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Empowering sex workers in India to reduce vulnerability to HIV and sexually transmitted diseases⋆

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Abstract

The Sonagachi Project was initiated in Kolkata, India in 1992 as a STD/HIV intervention for sex workers. The project evolved to adopt strategies common to women's empowerment programs globally (i.e., community mobilization, rights-based framing, advocacy, micro-finance) to address common factors that support effective, evidence-based HIV/STD prevention. The Sonagachi model is now a broadly diffused evidence-based empowerment program.

We previously demonstrated significant condom use increases among female sex workers in a 16 month replication trial of the Sonagachi empowerment intervention ($n = 110$) compared to a control community ($n = 106$) receiving standard care of STD clinic, condom promotion, and peer education in two randomly assigned rural towns in West Bengal, India (Basu et al., 2004). This article examines the intervention's impacts on 21 measured variables reflecting five common factors of effective HIV/STD prevention programs to estimate the impact of empowerment strategies on HIV/STD prevention program goals. The intervention which was conducted in 2000–2001 significantly: 1) improved knowledge of STDs and condom protection from STD and HIV, and maintained STD/HIV risk perceptions despite treatment; 2) provided a frame to motivate change based on reframing sex work as valid work, increasing disclosure of profession, and instilling a hopeful future orientation reflected in desire for more education or training; 3) improved skills in sexual and workplace negotiations reflected in increased refusal, condom decision-making, and ability to change work contract, but not ability to take leave; 4) built social support by increasing social interactions outside work, social function participation, and helping other sex workers; and 5) addressed environmental barriers of economic vulnerabilities by increasing savings and alternative income, but not working in other locations, nor reduced loan taking, and did not increase voting to build social capital. This study's results demonstrate that, compared to narrowcast clinical and prevention services alone, empowerment strategies can significantly impact a broader range of factors to reduce vulnerability to HIV/STDs.

Keywords

HIV; Sexually transmitted diseases (STD); Prevention; Sex workers; Empowerment; Replication; Intervention trial; India; Common factors

Introduction

The Sonagachi Project was conceived in 1992 to address vulnerability for sexually transmitted diseases (STD) and HIV infection among sex workers in red-light areas of Kolkata, India (Jana & Singh, 1995). It has since evolved to become a widely diffused model labeled an "empowerment approach" to STD/HIV prevention (Blankenship, Friedman, Dworkin, & Mantell, 2006; UNAIDS, 2000; Wallerstein, 2006), by successfully mobilizing diverse financial resources (e.g., WHO, DFID, Gates Foundation, government), and building a social movement of more than 60,000 sex workers to sustain and expand the program to over 60 communities in West Bengal (Jana, Basu, Rotheram-Borus, & Newman, 2004). The Sonagachi Project was also a model for (and its leadership advisors to) the recent Bill and Melinda Gates Foundation funded scale-up of HIV prevention targeting high-risk groups in India (i.e., Project Avahan).

This model program intervenes at multiple levels (structural or environmental, community, social network, individual) using core strategies common to women's empowerment programs globally to address five common factors of effective, evidence-based HIV prevention programs. The common factors framework resulted from content analyses of manuals for evidence-based interventions for HIV/STD prevention (Rotheram-Borus, Swendeman, Flannery, Rice, et al., 2009). Common factors represent what every HIV/STD prevention program does, or should do, to be effective and provides a framework for multiple intermediate prevention program goals: 1) provide a frame to motivate change; 2) increase knowledge of risk and protective factors; 3) build cognitive, affective, and behavioral skills; 4) reduce environmental barriers to change; and 5) build ongoing social support to sustain change over time.

To achieve HIV/STD prevention goals, the Sonagachi project has adopted empowerment strategies common across women's empowerment programs and organizations globally, identified in Kar, Pascual, and Chickering's (1999) "EMPOWER" review and synthesis: Education and leadership development, Media use and advocacy, Public education and participation, Organizing associations and unions, Work training and micro-enterprise, Enabling services and assistance, and Rights protection and promotion (see Jana et al., 2004 and methods below for Sonagachi specific details). Together, these strategies restructure risk environments to enable or "empower" sex workers to protect their health and families' well-being (Jana et al., 1998).

Due to Sonagachi's notoriety as a model program for replication, a large body of qualitative and descriptive research has emerged to elaborate Sonagachi's underlying *processes*, including: program development and intervention components (Jana et al., 1998, 2004); community participation (Basu & Dutta, 2008; Cornish, 2006a; Evans & Lambert, 2008a); advocacy and community leadership (Cornish & Ghosh, 2007; Pardasani, 2005); challenges to stigma and oppression (Cornish, 2006b); the role of agency and contextual contingencies in sexual practices (Evans & Lambert, 2008b); and sex worker collective identity in mobilizing condom use (Ghose, Swendeman, George, & Chowdhury, 2008). However, program *impacts* have only been reported quantitatively for increased condom use (Basu et al., 2004) and STD treatment seeking (Gangopadhyay et al., 2005) when compared to a standard care of STD clinics, peer education, and condom promotion.

We previously reported improved condom use rates over 16 months in a Songachi intervention replication community (39%) compared to standard care control (11%), and a 25% increase in consistent (i.e., 100%) condom users compared to a 16% decrease in control; STD incidence (<10%) was too low to detect intervention effects (Basu et al., 2004). Yet, these results do not elucidate the empowerment intervention's processes and proximal impacts on other HIV/STD

prevention related outcomes. This paper presents quantitative results of the Sonagachi empowerment intervention's impacts on 21 measured variables reflecting five common factors of effective, evidence-based, HIV/STD prevention programs as intermediate program outcomes. Broadening focus from condom use and STD infection to common factors of effective prevention programs enables elaboration of the ecologically driven empowerment processes, impacts, and limitations, and contributes to the practice-based evidence needed to support researchers and prevention planners to better understand ecologically oriented, multi-component, empowerment programs (Green, 2006).

