosylated haemoglobin A1c; **$HbA1c_{5.7/6.0}$**: HbA1c threshold 5.7% or 6.0% (usually reflecting 5.7% to 6.4% and 6.0% to 6.4%, respectively); **HbA1c/IFG**: both HbA1c and IFG;**i-**: isolated; **$IFG_{5.6/6.1}$**: impaired fasting glucose (threshold 5.6 mmol/L or 6.1 mmol/L); **IGT**: impaired glucose tolerance; **IFG/IGT**: both IFG and IGT; **IH**: intermediate hyperglycaemia; **IQR**: interquartile range; **SD**: standard deviation

Appendix 16. Confounder adjustment (I)

Study ID	Age	Sex	Body mass index, waist circumference, waist-to-hip ratio	'Ethnicity'	Site	Smoking status	Drinking status	Physical activity	Medications
Admiraal 2014	Yes	Yes	Yes	No	No	No	No	No	No
Aekplakorn 2006	No	No	No	No	No	No	No	No	No
Bae 2011	Yes	Yes	No	No	No	No	No	No	No
Bergman 2016	Yes	Yes	Yes	No	No	Yes	No	No	No
Bonora 2011	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No
Cederberg 2010	No	Yes	Yes	No	No	Yes	Yes	Yes	No
Chamnan 2011	Yes	Yes	Yes	No	No	Yes	No	No	Yes
Chen 2003	Yes	Yes	Yes	No	No	No	No	No	No
Coronado-Malagon 2009	No	No	No	No	No	No	No	No	No
Cugati 2007	Yes	Yes	No	No	No	No	No	No	No
De Abreu 2015	Yes	No	Yes	No	No	Yes	Yes	Yes	No
Derakhshan 2016	Yes	Yes	Yes	No	No	Yes	No	Yes	No
Dowse 1991	No	No	No	No	No	No	No	No	No
Ferrannini 2009	No	No	No	No	No	No	No	No	No
Filippatos 2016	Yes	Yes	No	No	No	Yes	No	Yes	No
Forouhi 2007	Yes	Yes	Yes	No	No	Yes	No	Yes	No
Han 2017	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No

(Continued)

Hanley 2005	Yes	Yes	No	Yes	Yes	No	No	No	No
Heianza 2012	Yes	Yes	Yes	No	No	Yes	No	No	No
Janghorbani 2015	Yes	Yes	Yes	No	No	No	No	No	No
Jeong 2010	No	No	Yes	No	No	No	No	No	No
Kim 2005	Yes	Yes	Yes	No	No	No	No	No	No
Kim 2016a	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No
Latifi 2016	Yes	No	Yes	Yes	No	No	No	No	No
Leiva 2014	No	No	No	No	No	Yes	No	No	Yes
Levitzky 2008	Yes	No	Yes	No	No	Yes	No	No	No
Li 2003	Yes	Yes	Yes	No	No	No	No	No	No
Lipska 2013	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No
Liu 2008	Yes	Yes	No	No	No	Yes	Yes	No	No
Liu 2016	Yes	No	Yes	No	No	No	No	Yes	No
Liu 2017	Yes	No	No	No	No	Yes	Yes	Yes	No
Lorenzo 2003	Yes	Yes	No	No	No	No	No	No	No
Lyssenko 2005	No	No	Yes	No	No	No	No	No	No
Man 2017	Yes	Yes	Yes	No	No	Yes	No	No	No
Mykkänen 1993	No	No	No	No	No	No	No	No	No
Nakagami 2016	Yes	No	Yes	No	No	Yes	Yes	No	No
Nakanishi 2004	Yes	No	No	No	No	Yes	Yes	No	No
Rathmann 2009	Yes	Yes	No	No	Yes	No	No	No	No

(Continued)

