Willingness to accept conditional economic incentives to reduce HIV risks among men who have sex with men in Mexico City

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Abstract

We measure willingness to accept (WTA) conditional economic incentives (CEIs) to reduce risks for HIV and other sexually transmitted infections (STIs) among men who have sex with men (MSM), including male sex workers (MSW), in Mexico City.

We conducted an embedded survey experiment with 1,745 young MSM and MSW (18-25 years of age) who received CEI offers and decided whether to accept a program which would provide incentives to participants if they were free of STIs (verified by biological testing). We used random-starting-point and iterative follow-up referendum options.

The incentive-elasticity of participation was between 0.0963 and 0.2767, depending on the modality and characteristics of the participant. The average WTA was high: 70-86%. The mean incentive to spur participation in those initially unwilling was USD$202 per person per year, but offers above USD$77 per person per year generally ensured that potential participants would not switch to "*no*".

Keywords: Willingness to accept; conditional cash transfers; contingent valuation; HIV/AIDS & STI prevention; contingency management; Mexico

(JEL: I18, I12, H49, O15;C93, D61)

1. Introduction

Changing behavior is one of the most relevant questions in public health, and it is at the core of effective HIV prevention. This paper uses insights from psychology and survey research to inform economics-based HIV prevention policy; we investigate whether conditional economic incentives (CEIs) would be accepted to reduce HIV risk behaviors among population groups at high-risk of infection.

The HIV epidemic in Mexico, as well as in many countries with concentrated epidemics, is driven by new cases in young men who have sex with men (MSM) including male sex workers (MSW) (Bastos et al., 2008; Caceres et al., 2008; Saavedra et al., 2008; Smith et al., 2009). The young MSM and MSW populations have been identified as some of the most vulnerable in Mexico, with estimated HIV prevalence rates of 8.9% and 10.2% respectively (Gayet et al., 2007; UNGASS, 2010); they account for most of the new infections in Mexico, for persons under 25 years of age (CENSIDA, 2009).

Effective means for HIV prevention exist, but they are underutilized; these include: consistent condom use, reduction of sex partners, and periodic testing for HIV and other sexually transmitted infections (STI). The challenge is how to improve the utilization of well-known existing technologies that are effective (Coates et al., 2008; Gupta et al., 2008; Padian et al., 2008). We suggest that CEIs may be an option to consider for complementing prevention activities among populations at high risk of infection. The main hypotheses of such programs would be that economic incentives with a level of conditionality for MSM and MSW could be effective motivators to increase health services utilization and participation rates in educational/life skills workshops; and that CEIs could contribute to increase correct prevention knowledge, and ultimately reduce risk behaviors and STI/HIV incidence.

Traditional approaches of education and psychosocial support in Mexico, and in Latin America more generally, have not been sufficiently effective in reducing incidence of STIs or HIV (Demaria et al., 2009; Walker et al., 2006). The systematic reviews over the last decade consistently argue that traditional approaches have had limited effect on behavior change, and that more “structural interventions” (such as changes in laws, taxes, and economic incentives) are needed (Dick et al., 2006; Magnussen et al., 2004; Michielsen et al., 2010; Parker et al., 2000; Rotheram-Borus, 2000; Speizer et al., 2003)

CEIs in the developing world (Latin America, and Mexico in particular) have been found successful (Adato and Hoddinott, 2010; Lagarde et al., 2007) in improving the utilization of prevention health services (Gertler, 2004); various intermediate outcomes (Barber and Gertler, 2009; Barham and Maluccio, 2009), and health status (Barber and Gertler, 2008; Fernald et al., 2008, 2009; Fernald and Gunnar, 2009; Leroy et al., 2008).

Some recent evidence suggests that CEIs could affect sexual risk outcomes in generalized epidemics, and potentially reduce HIV risks for up to 60% in young women who received economic incentives to stay in secondary school (Baird et al., 2010; Thornton, 2008; World Bank, 2010). The optimal level of incentives has not been studied; nor have these programs been widely analyzed in cost-benefit or cost-effectiveness terms (Galárraga et al., 2009). Hence, new evidence on the potential utilization of CEIs, using a behavioral economics approach that combines the “contingency management” literature in psychology (Lussier et al., 2006; Prendergast et al., 2006) with the “conditional cash transfers” approach in economics (Higgins, 2009), can enhance traditional approaches to prevent HIV/ STI, and would be highly significant (Medlin and de Walque, 2008).

Hence, the objectives of this paper are as follows: 1) to measure the willingness to accept (WTA) conditional economic incentives to stay free of sexually transmitted infections among low-wealth MSM, including MSW in Mexico City, identifying the determinants associated with their willingness to participate in CEI to prevent HIV/STI; 2) to provide an incentive-elasticity of the potential participation rate in such prevention programs; 3) to calculate the optimal level of incentive offers so that participation among the sub-groups at greatest risk is optimized; and (4) to compare the costs of a CEI program against the potential long-term savings in terms of HIV treatment costs averted. To the best of our knowledge, this is the first empirical study measuring the optimal levels of conditional cash transfer offers with contingent valuation methods in populations at high-risk of HIV infection in concentrated epidemic settings.

The paper proceeds as follows. The next section presents some basic theoretical considerations for the willingness to participate in HIV/STI prevention and the optimal incentive levels. Then we present the methods, including the survey and empirical analyses. Section 4 presents the results for non-parametric and parametric analyses, elasticities, stratification, and a summary of the benefit-cost ratio calculations.
We then discuss the results in light of the theory and prior literature. The conclusions focus on policy implications. (The cost benefit details and the most relevant portions of the questionnaire are presented in Appendices A and B).

2. Theoretical considerations

This section presents some theoretical considerations within a model of the interaction between potential participants in a prevention program that uses CEIs, and a health planner with a fixed budget, who wants to minimize HIV cases.