Operationalizing and measuring empowerment intervention impacts

Empowerment is a multi-level construct describing both *processes* and *outcomes* that aim to enhance agency with explicit attention to structure or context (Schulz, Israel, Zimmerman, & Checkoway, 1995). Empowerment has been elaborated at psychological, organizational, and community levels, and links individual self-efficacy (i.e., person-level empowerment) to participation in organizations that can influence structural factors or contexts (e.g., policies, risk environments) (Laverack & Wallerstein, 2001). Measuring "empowerment" is challenging due to the multi-level and ecological nature of the construct, and thus requires examining multiple, context dependent, outcome variables simultaneously (Alsop & Heinsohn, 2005; Israel, Checkoway, Schulz, & Zimmerman, 1994; Kabeer, 1999; Laverack & Wallerstein, 2001). While an empowerment program's stated priority targets may be specific (e.g., reducing SDT or HIV infection), a program's multiple intervention strategies are intended to impact a web of proximal and distal causal factors, which can translate across a broader range of challenges and result in a generalized reduction in structural vulnerabilities and enhancement of individual agency (i.e., empowerment as an outcome). However, generalized empowerment is difficult to assess reliably and meaningfully unless grounded in measured variables in specific domains (Alsop & Heinsohn, 2005), for example, safe-sex negotiation versus general or non-specific negotiation skills. Therefore, in this paper, we conceptualize empowerment as intervention strategies and processes, and examine their impacts on measured variables of multiple outcomes linked to program goals to reduce vulnerability to HIV/STDs, using a common factors of effective HIV/STD prevention framework.

The challenges to operationalizing and measuring empowerment have also inhibited generating a strong evidence-base for empowerment program impacts, particularly quantitative results prioritized by many researchers, policy makers, and funders. In the Sonagachi example, the lack of evidence on empowerment component impacts has led to questions about whether STD/HIV services, peer education, and condom promotion are sufficient and whether empowerment intervention strategies are necessary or what value they add (Gangopadhyay et al., 2005). This paper specifically compares the impact of Sonagachi's empowerment intervention strategies (advocacy, community organizing and mobilization, rights-based framing, and micro-finance) to a standard care of STD/HIV services, peer education, and condom promotion.

Empowerment literature supporting the Sonagachi intervention and study hypotheses

Empowerment theory and practice focused on enhancing the status and agency of women is commonly addressed in development economics (Kabeer, 1999; Sen, 1990). Gender-based marginalization, exacerbated by poverty and caste/class/ethnicity-based discrimination, is evident in low levels of education and limited economic opportunities for women outside the home globally (Krieger, 2003; Sen, 1990). These factors reinforce perceptions that girls are burdens in poor households, driving the "missing women" phenomena evident in sex-ratio demographic data suggesting that girls are aborted, victims of infanticide, or otherwise neglected to result in early mortality (Krieger, 2003). These issues are particularly salient in contemporary India (Bhaskar & Gupta, 2007). Low education and lack of economic opportunities drive some women in India to sex work when abandoned by husbands, widowed,

orphaned, or facing abject poverty (Gangopadhyay et al., 2005). Countervailing these trends are observations that economic opportunities for women outside the home increase negotiating power in household decision-making (Sen, 1990). Micro-finance addresses economic exclusion and vulnerability by making credit available to poor women and families (Yunus, 2005).

Household economic instability has also been found to increase HIV risk behaviors, with disproportionate impact on women (Aidala, Cross, Stall, Harre, & Sumartojo, 2005). In the sex work context, negotiating consistent condom use has economic consequences; sex workers surveyed in Kolkata who consistently use condoms experience financial losses estimated around 70% compared to less consistent condom users (Rao, Gupta, Lokshin, & Jana, 2003). Individual-level empowerment ("control perceptions" or self-efficacy), therefore, is a highly salient factor supporting condom use for groups that lack power such as women, young people, ethnic minorities, and the under educated (Albarracin, Kumkale, & Johnson, 2004).

Finally, "politicization" associated with rights-based and identity-movement empowerment strategies, like those used by the Sonagachi Project, reframe or transform self-perceptions and motivations in deprived groups, who may be "habituated to inequality," "unaware of possibilities of social change," "hopeless," or "resigned to fate" (Sen, 1990). Fairness, justice, and identity are particularly salient in women's movements in India (Ray & Korteweg, 1999).

Methods

Intervention methods and development

The Sonagachi Project is organized into relatively distinct organizational units that emerged over time in response to community needs and that work closely together to deliver a variety of clinical services and empowerment strategies. The three primary units are an STD/HIV intervention program, a sex workers community organization, and a micro-finance cooperative. Their evolution and theory of action are described below and shown in Fig. 1.

STD/HIV intervention project (SHIP)

In 1991 a rapid appraisal of STD/HIV risk in Kolkata's largest red-light area known as Sonagachi was conducted by the All India Institute of Hygiene and Public Health. Based on that appraisal, the STD/HIV Intervention Project (SHIP) was established to provide STD treatment, health education, and promote condom use in the community. The high status physician leading the project, and its professional support staff, gained entry to the community and access to sex workers by advocating with politicians, police, brothel owners, and other stakeholders, and framing HIV/STDs as threats to the livelihoods and health of the whole community. Sex workers were hired and trained as peer educators, condom social marketers, and eventually as supervisors and program coordinators.

Sex worker's community organization

SHIP supported establishment of a sex worker community forum as a program partner, which became formalized as the Durbar Mahila Samanwaya Committee (DMSC: "Unstoppable Equal Women's Committee") and is now the executive unit for the entire Sonagachi Project. The term "sex worker" was adopted to mitigate stigma associated with more common terms (whore) and build self-respect among sex workers. "Sex work is valid work – we demand worker's rights" became a master frame for the project to transform community perceptions, and provide a rights-based frame to motivate community mobilization and long term self-protection. In each community served, a local DMSC chapter is established with local sex workers elected by community members for two-year terms as President, Vice President, Secretary, and

Treasurer. DMSC officers, with support from SHIP staff, coordinate community organizing and mobilizing activities to build consciousness and solidarity among sex workers through meetings, street rallies, demonstrations, and state and national conferences of sex workers. DMSC officers also support SHIP's treatment, education, and condom promotion activities by assisting with community access and treatment follow-up, and diffusing prevention messages as popular opinion leaders.

Advocacy with stakeholders and powerbrokers

DMSC's officers and extended member network, as well as SHIP's highly educated physicicans, educators, and their networks, partner to advocate with powerbrokers on the importance of the project, treatment, and condom use for their mutual safety and livelihoods, and educate clients and the community through outreach events that also aim to reduce stigma that reinforces marginalization of sex workers. DMSC also encourages political participation to build a sex worker voting block to enhance social capital and leverage power in advocacy work with politicians and local political clubs that can influence policies, police actions, and powerbroker dynamics at local, state, and national levels.