Rijkelijkhuizen 2007	Yes	Yes	No	No	No	No	No	No	No
Sadeghi 2015	Yes	Yes	Yes	No	No	No	No	No	No
Sato 2009	Yes	NA	Yes	No	No	Yes	Yes	Yes	No
Song 2015	Yes	No	Yes	No	No	Yes	Yes	Yes	No
Soriguer 2008	Yes	Yes	Yes	No	No	No	No	No	No
Stengard 1992	Yes	No	Yes	No	No	No	No	No	No
Vaccaro 1999	No	No	No	No	No	No	No	No	No
Valdes 2008	Yes	Yes	Yes	No	No	No	No	No	No
Viswanathan 2007	Yes	No	Yes	No	No	No	No	No	No
Wang 2007	Yes	Yes	No	No	No	Yes	No	No	No
Wang 2011	Yes	Yes	Yes	No	No	Yes	No	No	No
Warren 2017	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Yeboah 2011	Yes	Yes	Yes	Yes	No	No	No	Yes	No
Zethelius 2004	Yes	No	Yes	No	No	No	No	No	No

'No' denotes possible confounder but statistical analysis did not adjust for this covariate

'Yes' indicates that statistical analysis adjusted for this confounder

NA: not applicable

Appendix 17. Confounder adjustment (II)

Study ID	Cardiovascular disease	Glomerular filtration rate, albuminuria	Blood pressure, hypertension	Family history of diabetes	Socioeconomic status	Region	Depression	Triglycerides	Cholesterol
Admiraal 2014	No	No	No	No	No	No	No	No	No
Aekplakorn 2006	No	No	No	No	No	No	No	No	No
Bae 2011	No	No	No	No	No	No	No	No	No
Bergman 2016	Yes	No	Yes	No	No	No	No	Yes	Yes
Bonora 2011	No	No	Yes	Yes	Yes	No	No	Yes	Yes
Cederberg 2010	No	No	No	No	No	No	No	No	No
Chamnan 2011	No	No	Yes	Yes	Yes	No	No	Yes	Yes
Chen 2003	No	No	No	Yes	No	No	No	Yes	No
Coronado-Malagon 2009	No	No	No	No	No	No	No	No	No
Cugati 2007	No	No	No	No	No	No	No	No	No
De Abreu 2015	No	No	Yes	No	No	No	No	Yes	Yes
Derakhshan 2016	No	No	No	Yes	Yes	No	No	Yes	Yes
Dowse 1991	No	No	No	No	No	No	No	No	No
Ferrannini 2009	No	No	No	No	No	No	No	No	No
Filippatos 2016	No	No	Yes	No	No	No	No	Yes	Yes
Forouhi 2007	No	No	No	Yes	No	No	No	No	No
Han 2017	No	No	Yes	Yes	No	Yes	No	Yes	Yes

(Continued)

Hanley 2005	No	No	No	No	No	No	No	No	No
Heianza 2012	No	No	Yes	Yes	No	No	No	Yes	Yes
Janghorbani 2015	No	No	No	No	No	No	No	Yes	Yes
Jeong 2010	No	No	Yes	No	No	No	No	Yes	Yes
Kim 2005	No	No	Yes	Yes	No	No	No	Yes	Yes
Kim 2016a	No	No	Yes	Yes	No	No	No	Yes	Yes
Latifi 2016	No	No	Yes	Yes	No	No	No	No	No
Leiva 2014	No	No	No	Yes	No	No	No	No	No
Levitzky 2008	No	No	No	No	No	No	No	No	No
Li 2003	No	No	No	No	No	No	No	No	No
Lipska 2013	No	No	Yes	No	No	No	No	No	No
Liu 2008	No	No	No	Yes	No	No	No	No	No
Liu 2016	No	No	No	No	No	No	No	No	No
Liu 2017	No	No	No	No	Yes	Yes	No	No	No
Lorenzo 2003	No	No	No	Yes	No	No	No	No	No
Lyssenko 2005	No	No	No	No	No	No	No	No	No
Man 2017	No	No	Yes	Yes	Yes	No	No	No	Yes
Mykkänen 1993	No	No	No	No	No	No	No	No	No
Nakagami 2016	No	No	Yes	Yes	No	No	No	No	Yes
Nakanishi 2004	No	No	No	Yes	No	No	No	No	No
Rathmann 2009	No	No	Yes	No	No	No	No	No	No

(Continued)