Many aspects of economic theory are involved in the analysis of CEI, including: merit goods, missing markets, misinformation, human capital investments, principal-agent, and social efficiency (Fiszbein et al., 2009). We focus on a basic choice model where individuals would participate in CEI prevention programs if the disutility of reducing sexual risk behaviors (SRB) is at least compensated with an increase in utility derived from the incentive; and where a rational health planner will offer an incentive high enough to maximize participation among individuals at high risk, but sufficiently low to stay within a fixed budget constraint.

Contextualizing the health capital approach (Grossman, 1972) for sex capital, Michael suggested to investigate the person's assets which may be effective to avoid sexually transmitted infections, including the habits to select sex partners and the social networks from which those partners are selected, as well as sexual practices, such as consistent condom use (Michael, 2004). Thus, in this framework, if a person is already engaging in *SRB* such as unprotected anal intercourse, anonymous sex, commercial sex, and multiple, concurrent sexual partnerships, then they have possession of a "good" that they inherently value, or from which they derive utility. These decision makers may know that *SRB* can have long-term health implications, but the short-term gains (in utility) may be too strong. CEI would make the costs associated with *SRB* more salient and relevant in the present.

Hence, the social planner can incentivize the persons at high-risk of HIV to reduce their sexual risk practices (i.e., reduce the number of sexual partners, consistently use condoms, reduce high-risk/unprotected commercial sex transactions, etc.). To counteract the disutility generated by the modification of their behavior, or the actual income loss experienced by sex workers as a result of 100% condom utilization (Gertler et al., 2005), the social planner would compensate for that disutility through a cash transfer or other form of economic incentive. In the model, only if the decision makers *demonstrated* reductions in SRB by staying free of STIs in periodic testing, they would receive the incentive. The social planner would set a fixed-level incentive (α) and exhaust its total budget (τ) to minimize new HIV infections.

To model the individual decisions, we use a state-dependent utility function where the decision maker cares not only about the monetary returns but also about the "state of nature" that causes them. We modify here the canonical presentation (Mas-Colell et al., 1995) so that we have two states of nature, one with the *status quo* where sexual risk behaviors occur, and one with an intervention where *SRB* are reduced. Assuming that only two states of the world exist, the probability that *SRB* are reduced is denoted by π, while the probability of the *status quo* is 1- π. Thus, the reward (economic incentive for staying free of STIs) maps the state of the world into a monetary outcome. The decision maker maximizes the expected utility function with *SRB* and all other goods (*G*) as follows:

$$Max \quad E\left[u(G, SRB), I, (1-\pi); u(G, -SRB), I+\alpha, \pi\right] \qquad (1)$$

where *I* is wealth and α is the economic incentive (or subsidy to reduce risk behaviors).

Under this expected utility maximization model, assuming that sexual risk behaviors are normal goods, the respondents would be willing to accept the prevention program if the utility of *SRB* was less than the disutility of giving up *SRB* plus the extra utility of the economic incentive:

$$WTA = 1 \quad iff \quad (1-\pi).u(G, SRB; I) \leq \pi.u(G, -SRB; I+\alpha) \qquad (2)$$

which implies a positive demand for the program (in terms of regular participation in prevention workshops), and a willingness to demonstrate reductions in sexual risk behaviors (i.e., willingness to engage in periodic HIV/STI testing). We suppose that the level of incentive (α) can cover regular participation in prevention programs or the reduction of risk sex behaviors or both. Under any case, the condition in (2) must be met. The expression in (2) would be satisfied with equality at the point of indifference (or "switching point") between participating or not.

Formally, there exists an optimum incentive level $\alpha^* \geq 0$ that maximizes utility such that the utility maximization problem becomes:

$$\underset{\alpha \geq 0}{Max}\,(1-\pi).u(G, SRB; I) + \pi.u(G, -SRB; I+\alpha) \qquad (3)$$

At an optimum α*>0 where the decision maker is indifferent about his willingness to participate, the FOC requires that:

$$(1-\pi).u'(G, SRB; I) + \pi.u'(G, -SRB; I+\alpha^*) = 0 \qquad (4)$$

$$(1-\pi).u'(G, SRB; I) = -\pi.u'(G, -SRB; I+\alpha^*) \qquad (5)$$

$$\frac{u'(G,SRB;I)}{u'(G,-SRB;I+\alpha^*)}=-\frac{\pi}{(1-\pi)} \qquad (6)$$

That is, at the optimum level of incentives, the ratio of marginal utilities in each state is equal to the ratio of the probabilities for each state (with and without HIV/STI risks).

If the maximization problem is constrained within an incentive space boundary such that $\alpha^* \leq \alpha_{max}$; where the maximum incentive (α_{max}) is defined in a feasible local context, then the social planner can minimize HIV infections by setting $N\alpha^*=\tau$; i.e., exhausting the fixed budget with N program participants at high-risk.

Since numerous factors, other than just economic aspects, are at play, we are cognizant of our limited ability to empirically estimate marginal utilities from sexual risk behaviors. Nevertheless, we consider equations (2) and (6) necessary components of a latent function, for which we can empirically approximate α^* with methods explained in the next section.

3. Methods

This section presents the methods for: measuring willingness to accept CEI for HIV/STI prevention; identifying determinants associated with WTA; estimating the incentive-elasticity of the demand for HIV prevention programs based on CEI; and calculating the optimal incentive level (α^*).

3.1 Survey: Data collection

We collected information on willingness to accept CEI to participate in a HIV/STI prevention program to stay free of STIs among young men who have sex with men (including male sex workers), ages 18-25, in Mexico City. The work was completed in collaboration with members of the local community and civil society associations with in-depth knowledge of the formal and informal meeting places for MSM and MSW. We used an embedded survey experiment to produce exogenous variation in the responses (McFadden et al., 2005).