Micro-finance cooperative

The USHA Multi-purpose Cooperative was established to provide safe savings and lending to reduce vulnerability to theft as well as debts from informal sources (money lenders, madams, peers) that reduce negotiating capacities in sexual exchanges. Sex workers' marginalized and stigmatized status, coupled with low literacy levels, present significant environmental barriers to accessing traditional banking. USHA's sex worker "field tellers" go into the community, from house to house, encouraging peers to commit to a savings plan and then make daily or weekly follow-up visits to collect deposits and report on account balances. When needed, depositors can "borrow" or withdraw from their own accounts, with counseling from field tellers and other USHA staff. Larger loans are also made available to finance micro-enterprises (e.g., sewing, craft manufacture, small retail, farmland and livestock, investment in rickshaw or taxicab).

Multiple intervention strategies to restructure risk environments

The Sonagachi Project's intervention components evolved to restructure power dynamics and risk environments in brothel communities to support STD/HIV prevention goals specifically, and sex workerautonomy and safety generally. Fig. 1 shows a logic model representing Sonagachi intervention components, development and sequence in replications, their targeted outcomes as measured variables in the common factors for HIV/STD prevention framework, and reinforcing relations between factors. SHIP activities primarily aim to impact HIV/STD-related knowledge and skills, in addition to providing treatment and condoms. DMSC activities address all five factors, primarily by diffusing information and support for SHIP activities, diffusing rights-based frames and messages to motivate change, building social support and community solidarity, mobilizing political participation to build social capital to enhance advocacy, and diffusing new norms for savings and alternative income enabled by USHAs micro-finance services. In terms of HIV/STD prevention goals, sexual negotiation skills and related variables are most proximal, while framing, social support, social capital, and economic security all support negotiation power and skills.

Hypotheses

This paper's first aim is to evaluate Sonagachi's empowerment intervention effects on 21 measured variables representing HIV/STD linked program outcomes outlined in Fig. 1 and detailed below. We hypothesized that sex workers in the Sonagachi intervention community will report greater increases in these outcome variables over time compared to a control

community receiving STD treatment, peer education and condom promotion only as standard care. The cumulative impacts of the intervention are also examined by summing the individual measured outcome variables into a summary outcome index.

A secondary aim of this paper is to examine demographic variables and other potential predictors or confounders of empowerment intervention effects on HIV/STD prevention outcomes. Age, time working in sex work, literacy, self-employment, and higher income are hypothesized to support broader empowerment processes such as workplace autonomy, financial security, and negotiation power that reduce vulnerability to HIV/STD infection. Having a live-in male partner or husband may limit freedoms to make changes advocated by Sonagachi. Having children is hypothesized to motivate mothers to participate in Sonagachi activities but may also induce economic pressures that suppress negotiating capacities and program participation.

Study design

A quasi-experimental intervention trial was conducted from 2000 to 2001 in two rural towns in West Bengal with no prior Sonagachi Project exposure. The study's broad goals were to evaluate Sonagachi's empowerment intervention impacts on HIV/STDs infection, condom use, and other intermediate outcomes (the focus of this study) compared to STD/HIV treatment, peer education and condom promotion alone as a standard of care. Female sex workers were selected through two-stage random sampling of houses and residents in the two town's "red-light areas" (n = 110 in each), invited to participate in assessment activities with informed consent, and completed a baseline and three follow-up interviews over 16 months. The structured assessments were completed in Bengali by SHIP evaluation staff-persons, who were trained and overseen by UCLA researchers.

The Institutional Review Boards of UCLA, DMSC, and local community groups in each town reviewed and approved the study protocol. Participants provided voluntary informed consent written in simplified language or delivered verbatim if the participant was illiterate.

Intervention

STD clinics were established in both communities as standard care, including in-clinic peer education and condom social marketing. Empowerment intervention strategies (community organizing, advocacy, rights-based framing, micro-finance) were implemented in the intervention community.

Outcome variables

STD/HIV knowledge—Sex workers were asked to identify STD symptoms, and HIV and STD prevention methods. Each question was coded (1) if the sex worker knew at least one STD symptom, and that condoms prevent HIV/AIDS and STDs, respectively. Sex workers were also asked if they perceived themselves to be at risk for STD/HIV.

Skills for sexual negotiation and workplace autonomy—Three questions assessed condom use sexual negotiation: being the most important condom use decision-maker among a list that included clients, madam, partner, and landlords; ability to refuse a client for a particular sex act; and having ever refused a client for refusing to use a condom. Two questions assessed general work-place autonomy: ability to change work contract; and ability to take leave if sick or unwilling to work.

Sex "worker" frame to motivate change—Three questions were asked reflecting the worker frame diffused by Sonagachi; agreeing with the statement that "sex work is valid work"; having ever disclosed their profession to a non-sex worker (reflecting reduced stigma or sex

worker pride); and if they wanted more education or training (reflecting consciousness as a "worker" and human being with a long term vision as opposed to a "fallen woman").

Social support via organizing and solidarity—Three questions were asked, covering the prior three-months: visiting with other sex workers outside work; participation in social functions; and helping other sex workers when harassed or abused.

Financial security—Four questions asked about saving money, having other income outside sex work, working in other places, and taking loans. Taking loans was considered a negative outcome reflecting economic insecurity since savings are encouraged over loan taking by Sonagachi.

Political participation—Sex workers were asked if they voted in the last election and, if so, whether they voted willingly.

Summary outcome index—A pseudo-continuous outcome measure was constructed by summing the binary outcome variables described above. Outcome variables without statistically significant intervention effects in individual analyses were excluded from the summary index.

Hypothesized predictors or confounders of intervention effects

Age and experience—Age was measured in years. Work experience was measured in months working in sex work.

Literacy—Sex workers were asked if they could sign their name (13%), were self-taught (3%), had primary school education (11%), or secondary school education (1%). Preliminary analyses indicated that formal education (primary or secondary) predicted the most variation in outcomes so literacy was dichotomized as formal education (1) or not (0).

Live-in partner status—Live-in partners commonly consider themselves to be married; responses were collapsed to "having a current live-in husband or partner" (1) versus not (0).

Present work contract—Women reported being self-employed (75%), or working under a madam with a 50/50 split contract (2%) or a "bonded" salaried contract (23%). This variable was dichotomized as self-employed (1) versus contract worker (0).