Rijkelijkhuizen 2007	No	No	No	No	No	No	No	No	No
Sadeghi 2015	No	No	No	Yes	No	No	No	No	No
Sato 2009	No	No	No	Yes	No	No	No	No	No
Song 2015	No	No	Yes	Yes	No	No	No	Yes	No
Soriguer 2008	No	No	Yes	Yes	No	No	No	Yes	No
Stengard 1992	No	No	No	No	No	No	No	No	No
Vaccaro 1999	No	No	No	No	No	No	No	No	No
Valdes 2008	No	No	No	No	No	No	No	Yes	No
Viswanathan 2007	No	No	No	Yes	No	No	No	No	No
Wang 2007	No	No	No	Yes	Yes	No	No	No	Yes
Wang 2011	No	No	Yes	Yes	No	No	No	Yes	Yes
Warren 2017	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Yeboah 2011	No	No	No	No	Yes	No	No	No	No
Zethelius 2004	No	No	No	No	No	No	No	No	No

'No' denotes possible confounder but statistical analysis did not adjust for this covariate

'Yes' indicates that statistical analysis adjusted for this confounder

WHAT'S NEW

Date	Event	Description
26 November 2018	Amended	Plain language summary: explanation on fasting blood sugar and oral glucose tolerance test corrected

CONTRIBUTIONS OF AUTHORS

All review authors read and approved the final review draft.

Bernd Richter (BR): protocol and review draft, search strategy development, acquisition of trial reports, trial selection, data extraction of all trials, data analysis, data interpretation and writing of drafts.

Maria-Inti Metzendorf (MIM): search strategy development, trial selection, check of data extraction, review of drafts.

Bianca Hemmingsen (BH): protocol and review draft, trial selection, data interpretation and review of drafts.

Yemisi Takwoingi (YT): protocol and review draft, data analysis, data interpretation and review of drafts

DECLARATIONS OF INTEREST

BR: the World Health Organization (WHO) funded this review.

MIM: none known.

BH: none known.

YT: none known.

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Internal sources

- No sources of support supplied

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- World Health Organization, Other.

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We changed the title of the protocol from 'Intermediate hyperglycaemia as a predictor for the development of type 2 diabetes: prognostic factor exemplar review' to 'Development of type 2 diabetes mellitus in people with intermediate hyperglycaemia' to fit the objectives of the review. We also modified the objectives from "to assess whether intermediate hyperglycaemia is a predictor for the development of type 2 diabetes mellitus (T2DM)" to objective 1 "to assess the overall prognosis of people with IH for the development of T2DM and to assess how many people with IH revert back to normoglycaemia (regression), and objective 2 "to assess the difference in T2DM incidence in people with IH versus people with normoglycaemia". Both changes reflect the fact that our review addresses two prognostic questions at the same time. First, if people have intermediate hyperglycaemia at baseline, how many individuals develop type 2 diabetes in the future? This research question investigates the cumulative incidence of type 2 diabetes over time and does not depend on a comparison with a group with normoglycaemia at baseline; it is also important to note how many people change back from intermediate hyperglycaemia to normoglycaemia. The second prognostic question is, how does glycaemic status (intermediate hyperglycaemia compared with normoglycaemia) at baseline affect the development of type 2 diabetes? In particular, we were interested in intermediate hyperglycaemia, defined using impaired fasting glucose, impaired glucose tolerance and elevated glycosylated haemoglobin A1c and combinations thereof.

We specified inclusion criteria in more detail to explain the difference between studies evaluating the overall prognosis of people with intermediate hyperglycaemia and studies evaluating intermediate hyperglycaemia versus normoglycaemia as a prognostic factor developing type 2 diabetes mellitus.

Regarding methods, we explained our exclusion criteria in more detail and deleted 'conference abstract' as an exclusion criterion (we moved one formerly excluded study, Misnikova 2011, to 'Studies awaiting classification').

INDEX TERMS

Medical Subject Headings (MeSH)

Blood Glucose [analysis]; Diabetes Mellitus, Type 2 [epidemiology] [*etiology]; Disease Progression; Hyperglycemia [blood] [*complications]; Incidence; Prediabetic State [blood]; Prognosis; Prospective Studies

MeSH check words

Humans