Using time-and-place sampling (Magnani et al., 2005), we fielded 84 questions through hand-held computers (personal digital assistants: PDAs). The interviews lasted about 40 minutes, and they were self-administered by the respondents to keep the responses anonymous and increase the veracity of the information. There was a set of introductory questions to assess knowledge, attitudes and practices regarding HIV and other STIs.

The WTA component of the interview included a brief description ("mini-vignette") of a potential program involving CEI for staying free of STI monitored through periodic testing. To increase the statistical information on the respondents' latent values, the WTA questions were conducted as a double-bounded contingent valuation bargaining game (or experiment) (Hanemann et al., 1991). We assessed the incentive necessary for the respondents to participate in prevention talks and specific risk-reduction behaviors so that they would stay free of STIs. We used a random-starting-point approach, and iterative bidding (referendum) to estimate willingness to accept CEIs for HIV/STI prevention. Each subject was asked a closed-ended (yes/no) question about whether they would enroll in the prevention program given a specific set of incentive offers. To avoid a starting point bias in the willingness to accept questions, the computers picked a random number (*$X*, from a given range) to start the bidding process with the following question: "*Would you be willing to participate in the prevention program for an incentive of $X per month?"* Follow-up bargaining questions ensued, raising the offer if the respondent did not accept the first offer, or lowering it if the respondent accepted the first offer. The bargaining game was conducted to try to maximize the number of potential participants, but at the same time looking for the minimum incentive level at which the respondents (at high-risk) would agree to participate. There were two random (initial) questions: *wta1* and *wta3* at

$X1 per month to attend prevention talks, and $Y1 per quarter to undergo STI testing respectively. Each was followed by a bargaining referendum: *wta2* and *wta4* associated with incentive offers of $X2/mo. and $Y2/qtr. Furthermore, to check for the possible "embedding" or "bundling" effect (Kahneman and Knetsch, 1992), we also asked a question of whether *no monthly talks* would be preferred; the participants would then receive a higher CEI (equivalent to the quarterly prize plus the accumulated monthly incentives) but only with the requirement of being STI free. This option was *wta5* associated with $Y3. The offers were made within a set of feasible bounds to maximize policy relevance. (Appendix A presents the complete WTA questions and the formulae for the follow-up incentive offers).

To reduce the possible bias due to unfamiliarity with the type of questions asked in contingent valuation surveys, the interviewers first explained the program and the simple bargaining game that would be played in the form of a mini-vignette. Since question order may play a role, the bargaining game was placed early in the interviews, leaving sexual risk behaviors, and basic socio-demographic, education, occupation, income and household assets and related questions until the end.

3.2 Data Analysis

First, we conducted non-parametric regression analysis of the randomly assigned incentive offers to uncover some of the general responses for the willingness to participate in prevention programs linked to CEIs. We took advantage of the randomization process which effectively presented us with an experimental setting to test the effect of incentive offer levels on the conditional willingness to accept reductions of HIV/STI risks. Non-parametric regression described how to estimate the function *m* in the regression equation:

$$wta_i = m(\alpha) + e_i \qquad (7)$$

The binary indicator for willingness to accept the prevention program was indicated by $wta_i=1$ for interviewed person *i; n*ot accepting was defined as $wta_i=0$, and *e* was a random error. The variable α indicated the incentive offer amount.[3] A conditional mean $E(wta|\alpha)$ and a slope at each incentive α were estimated. We assumed no functional form for the relationship; so we allowed the data to "choose" not only the parameter estimates, but also the shape of the estimated (smoothed) curve itself. Following the general framework in Fan (1992) we conducted weighted regressions to find *a* and *b* to minimize:

$$\sum_{i=1}^{n}(wta_i - a - b(\alpha_i - \alpha))^2 K\left(\frac{\alpha_i - \alpha}{h_n}\right) \qquad (8)$$

where *K* denotes the kernel and h_n denotes the bandwidth.

Second, we used non-linear (probit) multivariate regression models to find significant factors determining potential participation. Congruent with the latent equation (2) in the previous section, we modeled the inverse standard normal distribution of the probability of accepting CEI for HIV/STI prevention as a linear combination of predictors of the form:

$$\Pr(wta_i = 1 | \alpha, VC) = \Phi(\beta_1\alpha_i + \beta_2\alpha_i^2 + VC_i^{'}\mu) \qquad (9)$$

where Pr=probability, and Φ is the cumulative distribution function of the standard normal function. As before, the binary indicator for accepting was by $wta_i=1$ and $=0$ otherwise. The parameters β_1, β_2, and the parameter vector μ were estimated using maximum likelihood. We included the squared term of the incentive offer to allow for non-linearities in the marginal incentive offer effects. The vector of controls (*VC*) included: age (in years), age squared, whether the individual has HIV or other STI, whether any condoms were used at the last sexual intercourse, the number of sexual partners per month, whether

[3] All incentive offers in the survey were made to participant in current Mexican pesos during October 1-December 15, 2008. For the analysis, however, and throughout this paper, all incentive offers were converted to US dollars (USD) at the data-collection period average exchange rate of 12.97 Mexican pesos per USD$1 (IMF 2008). Conducting the analysis in Mexican pesos did not qualitatively alter the nature of the results.

the last sexual intercourse occurred with someone who the respondent had just met, whether he has a stable partner, whether sex work is his main income source, whether he is a student, the highest level of education (primary=1, secondary=2, high school=3, college=4, graduate school=5), and a wealth index (which represented a continuous measure of assets and economic status constructed using the availability of: vehicle and house ownership, more than five rooms in the house, laptop and desktop computers, cable television, Internet access, and household help).

We conducted the analysis for each of the WTA responses (*wta1*-*wta5*, and for the interaction of *wta1* and *wta3*).