Income—Income was reported in rupees earned per week.

Statistical methods—Random-effects repeated-measures regression analyses were conducted for all outcomes using SAS v. 9 (i.e., NLMIXED procedure for binary logistic outcomes and the MIXED procedure for the summary outcome index), as well as the HMLM and HLM2 modules in HLM v.6.4. Analyses tested random intercepts and slopes using full and restricted maximum likelihood estimation. Hypothesized predictors or confounders of intervention effects were also tested in longitudinal models, which confirmed that they did not change significantly over the intervention period.

Time—Preliminary analyses coded time as a continuous variable with baseline coded (0) and each follow-up coded 1–3, estimating average change in outcome at each follow-up. For final analyses, time was re-coded to 0, 0.33, 0.67, and 1 for baseline and follow-ups, respectively, to provide estimates of overall expected change by final follow-up at 16 months.

Statistical methods for the 21 individual binary outcomes—All 21 individual measured outcome variables were examined in separate models. Random-effects repeated-measures logistic regression methods with modestly sized samples, as in this study, do not provide statistical power to support complex models with many covariates and interaction terms (Liu & Wu, 2008). In preliminary analyses, random intercept and slope (RIAS) models, and models with several covariates failed to converge. Since this study's primary aim is to examine intervention effects, priority was placed on controlling for confounders of intervention effects through effect modification (i.e., predictor by intervention by time interactions). Each hypothesized predictor or confounder (i.e., age, time in sex work, education, income, self-employment, children, partnered) was tested for intervention effect modification for each outcome in random intercept models that adjust for baseline differences in the outcomes between groups.

Statistical methods for the summary outcome index—Summing the individual outcome variables into a pseudo-continuous summary outcome index enabled random-effects repeated-measures linear regression methods that support more complex multivariate models. The index also approximates a dose-response measure for intervention effects. Individual outcome variables that did not have statistically significant intervention effects were excluded from the summary outcome index (see results and Table 1), resulting in 16 total variables comprising the index. Hypothesized predictors and confounders were tested in models estimating summary outcome score at baseline (i.e., intercept equation), change in summary outcome score over time (i.e., slope equation), and intervention impacts on outcome score over time (i.e., intervention effect modification interaction term). Analyses also tested "level-one" covariance structures (i.e., modeling correlation of repeated-measures within individuals), and quadratic and cubic growth curves. Finally, a latent variable model tested the influence of summary score at baseline on change in summary outcome score over time by including the intercept equation (estimating the baseline outcome score) as a predictor of the slope equation (estimating change in summary outcome score over time) (see Raudenbush & Bryk, 2002;Seltzer, Choi, & Thum, 2003).

Results

Sample description and univariate statistics

A detailed study and sample description was published previously (Basu et al., 2004). Briefly, the mean age was 27 (SD = 7, range 18–50) with about half the sample between ages 21 and 29. Half had live-in partners and about half (46%) had children. Substance use was low; only about 1/3 reported drinking alcohol, and less than 3% ($n = 5$) injected drugs. Biomarkers and clinical exams indicated low current STD prevalence (<10%) but high lifetime exposure; about 60% had been exposed to syphilis; low STD and HIV incidence rates during the study did not support statistical power to analyze impacts on these health outcomes (see Basu et al., 2004).

Because baseline interviews were not conducted on the same day as enumeration, random selection and informed consent, the number of women interviewed at baseline ($n = 100$ each community) is less than the total enumerated, consenting and completing at least one interview over the four waves ($n = 110$ in intervention, $n = 106$ in control). Follow-up rates were high with 90% average retention and 80% completing all four assessments (see Table 1).

Binary outcome results

Table 1 shows population proportions (percents) for each binary outcome variable at each assessment. Because retention varied, the percents do no represent unbiased population proportions. Repeated-measures logistic regressions weight missing observations to produce unbiased results. Table 1 also shows odds ratios and 95% confidence intervals parameterized

to estimate the cumulative odds of change in each outcome by final follow-up for the intervention and control communities; the intervention community odds ratio estimates the intervention effect, which is the difference between intervention and control time slopes. All outcomes across all five common factor domains had statistically significant intervention effects except for ability to take sick leave, working in other locations, taking loans, and voting. Almost all voters voted willingly except at final follow-up in control where 66% reported voting but only 55% voted willingly, therefore, about 10 control community sex workers were coerced to vote during the final assessment period.

Disclosing profession, participating in social functions, and having other income had statistically significant intervention effect interactions (i.e., effect modification). Self-employed women in the intervention community had higher odds of going to social functions and disclosing profession compared to control by final follow up. Older women reported increases in other sources of income in both communities, with a moderately higher rate in the intervention community (see Table 1).

Summary outcome results

Random intercept and slope models with a heterogeneous autoregressive level-one covariance structure (reflecting correlation within individual's responses between assessments) provided the best fit to the data. Quadratic and cubic growth curves were not statistically significant. Table 2 shows results for three intervention effect models: a) a "null" model with no covariates; b) a full multivariate model with hypothesized predictors that were statistically significant and/ or improved overall model fit; and c) a latent variable model that controls for the effect of predictors of baseline summary outcome scores on change in summary outcome scores over time.

Summary outcome score means did not differ across communities at baseline. Since the summary outcome is composed of 16 individual questionnaire items, each 1 point change in the mean reflects a change of approximately one question response. The "null" model estimates that, on average, both communities had a mean outcome score of 9 (about 9 of 16 items) at baseline. Control community sex workers reported a 2.2 point summary score decrease (about 2 fewer of 16 items) compared to a 4.5 point increase in the intervention community by final 16 month follow up (see Fig. 2a). The full multivariate model estimates baseline summary outcome mean at 6.7 (adjusted for self-employment, education, age, partner status, and weekly income) and a 1.6 point decrease in control and 4.8 point increase in intervention by 16 months. The latent variable model estimates no decrease in control and a 4.8 point increase in the intervention community, reflecting that sex workers in the intervention community improved on an average of 5 of 16 individual outcomes summed in the index by 16 months, increasing from a mean of about 7 to 12, a 71% increase compared to no change in control (see Fig. 2b).

Predictors of summary outcome score at baseline

Having a live-in male partner, higher income, formal education, and being self-employed were all statistically significant predictors of baseline summary outcome index scores (see Table 2). Having children was not statistically significant and deviance tests confirmed lack of improvement to model fit. Older age, and by extension, time in profession, reduced baseline summary outcome scores. Since age and income were negatively correlated (older women generally earned less money), income accounted for a moderate proportion of the age effect. Older age was also correlated with self-employment and having a live-in partner, which account for a large proportion of the hypothesized benefits of age or experience on summary outcome scores.

Predictors of change in summary outcome score over time

Being self-employed was associated with lower change in summary outcome score over time (see Table 2). Since self-employment predicted higher baseline summary outcome scores, self-employment places a ceiling effect on detecting changes in summary outcome scores over time, as measured in this study, regardless of intervention exposure. Similarly, formal education was predictive of higher summary outcome score at baseline and a corresponding lower change in summary outcome score in the intervention community through intervention effect modification.

Limitations

Attrition—While follow-up rates were high in both communities, final follow-up retention was lower in control (80%) compared to the intervention (93%) samples (see Table 1). Analysis suggested that missing cases may not be completely at random (MCAR). As reported previously, during the course of the study the control community became aware of Sonagachi in other communities (Basu et al., 2004). The consistently large decreases in population proportions (percents) for outcome variables at wave 3 in control coupled with lower retention rate (see Table 1) suggests that "empowered" women may have left the control community before the final follow-up. Since this loss to follow-up is likely related to outcomes, it would not violate the less stringent missing at random (MAR) requirement for unbiased estimates in repeated-measures analyses (Raudenbush & Bryk, 2002). Regression slopes for respondents with missing data are down-weighted and the full multivariate models, particularly the latent variable model, adjust for factors predicting outcome over time and attrition. Thus, while results generally suggest that measured outcomes decreased in the control on a community level, the latent variable model controlling for individual-level differences suggests that decreases may not have occurred for individuals. Regardless, Sonagachi's interventions are delivered to the entire community and impacts are partly dependent on sex worker participation to build community solidarity and change community norms. Attrition of sex workers empowered for HIV/STD prevention (and likely other unmeasured domains) may leave a vacuum of leadership and support in the community that can lower the bar of expectations from clients and powerbrokers, reduce negotiating power of remaining sex workers, and result in decreased STD/HIV prevention related outcomes, specifically, and empowerment more broadly, for both the community and individuals. While this leadership vacuum may create opportunities for new leaders to emerge from the community, the assessment period and methods could not assess this longer term change.

Measurement—To maintain low assessment burden, the number of questions and response options available to assess the constructs of interest was limited. The questions were not developed with an explicit common factors framework in mind, so outcome variables may not directly reflect their common factor domain label, for example, the skills domain outcome variables capture self-efficacy and attitudes (i.e., most important condom decision-maker) that support sexual and workplace negotiation skills. Also, preliminary analyses indicated that many measured variables examined as outcomes were correlated, which is expected in an empowerment framework that recognizes inter-dependencies of empowerment as both processes and outcomes. This data does not support complex causal modeling such as repeated-measures analyses with multiple outcomes and time-varying covariates. Future analyses using this data may support simpler mediation models of condom use as an outcome, but this paper highlights the Sonagachi empowerment intervention's impacts on other factors that reduce vulnerability to HIV/STD infection. Future studies should use continuous outcome measures (i.e., likert scales, counts) to gain the benefits of linear over logistic modeling methods. The summary outcome index is an example of a first step. Although the summary outcome index incorporates several measured variables for each of the five common factors (knowledge, negotiation skills, motivating frame, social support, environmental barriers), the index is not

balanced across domains. The individual binary outcome variable results presented in Table 1 are intended to lend insight into the relative contributions of each variable to the summary outcome index. The authors and colleagues (i.e., Ghose et al., 2008) are also currently testing more comprehensive measures of empowerment processes and outcomes from multiple domains critical to sex workers (i.e., violence and coercion, police interactions, community relations, stigma, engagement with civic institutions, etc.) that will support more complex causal and statistical models.

Intervention duration—The 16 month follow-up period in this study documented the initial stages of intervention replication when impacts are most likely to be detectable for outcome variables more proximally linked to HIV/STD prevention activities. Impacts on distal health outcomes such as STD/HIV infection in low prevalence countries like India may require longer periods for new incident infections to be detected, particularly in the presence of treatment and prevention services as a standard of care. The infrequency of events limiting detection of intervention effects may also explain the lack of statistically significant impacts on voting. Also, relatively short follow-up period may have limited detection of change in variables treated as predictors in this analysis (i.e., self-employment, education, income, partners) that preliminary analyses demonstrated did not change significantly over 16 months.

Discussion

Over a 16 month replication trial, the Sonagachi Project's empowerment intervention strategies (community organizing and mobilization, rights-based framing, advocacy, micro-finance) had broad impacts on factors that reduce vulnerability to HIV/STD infection, and which are common across effective HIV/STD prevention programs. Compared to a standard care of STD clinic, condom promotion, and peer education, the additional empowerment intervention strategies: 1) *improved knowledge* of STDs and condom protection from STD and HIV, and maintained STD/HIV risk perceptions despite treatment; 2) *provided a frame to motivate change* based on reframing sex work as valid work, and reflected by increased disclosure of profession to non-sex workers by self-employed sex workers, and instilling a hopeful future orientation reflected in desire for more education or training; 3) *improved cognitive, affective and behavioral skills* in sexual and workplace negotiations reflected in shifts in condom decision-making cognitions, increased refusal abilities, and ability to change work contract; 4) *built social support* among sex workers by increasing social interactions outside work, social function participation, and helping other sex workers when harassed; and 5) *addressed environmental barriers* based on economic vulnerability and insecurity by increasing savings, and alternative income sources for older sex workers, which Sonagachi prioritizes due to lack of alternative income opportunities and decreasing earnings from sex work with older age.