3.3 Elasticities and the optimal incentive level

Using the robust multivariate probit regression parameter coefficients we calculated the incentive elasticity of demand for potential participation in the program based on specific sets of characteristics for the incentive offers and the covariates vector (as defined above). In particular, we first estimated the probability of accepting the program at a low-incentive offer level (25 percentile of the incentive offer distribution). Then, we recalculated the probability of participation at a high-incentive level (defined as doubled that initial low-incentive offer). The elasticity (ε) was calculated as follows:

$$\varepsilon = (\mathrm{Pr}_H - \mathrm{Pr}_L) / \mathrm{Pr}_L \qquad (10)$$

where Pr_H and Pr_L were the probabilities of accepting the program at the high- and low-incentive offer levels, respectively.

Individual level effects were estimated for two representative cases. Case #1 was a 21-year-old male sex worker (MSW) with a prevalent sexually transmitted infection (STI) or who is HIV-positive, who did not use a condom in the last sexual act, which was with man he had just met, who does not have a stable partner, is not currently a student, finished middle school, and had a low wealth index (lower 25 percentile). Case #2 was a 21-year-old man who has sex with other men (MSM), who does not have an STI or HIV and used a condom in the last sexual act, which was not with a man he had just met; who has a stable partner, is currently a student, finished high school, and had a high wealth index (upper 75 percentile).

Finally, as a proxy for the optimal incentive, we estimated the "switching point" through a separate analysis on the switchers: those respondents who initially refused to participate but then accepted, or vice versa. In addition to helping to identify the optimal incentive (within a constrained set of feasible incentives), these two groups were relevant because their responses may reflect certain ambivalence about the program, or that the initial (random) bidding that was too low or too high. We first described the basic characteristics for the "positive" switchers (those who switched to *yes*), and then for the "negative" switchers (those who changed to *no* in the follow-up referendum). We also conducted robust linear multivariate regression to analyze the determinants of switching.

4. Results

4.1 Descriptive Statistics

Table 1, Panel A, presents the descriptive statistics for 1,745 men who have sex with men in Mexico City included in the survey. The median age was 21 years (range: 18-25 years). The number of sexual partners (with whom they had anal sex with penetration) in the last month was 3.2 men on average (median: 2). More than a third of the respondents (37%) had just met the person with whom they had the last sex act. About 12% of the sample did not use a condom at all during their last sexual act (neither the respondent, nor their partner).[4] A total of 37% of the respondents affirmed to have a stable

[4] Almost a third of respondents (32%, not shown) did not used a condom "appropriately"; appropriate condom use defined as when respondent used a condom when he had a penetrative role only, or when partner used it when respondent had a receptive role only, or when both used it regardless of sexual roles.

partner.[5] Over 5% of the sample reported sex work as their main source of income; and 46% of respondents were students. On average, the respondents had completed high school.

In terms of the outcomes and main explanatory variables, Table 1, Panel B, shows that 71% of respondents were willing to accept monthly talks at a conditional economic incentive offer of “X1” per month; where the random monthly incentive offer amount “X1” was $4.66 per month on average, and it varied from $0.77 to $13.88. Similarly, in the first bargaining question, 74% of respondents were willing to accept monthly talks for “X2” per month. The offer “X2” was $5.46 per month on average, and it varied from $0.54 to $14.65.

Over three quarters of the respondents (77%) were willing to accept a quarterly prize “Y1” for STI testing and for staying free of STIs. The random quarterly amount “Y1” was on average $13.98 and it ranged from $2.31 to $41.63. After the second bargaining question, the willingness to accept quarterly prizes increased: 80% of the respondents were willing to accept a quarterly prize “Y2” for STI testing and staying free of STIs. The quarterly amount “Y2” was $14.94 on average, and it ranged from $1.62 to $83.27.

The interaction of accepting both monthly talks (*wta1*) and accepting quarterly STI testing (*wta3*) had a potential take-up rate of 66%. Adding to the average monthly incentives and quarterly prizes resulted in a total yearly amount per person of $111.9 per year. The highest overall willingness to accept (86%), nevertheless, was for quarterly amount “Y3”, which required no attendance to monthly talks, only quarterly STI testing and staying free of STIs. The quarterly offer amount “Y3” was on average $33.1 and it varied from $4.63 to $84.81. A CEIs program for HIV prevention using only the quarterly

[5] The length of their longest relationship was 17 months on average, with a median of 10 months.

prizes, without monthly incentives for prevention talks, would thus cost $132.4 per person per year.

4.2 Impact of incentives on willingness to accept: non-parametric analysis

First we analyzed the data non-parametrically. Figure 1 shows the proportion of participants willing to accept conditional incentives to attend monthly prevention talks at different random incentive offer levels ("X1"). The figure shows an effect of the incentive level on the willingness to participate. The error bars are presented also, showing significant differences for WTA across the incentive offer levels. At low levels of incentives $1.0-$1.5 the percentage willing to participate is about 63%. The percentage willing to accept increases steadily to about 76% with incentive offers of $5.0-$5.5, but then it grows more slowly to 77% with $7.0-$7.5, flattens out, and even decreases. Similarly, Figure 2 shows a non-parametric estimation, using locally weighted regression (Fan, 1992) for the willingness to accept quarterly STI testing and economic incentives for staying free of STIs. We see a pattern of increasing WTA as the levels of the random incentive offers "Y1" increase, but then there is also evidence of "decreasing marginal returns" to the incentive offers.

4.3 Testing the balance of observables across different incentive offers

To avoid starting-point bias in our contingent evaluation work, we utilized random initial offers. In this section we test whether the randomization occurred as hypothesized in the embedded survey experiment. Table 2 shows that the incentive offers were uncorrelated with sexual risk behaviors and other characteristics, and that the randomization worked.