The measured outcome variables that were not impacted by the Sonagachi empowerment intervention by 16 months after replication also range across the common factors of effective prevention. The intervention did not increase sex workers' ability to take leave from work if sick or unwilling to work, suggesting either a lack of impact on a higher level of workplace autonomy or economic pressures that drive sex workers to work whenever clients are available. Political participation, measured as voting, did not improve although there may have been rare opportunities to vote during the 16 month follow-up period. However, results suggest that the empowerment intervention may have prevented coerced voting. The USHA micro-finance cooperative and supporting messages diffused by DMSC did not reduce loan taking, although the program's primary emphasis is on longer terms savings, particularly during initial replication period when individuals are accumulating savings that they would later borrow or withdraw from. Working in other places is another secondary goal intended to enhance economic opportunities and negotiation powers that was not impacted by the intervention. These outcomes are more distally related to HIV/STD prevention and, therefore, tend to be

secondary or indirect targets of the Sonagachi Project's primary intervention strategies. Significant impacts on these factors may require longer intervention duration, alternative intervention strategies, or macro-level structural changes. Availability of alternative sources of income accessible and acceptable to younger sex workers, who generally earn much larger sums of money than other women with low levels of education in India, may require changes in macro-economic conditions beyond the scope of the Sonagachi Project's intervention strategies.
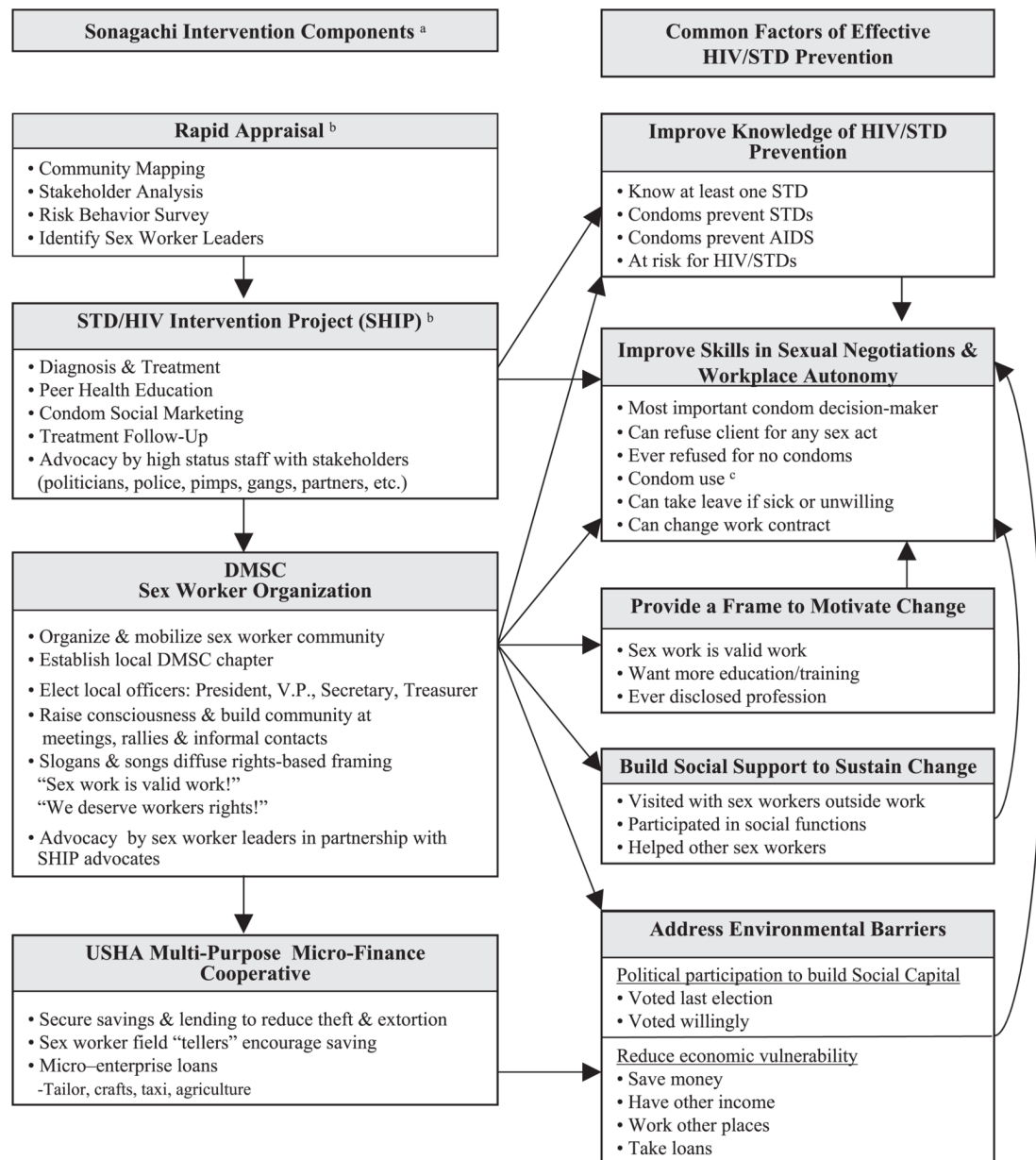
This study's results also have implications for STD/HIV prevention and empowerment practice and theory more broadly. While both communities in the replication trial received the same STD/HIV prevention and treatment services, the Sonagachi empowerment intervention improved the majority of the HIV/STD linked measured outcome variables, demonstrating that empowerment intervention components can enhance health-related prevention outcomes above and beyond the impacts of clinical services and health education. Consistent with the decreases in consistent condom use in the control community reported previously (Basu et al., 2004), outcome variables across the five common factors domains examined in this paper had downward trends in control, particularly those related to condom attitudes, STD risk perceptions, and skills for sexual and workplace negotiation, but also motivating frames for change, social support, and saving money. These results suggest that STD/HIV prevention programs that provide essential but narrowly focused clinical services and education, and that do not also address broader factors (motivation, social support, environmental barriers), may have unintended negative impacts. Programs emphasizing disease and risk reduction may reinforce stigma and marginalization by framing vulnerable populations as 'vectors of transmission', that may increase stigma and discrimination, undermine autonomy and negotiating capacities, or reduce acceptance and utilization of the services provided by the prevention program. We have recently advocated for reframing "HIV prevention" to "Family Wellness" by translating common factors for effective HIV prevention to the primary challenges to health and well-being in a given community, instead of a narrowcast and stigmatizing focus on HIV/AIDS that also distorts how health systems apply limited resources (Rotheram-Borus, Swendeman, & Flannery, 2009). The Sonagachi Project provides an evidence-based example of an alternative reframe for HIV/STD prevention, based on worker's rights and women's empowerment, which has been broadly diffused and sustained.

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Sonagachi Intervention Components [a]

Common Factors of Effective HIV/STD Prevention

Rapid Appraisal [b]

- Community Mapping
- Stakeholder Analysis
- Risk Behavior Survey
- Identify Sex Worker Leaders

STD/HIV Intervention Project (SHIP) [b]

- Diagnosis & Treatment
- Peer Health Education
- Condom Social Marketing
- Treatment Follow-Up
- Advocacy by high status staff with stakeholders (politicians, police, pimps, gangs, partners, etc.)

DMSC Sex Worker Organization

- Organize & mobilize sex worker community
- Establish local DMSC chapter
- Elect local officers: President, V.P., Secretary, Treasurer
- Raise consciousness & build community at meetings, rallies & informal contacts
- Slogans & songs diffuse rights-based framing "Sex work is valid work!" "We deserve workers rights!"
- Advocacy by sex worker leaders in partnership with SHIP advocates

USHA Multi-Purpose Micro-Finance Cooperative

- Secure savings & lending to reduce theft & extortion
- Sex worker field "tellers" encourage saving
- Micro–enterprise loans
  -Tailor, crafts, taxi, agriculture

Improve Knowledge of HIV/STD Prevention

- Know at least one STD
- Condoms prevent STDs
- Condoms prevent AIDS
- At risk for HIV/STDs

Improve Skills in Sexual Negotiations & Workplace Autonomy

- Most important condom decision-maker
- Can refuse client for any sex act
- Ever refused for no condoms
- Condom use [c]
- Can take leave if sick or unwilling
- Can change work contract

Provide a Frame to Motivate Change

- Sex work is valid work
- Want more education/training
- Ever disclosed profession

Build Social Support to Sustain Change

- Visited with sex workers outside work
- Participated in social functions
- Helped other sex workers

Address Environmental Barriers

Political participation to build Social Capital
- Voted last election
- Voted willingly

Reduce economic vulnerability
- Save money
- Have other income
- Work other places
- Take loans

[a] The sequence of intervention components reflects their evolution in the Sonagachi project development
[b] Rapid appraisal and SHIP were implemented in the replication control community as standard care, excluding advocacy.
[c] Condom use increases were reported by Basu et. al., 2004.

Fig. 1.
Sonagachi intervention components, and targeted HIV/STD outcome domains and measured variables.
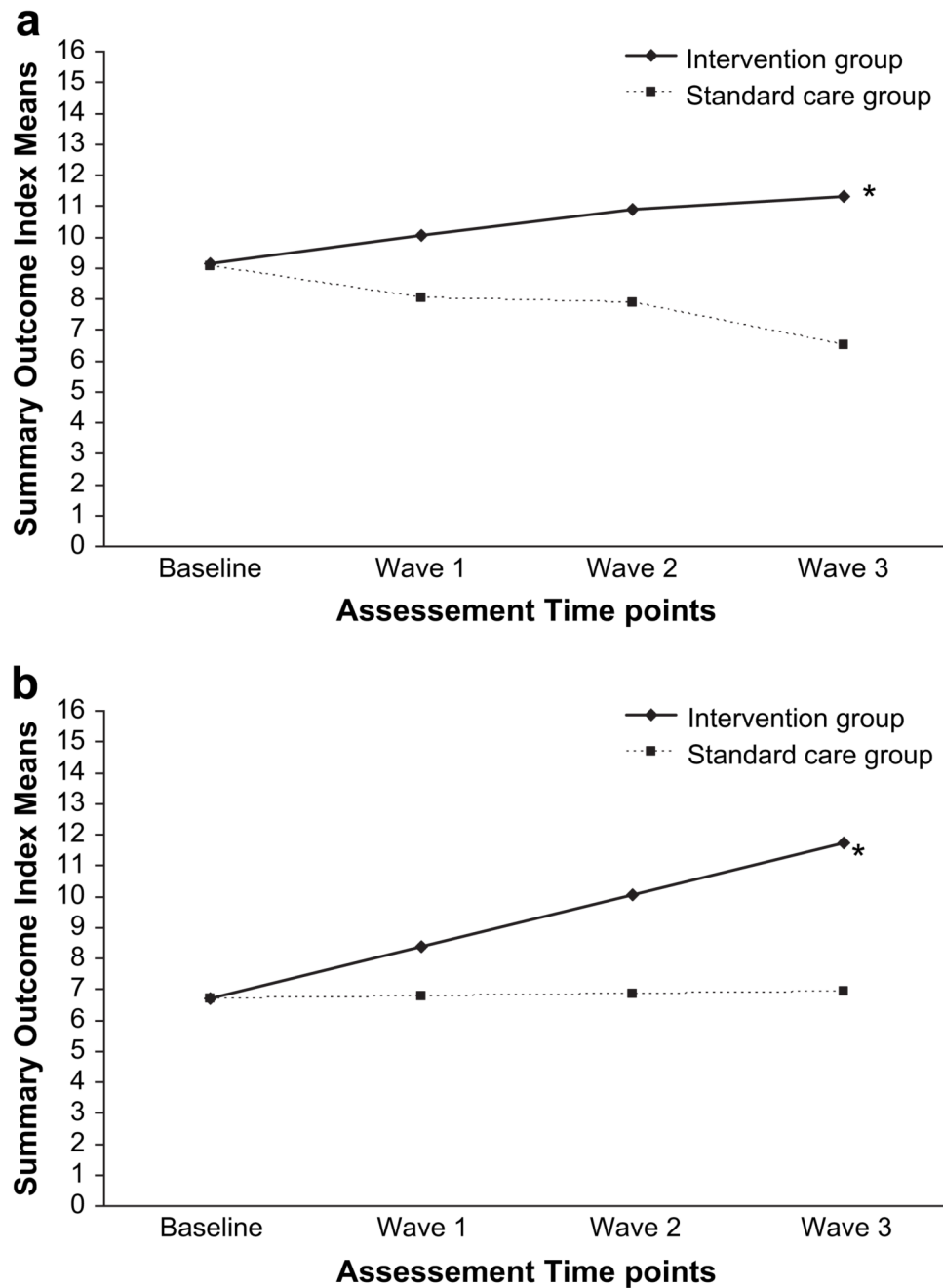
Fig. 2.
a. Summary outcome index means over 16 months by intervention community (unadjusted).
b. Adjusted summary outcome index means over 16 months by intervention community.
*Statistically significant intervention effect ($p < 0.001$) based on the comparison of slopes for the two communities over time.