Specifically in Table 2, the dependent variables were the "treatments" (different levels and modalities of conditional economic incentive offers) and the covariates were variables that may be related to health risk and sexual risk behavior preferences. For the truly randomized treatments (monthly incentive “X1” and quarterly incentive “Y1”), none of the regressors was significant, meaning that there was balance on observables across the truly randomized treatments. For the follow-up (non-random) bargaining referenda (monthly incentive “X2” and quarterly incentive “Y2”) and the follow-up (substitution) question (quarterly incentive “Y3”), some of the covariates were significant. In particular, older and more educated participants got higher follow-up “X2” offers, while those who had had sex with someone they had just met received a lower monthly bargaining offer. Similarly, those with more years of formal education, and wealthier MSM received higher follow-up quarterly offers “Y2”; while male sex workers and those with more sex partners received lower bargaining offers.

4.4 Willingness to accept economic incentives for HIV prevention

Now we turn to a multivariate analysis of the willingness to accept conditional economic incentives for prevention of HIV/STI among men who have sex with men in Mexico City. Table 3 reports marginal effects from probit regression models of the outcomes (*wta*) on the conditional incentive offers (expressed in USD), their squares, and the full set of covariates. Column (1) shows the results for the willingness to accept incentives *conditional on attending monthly talks.* The coefficient on the incentive offer was positive and significant; however, the effect of the incentives on participation was non-linear: the squared term was negative and significant. In addition, men who said that they had HIV or another STI were significantly less likely to participate, whereas those whose last sexual partner was someone they had just met were more likely to sign up.

In the second column, we can see the results of the *first bargaining referendum*. Those who accepted the program at the first random incentive were given a lower incentive offer, and those who rejected the program at first were offered a higher incentive.

The marginal effect of the incentive offer was still positive, slightly smaller, and non-linear as before. Also in this first bargaining game, those with more partners were more willing to accept, while those whose main source of income was sex work were less willing to accept the compensation.

Column (3) presents the model for the question on willingness to accept incentives tied to *quarterly STI testing and being free of STIs*. Here also the incentive offer levels were positively related to the willingness to participate, and there was evidence of diminishing marginal returns: as the incentive offers increased, the levels of participation gradually stagnated. The fourth column presents the results of the *second bargaining game*, where those who did not accept the quarterly STI testing were offered a higher incentive, and those who did, were offered a lower one. The correlation between the follow-up referendum offer and the willingness to participate was negative, suggesting that higher incentives led generally to lower participation rates. This result can be explained in terms of the endogeneity of the higher offers in "Y2", which were , by designed, more likely to be received among those who initially rejected offers "Y1".

In column (5), we present the interaction of the willingness to participate in monthly prevention talks *and* quarterly STI testing/prizes for being free of STIs. Higher incentives had a positive, and significant effect on participation rates. The effect was non-linear, as incentives continued to increase the participation rates declined. Again, those with known HIV or other STIs were less likely to participate.

The sixth column shows results for the question where respondents were asked if they would prefer to have only quarterly STI testing, without monthly talks. The correlation of program acceptance with the level of incentives was positive but not significant, suggesting there was no evidence of an "embedding effect". In addition, students and those with stable partners tended to have higher probabilities of accepting the streamlined program (periodic testing with no talks).

4.5 Heterogeneity in the willingness to accept economic incentives for HIV prevention

There may be different effects for different populations. Thus, Table 4 presents an analysis for the full sample (Panel A), and stratified analyses for: participants at highest risk: MSW or those with more than nine sexual partners per month (Panel B); those respondents who currently have an STI or live with HIV (Panel C); the low-wealth sample: below 25 percentile in the wealth index (Panel D); and those who did not use a condom "appropriately" (Panel E).

Column (1) shows the results for willingness to accept incentives conditioned to attending monthly prevention talks. The baseline marginal effect (of 0.075), in Panel A, more than doubled (to 0.1734) when we restricted the sample to the low-wealth population (in Panel D), implying a much more pronounced willingness to participate in the CEI program among the economically-disadvantaged groups. Other groups substantially more inclined to participate were: those at highest risk (MSW and those with more than nine sex partners per month), as well as the group currently with HIV/STI. Likewise, we can see in column (2) that the incentive effects for the bargaining game also changed for the different populations, but not as markedly as before. While people with HIV/STI were almost twice more likely to accept the follow-up referendum at the incentive offer of X2, those at highest risk (MSW and those with most sex partners) were not affected by the bargaining game.

The heterogeneity analyses for the other program modalities echoed those presented already. The key populations at greater risk (Panels B-D) seemed to have greater responsiveness to the incentive offers. In contrast, those not using condoms appropriately (Panel E) showed similar trends in responsiveness to the CEI, but in lesser magnitudes.

The stratified analysis pinpointed the groups for which incentives may matter the most in terms of effectiveness, and overall societal cost-effectiveness. (Appendix B presents the details of a benefit cost analysis exercise based on some of these heterogeneous effects).

4.6 Incentive elasticities of participation demand

In the previous sections, the magnitude of the coefficients for the incentives was comparable only within the same CEI modalities. That is, we could compare only within columns (1-2), (3-4), (5) and (6) in the previous Tables 3 and 4, but not directly across modalities. Hence, this section gauges the effects of changes in the incentive offers on the probability of participation in percentage, unit-free terms (elasticities). Table 5 presents the incentive-elasticity of willingness to accept CEI. Specifically, we focus on two representative cases. For Case #1 (lower SES, higher-risk MSW), the elasticity for participating in monthly talks was 0.1069; that is, doubling the incentive offer from the low (25 percentile) offer of USD$2.31 per month would increase participation by 10.69% (from the initial participation rate of 66.97% to 74.12%). Similarly, increasing the quarterly incentive offer by 100%, from the low (25 percentile) quarterly incentive offer of USD$6.94 would result in increased take-up by 16.49% (from an initial take-up rate of 70.61% to 82.26%). Lastly, increasing the total annual offer by 100%, from the low (25 percentile) incentive offer of USD$55.51 per year would result in an increase of 24.47% for periodic STI testing and the talks combined (from a participation rate of 64.98% to 80.89%).

On the other hand, for Case #2 (higher SES, lower-risk MSM) the elasticity of potential demand for monthly talks was 0.0963; that is, increasing the level of incentives for monthly talks by 100% would increase the probability of program uptake by 9.63% (from the initial uptake of 70.32% to 77.1%). For the second random incentive question (regarding quarterly testing and prizes for staying free of STIs), the elasticity of potential participation with respect to the incentive amount was 0.1870. In other words, doubling the incentive offer would increase the probability of participation by 18.70% (from the initial rate of 77.57% to 92.07%). Finally, analyzing the interactions in yearly incentive terms, doubling the annual incentive would increase participation at talks and periodic STI testing (combined) by 27.67% (from the initial rate of 61% to 77.89%).

4.7 Analysis on switchers and the optimal incentive levels

The "switching point" implies a decision reversal (a change from *no* to *yes* or vice versa after the initial referendum), and hence constitutes the clearest empirical proxy of the optimal incentive level. Table 6, Panel A summarizes the results on the switchers. The first two columns present results for the "positive switchers": those who changed from *no* to *yes*; while columns (3) and (4) show results for "negative switchers": those who changed from accepting the program initially, to then rejecting it. A total of 238 respondents (13.64% of the full sample) switched from *no* to *yes* in the monthly talks participation questions (from "*no*" in *wta1* to *"yes"* in *wta2*). Similarly, 147 respondents (8.42% of the full sample) did so in the questions about quarterly testing and prizes for staying free of STIs (from "*no*" in *wta3* to *"yes"* in *wta4*). On average, the follow-up incentive offer ("X2") for positive switchers in the monthly talks was USD$9.33 per month. Likewise, the follow-up quarterly incentive offer for the positive switchers ("Y2"), on average, was USD$22.44 per quarter. Thus, the positive "switching point" for potential participants implied an offer of USD$201.69 per year. On the other hand, a much lower yearly incentive offer of USD$76.78, on average, led switchers into saying that they would be unwilling to participate (after initially accepting). Note, furthermore, in Panel B, that those switching to a accepting the incentives had higher rates of HIV/STI; while those switching to not accepting the incentives were more likely to have had sex with someone they had just met, and they were also slightly more likely to be MSWs.

Because switching rates have important policy implications, Table 7 shows the determinants of switching. The follow-up conditional incentive offers had an important effect. The coefficients for these conditional incentives offers were positive and significant for those who switched to *yes*, meaning that higher levels of bargaining incentive offers led to more acceptance of the program in the follow-up referenda. Specifically, an additional USD $1 per month (in the follow-up incentive offer "X2") led to an increase of 2.94 percentage points in the probability of switching participation to accepting the talks (from an initial 14.6% probability of switching). Similarly, an extra USD$10 per quarter (in the follow-up quarterly economic offer "Y2") increased the probability of switching to acceptance of testing and prizes for staying free of STI by 2.5 percentage points (from a baseline of 8.85%). On the other hand, the conditional incentive offer coefficients were negative and significant for those who changed their mind and decided *not* to participate. In other words, higher bargaining incentive offers led to reduced refusal rates. Namely, each additional USD$1 per month (in "X2") reduced the negative switching by 1.96 percentage points (from an initial probability of 11.3% in switching to negative); while each additional USD$10 per quarter (in "Y2") reduced the chances of rejecting the program (after having initially accepted) by 2.7 percentage points (from a baseline of 6.5%).

4.8 Robustness Checks

We conducted several non-parametric and parametric sensitivity analysis exercises to test the robustness of our results. First, we used quantile regression analysis to test the stability of the coefficients across the different quantile distributions of the data. This non-parametric method provided further evidence that the coefficients were stable across the fractions of the data; and the magnitude of the elasticity of participation with respect to the incentive offers was comparable to that reported in the main results. Second, linear probability models were fitted in a quadratic form, and the coefficients were similar to the probit marginal effects presented earlier. Finally, we tried alternative covariate vector specifications based on the literature: we constructed a “correct knowledge” variable based on several questions related to knowledge of HIV and other STIs. The variable was positively related to educational achievement and also positively related to the wealth index. However, the “correct knowledge” variable was not statistically significant in the overall models of willingness to accept: the main coefficients remained largely unchanged. Similarly, correct knowledge did not affect other outcomes such as condom use or having had sex with someone who participants had just met (results not shown).

4.9 Benefit Cost Estimations

Based on the results presented above, and a review of secondary sources, we conducted a prospective benefit cost analysis exercise for an HIV prevention program based on CEI for MSM and MSW in Mexico City. (Annex Table A1 shows the main parameters and sources). We estimated a range of fixed and variable costs for a multi-year STI/HIV prevention initiative targeted to a high-HIV incidence sub-population. Recurrent costs included: variable costs such as STI screening and treatment; supervision and monitoring of the new pilot program; and the administrative and monetary costs of the economic incentives. We used administrative data from current projects to estimate the costs of counseling and HIV and STI testing, including the costs of counselors, tests and other relevant inputs. The costs of workshops and the incentives were utilized from planning budgets. The HIV prevalence among MSM in Mexico has been estimated for several years, and it was at 10.2% in 2009 (UNGASS, 2010); incidence estimates were calculated using UNAIDS’ Estimation and Projection Package (EPP, 2010). For the base case, the potential effectiveness of the program was conservatively estimated at 16%, based on the literature related to effectiveness of HIV prevention among youth (Dick et al., 2006; Michielsen et al., 2010); other scenarios used more optimistic assumptions (30 and 60% reductions) based on the recent evidence from other similar conditional economic incentive programs (Baird et al., 2010; Medlin and de Walque, 2008; Thornton, 2008; World Bank, 2010).