Table 1

Population proportions (%), odds ratios (OR) and 95% confidence intervals (CI) for trends in outcome variables over 16 months.

	Sonagachi intervention (n = 110)						Standard care control (n = 106)					
	0	1	2	3	OR*	95% CI	0	1	2	3	OR	95% CI
Assessment wave												
Number interviewed at each wave[a]	100	100	95	102			100	99	94	86		
Percent of total sample	91	91	86	93			94	93	89	81		
Knowledge of risk & protective factors												
Know at least one STD[a]	79	93	92	100	48.5	(14.4, 163)	60	60	77	64	1.10^	(0.60, 2.04)
Condoms prevent STDs[a]	78	88	96	96	23.2	(7.69, 70.3)	80	72	77	77	0.86^	(0.45, 1.64)
Condoms prevent AIDS[a]	67	85	87	88	23.3	(11.2, 48.1)	40	59	56	36	0.52	(0.30, 0.90)
At risk for STDs (yes vs. no/dk)[a]	59	39	40	38	6.5	(3.28, 12.9)	55	31	19	12	0.06	(0.03, 0.11)
Skills for workplace autonomy & negotiation												
Important condom decision-maker[a]	25	52	55	69	24.7	(11.0, 55.6)	41	29	24	19	0.31	(0.16, 0.63)
Can refuse client (yes vs. no/dk)[a]	62	64	80	75	9.5	(4.82, 19.0)	53	47	40	40	0.38	(0.22, 0.64)
Ever refused (yes vs. no/dk)[a]	42	39	51	48	6.2	(3.16, 12.3)	38	28	23	20	0.28	(0.14, 0.54)
Can change contract (yes vs. no/dk)[a]	66	72	78	75	14.5	(6.64, 31.6)	61	60	53	29	0.16	(0.08, 0.31)
Can take leave (yes vs. no/dk)	59	73	75	72	1.56^	(0.77, 3.15)	53	61	64	64	1.84^	(0.99, 3.43)
Sex 'worker' frame to motivate change												
Sex work is valid work[a]	39	47	58	100	175.8	(52.6, 588)	48	22	34	17	0.26	(0.13, 0.52)
Want more education/training[a]	53	52	54	53	7.6	(3.18, 18.2)	70	64	61	24	0.08	(0.04, 0.16)
Ever disclosed profession[a,c]	76	74	81	76	0.74^	(0.34, 1.60)	79	83	83	84	1.41^	(0.75, 2.62)
(Among self-employed workers)[b]					109	(10.5, 1125)					9.8	(1.93, 49.5)
Social support via organizing & solidarity												
Visited with sex workers outside work[a]	53	64	73	71	13.1	(5.09, 34.0)	63	49	53	48	0.42	(0.22, 0.81)
Participated in social functions[a]	73	71	78	76	3.46	(1.42, 8.40)	78	66	67	65	0.49	(0.27, 0.89)
(Among self-employed workers)[b]					33	(4.40, 244)					2.45^	(0.74, 8.06)
Helped other sex workers[a,c]	74	78	73	73	2.63	(1.56, 4.46)	77	63	59	57	0.35	(0.22, 0.57)

	Sonagachi intervention (n = 110)						Standard care control (n = 106)					
	0	1	2	3	OR*	95% CI	0	1	2	3	OR	95% CI
Environmental barrier-financial security												
Save money[a]	60	70	79	77	45	(14.3, 140)	54	53	45	35	0.18	(0.08, 0.44)
Have other income[a,c]	7	16	17	18	0.79^	(0.33, 1.90)	11	17	19	24	3.37	(1.64, 6.92)
(Among older workers)[b]					1.18	(1.02, 1.37)					22	(2.27, 206)
Work other places[c]	25	33	38	36	1.13^	(0.49, 2.61)	29	32	31	35	2.35	(1.20, 4.58)
Take loans[c]	26	46	49	52	1.20^	(0.60, 2.41)	29	46	46	50	3.99	(2.23, 7.12)
Environmental barrier-political participation for social capital												
Voted last election	43	38	47	46	0.58^	(0.21, 1.59)	53	59	65	66	2.98	(1.54, 5.75)
Voted willingly	41	38	47	46	0.86^	(0.31, 2.37)	51	58	64	55	2.22	(1.03, 4.81)
Summary outcome index mean[a]	9.1	10	10.9	11.3			9.1	8.0	7.9	6.5		

*Odds ratios for the Sonagachi intervention community represent the difference between intervention and control time slopes (i.e., intervention effect);

^ $p > .05$;

all other odds ratio estimates are statistically significant at $p < .001$.

[a]16 individual outcome variables with statistically significant intervention effects were summed to form the summary outcome index.

[b]These estimates reflect interactions for time by intervention by predictor (i.e., self-employed and age, respectively).

[c]Laplace approximation for numerical integration failed to converge for these models; results are based on penalized quasi-likelihood (PQL) estimation.

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Table 2

Parameter estimates and standard errors (*SE*) from random-effects linear regressions estimating summary outcome index scores at baseline and by 16 month follow up in Sonagachi empowerment intervention ($n = 110$) versus control ($n = 106$) communities.

Models	Intervention effect only	SE	Full multivariate	SE	Latent variable	SE	Difference in latent estimates	Standard error of difference
Baseline summary index estimate (*P1*)								
Intercept (*B0*)	9.08	0.2*	6.7	0.35*				
Self-employed			2.39	0.4^				
Formal education			1.32	0.55*				
Age (mean centered at 26)			−0.07	−0.03*				
Live-in partner			0.98	0.32*				
Weekly income (per 50 rp.)			0.05	0.02*				
Cumulative change by wave 3								
Intercept (time)	−2.23	0.28*	−1.62	0.4*	0.24	1.08	−1.87	1.02
Intervention effect	4.51	0.34*	4.81	0.34*	4.81	0.34*	0	0
Self-employed			−1.21	0.44	−0.55	0.53	−0.67	0.38
Formal education			0.88	0.8*	1.25	0.77	−0.37	0.25
Education by intervention			−2.27	1.06^	−2.27	1.06^	0	0
Baseline index estimate (*P1*)				*B0*	−0.28	0.15		
				Age	−0.02	0.01	0.02	0.01
				Partner	0.27	0.17	−0.27	0.17
				Income	0.01	0.4	−0.01	0.008

*
p < .001;

^
p < .05.