We estimated the cost savings associated with averted HIV treatment costs in Mexico based on published studies (Aracena-Genao et al., 2008; Aracena et al., 2005; Bautista-Arredondo et al., 2003; Bautista-Arredondo et al., 2008). The benefit-cost estimates were likely to underestimate the true value to society as opportunity costs (travel, waiting and participation time), as well as other economic costs such as productivity gains, were not included. Also, we did not consider the savings from averted STI infections or from "treatment as prevention" (i.e., secondary and tertiary cases averted). Under the most conservative effectiveness rate (of 16%), using an annual cost of USD$5,585 per person per year for highly active antiretroviral treatment in Mexico (Bautista-Arredondo et al., 2008), and a time horizon of 25 years, discounted at 3% per annum, we found that the benefit-cost ratio was 2.86 for a one-year program (Annex Table A2). Increasing the duration of the program to two years reduced the benefit cost ratio to 1.45. Using higher treatment costs which account for treatment of complications and other related costs (Aracena-Genao et al., 2008) increased the benefit-cost ratio substantially (See Appendix B for further details).

Thus, even in the most conservative case scenario, for each $1 invested in the proposed HIV prevention program using CEI, the Mexican health sector would at least recover that investment, and more likely save money in terms of forgone HIV treatment costs. In the scenarios with a more optimistic effectiveness rate of 60% reductions in HIV incidence (similar to that recently shown in Malawi), the benefit-cost ratio increased up to

14.78; that is, the Mexican society could save up to almost $15 per each $1 invested in prevention through CEI. Assuming higher levels of incentives (about $200 per person per year, or enough to convince initially reticent respondents), the CB ratios were above unity under all modalities at 60% effectiveness, for three out of four modalities at 30%, and for two (out of four) at 16%.

As stated previously, the benefit-cost results presented are conservative estimates of the benefits as we have not estimated the secondary and tertiary HIV prevention gains as others have. For example, in a study for Thailand (Revenga et al., 2006) each $1 in prevention would save up to about $47 in future treatment costs.

5. Discussion

Although effective HIV prevention interventions exist, low take-up rates are a common problem. Thornton (2008) has shown that a small economic incentive can improve participation rates in HIV testing dramatically. Recent (preliminary) evidence from Malawi and Tanzania seems to point to highly efficacious conditional economic incentive programs (Baird et al., 2010; Medlin and de Walque, 2008; Thornton, 2008; World Bank, 2010).

This paper presents formative quantitative work showing that paying potential program users to sign up, get tested, attend prevention workshops and reduce risk behaviors may be highly cost beneficial. The results show formative evidence for policy development in the HIV prevention field in Mexico, with possible implications for other concentrated epidemic settings, focusing on men who have sex with men, particularly male sex workers.

New and innovative methods for HIV prevention, particularly those improving take-up of known effective technologies, are sorely needed worldwide. This paper shows the willingness to accept economic incentives for participating in prevention workshops and remaining free of STIs (verified through periodic STI testing) among populations at high risk (MSM and MSW of low socio-economic status in Mexico City). The highest willingness to accept was found for quarterly testing without monthly talks (86% responded they would be interested), while the lowest WTA (69.7%) was found for the participation in both monthly prevention and quarterly STI testing combined. Thus, the results suggest “bundling” or “embedding effects” (Kahneman and Knetsch 1992) in relation to monthly talks vis-à-vis quarterly incentives as the “unbundled” option (*wta5*) which did not require talks, but only STI testing and CEI for staying free of STIs had by far the highest acceptance rate.

While the incentive elasticity of participation for monthly talks (*wta1*) was 0.0963: that for quarterly STI testing (*wta3*) was of 0.1870, meaning that a 100% increase in the incentive offer increased potential participation rates by 9.63% and 18.70% in monthly talks and quarterly testing, respectively.

Non-parametric and various parametric specifications show that, in general, higher (random) incentive offers result in higher participation probabilities, but there is strong evidence of diminishing returns. Furthermore, the coefficients and marginal effects are stable across various sub-populations at higher risk: MSW, those with a prevalent STI or living with HIV, low-wealth groups, and those without appropriate condom use.

The patterns of the (non-random) bargaining referendum offers reveal that some populations perceive themselves at higher risk and would be more willing to join a CEI program tied to periodic STI testing. On the other hand, those with more wealth, more education, and less sexual partners were more likely to refuse the initial offer and hence receive a higher follow-up offer. This explains the puzzling negative sign on the marginal effect of the quarterly bargaining offer (*wta4*): Those who already said *no* to the first offer, had higher second offers, and may have been more likely to say *no* again.

Correspondingly, those who had accepted to participate with the first offers, received a lower second offer, but may have been also more likely to say *yes* again.

The "switching point" implies a decision reversal: a change from *no* to *yes* or vice versa and was the proxy for the optimal incentive. Positive switching (a change to *yes*) occurred at higher incentive levels: $202 per positive switcher per year; while negative switching (a change to *no*) occurred at lower incentive offers: $77 per person per year. Consequently, convincing reluctant participants to attend monthly talks and quarterly testing would require offers as high as about $200 per person per year. Nevertheless, offers of about $80 per year would avoid that potential participants get discouraged. Even with some switching to *no*, the overall participation rates in the follow-up experiments are high. Did the positive switchers get an initial low incentive? Yes, on average positive switchers had much lower incentives than the averages in the full sample, and those who switched to *no* received higher initial incentive offers.

The switching patterns are consistent to what the model would predict: switching into "yes" requires higher compensation, whereas switching to "no" occurs at the lower incentive offers. The negative switching average constitutes a lower bound of the optimal incentive (α^*), while the positive switching average is an upper bound. The patterns are also consistent with those found in other applications of contingent valuation methods, as varied as the willingness to pay for hunting and fishing permits, or for the willingness to accept compensation for waste disposal infrastructure projects (Alberini et al., 2003; Ferreira and Gallagher, 2010; Roach et al., 2002). Nevertheless, the model implicitly assumes that each participant is acting independently of all of the others. Future extensions can investigate the interaction among players using game theory and economic psychology insights. If a CEI program was offered, it would probably either be extremely popular (in which case the financial amounts needed to attract participants would probably be lower than that estimated) – or it would be completely unpopular – in which case the resources needed to achieve coverage would need to be much higher.

5.1 Limitations

The current research has some limitations. The sample is not representative of the entire MSM or MSW populations in Mexico City (a highly diverse metropolis of over 20 million people). Thus, the results cannot easily be generalized. The sample should be informative, nevertheless, about the persons present at the *places* and *times* where data was collected. From a public health perspective, the population surveyed should be the most relevant: those at higher risk of infection in bars and other (formal and informal) meeting places where they are already with a sexual partner or are looking for one; as well as MSW who are at their sex work sites.

Uncertainty about the possibility of eliciting true preferences is an inherent limitation in this type of contingent valuation (CV) research (McFadden, 1994). Still the CV techniques are the best available for prospective valuation of non-tangible goods and services with missing markets. There is a need nevertheless for implementing larger pilot prevention programs sustained over a few years to study true revealed preferences and participation rates. Also, some biases may occur as a positive response may be given simply because that is the "socially desirable" answer. Some of those biases were reduced in this research by letting the respondents use computer-assisted self-interview technology.

For policy relevance, we needed a plausible range of incentive amount offers. Thus the range for the incentive offers was bounded: the higher initial offers were followed up by progressively smaller increases (in the bargaining games). The model serves to estimate an incentive amount sufficiently high to encourage participation of N individuals, but does not represent the most reluctant participants, or those with the highest thresholds. Thus, we cannot estimate the full measure of the consumer's surplus forgone (or the full compensation required to completely eliminate HIV risk behaviors); the estimates presented are a lower bound, and a *potentially feasible* upper bound (within the populations at highest risk of infection).

In spite of the limitations, the results suggest that the target population is highly willing to accept economic incentives linked to behavior change to prevent HIV/AIDS and other sexually transmitted infections. MSM and MSW in the sample seem generally well disposed to participate in a CEIs program for HIV and STI prevention in Mexico. This quantitative research corroborates the qualitative work done earlier (Infante et al., 2009) and suggests that a targeted pilot program could be accepted by the population. Mexico, a global leader in conditional economic incentives for human development and poverty reduction, could extend that successful model to prevent HIV and other STIs.

6. Conclusions

This paper has shown the willingness to accept conditional cash incentives directly linked to HIV/STI prevention in men who have sex with men (including male sex workers) in Mexico City. The exercise has found high potential up-take among the target populations: with acceptance rates ranging from 70 to over 86% depending on the specific modalities. The option of periodic STI testing without having to attend prevention talks was the most popular modality (86%).

For those who initially did not accept the potential program, the expected economic incentive to switch to yes, conditional on monthly prevention talks and staying free of STIs (verified with quarterly STI testing), was of $202 per person per year, which is a feasible amount in comparison to other social assistance programs in Mexico City.[6]

[6] The government in Mexico City has several social assistance programs that include economic incentives for vulnerable populations including: senior citizens, single mothers, migrants and indigenous people, out-of-school youth (See http://www.transparencia2008.df.gob.mx/wb/Transparencia/programas_2010). However, no program currently exists to populations particularly vulnerable to HIV/AIDS.

Various models show a positive relation between the incentive offer and the WTA. By doubling the incentive offer, participation in regular STI testing linked to CEI for staying free of STIs increases by over 16% (among low-SES MSW).

Conditional economic incentives have the potential to increase the take-up of HIV prevention interventions in the "right" target populations for Mexico. Highly-targeted and outcome-oriented CEIs could be well accepted by specific populations highly at risk. The results presented show that a sufficiently high level of compensation may induce reduced risk (by a combination of reduced number of sex partners and increased condom use) to stay free of STIs and thus be compliant with the program. At potentially achievable levels of effectiveness, the targeted CEI intervention seems to be a cost-beneficial alternative as the investment in prevention would result in substantial treatment cost-savings within a plausible time horizon.

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Table 1: Descriptive Statistics: men who have sex with men in Mexico City [a]

A. Covariates	N	Mean	Median	Std. Dev.	Min	Max
Age (in years)	1,745	21.4	21	2.3	18	25
Age squared	1,745	461.3	441	100.3	324	625
Has HIV or other sexually transmitted infection (STI) [b]	1,683	0.094	0	0.292	0	1
Any condom use at last sexual act [b,c]	1,610	0.876	1	0.33	0	1
Male sex partners (last month)	1,745	3.2	2	6.1	1	139
Last sex act with a partner whom respondent had just met [b]	1,617	0.366	0	0.48	0	1
Has a stable partner [b]	1,648	0.365	0	0.48	0	1
Sex worker [b]	1,487	0.051	0	0.22	0	1
Student [b]	1,598	0.461	0	0.50	0	1
Highest level of education [d]	1,745	3.1	3	0.64	1	5
Wealth index [e]	1,596	0.00	-0.05	0.77	-0.89	2.53
B. Willingness to accept & economic incentive offers [f,g]						
WTA1: Accept monthly talks & STI tests for "X1"	1,628	0.714	1	0.45	0	1
X1: random monthly incentive offer (USD/mo.)	1,729	4.66	4.24	2.90	0.77	13.88
WTA2: Accept monthly talks & tests for "X2"	1,626	0.739	1	0.44	0	1
X2: bargaining monthly incentive offer (USD/mo.)	1,729	5.46	4.05	3.75	0.54	14.65
WTA3: Accept quarterly prize "Y1" to stay free of STI	1,645	0.774	1	0.42	0	1
Y1: random quarterly incentive offer (USD/qtr.)	1,729	13.98	12.72	9	2.31	41.63
WTA4: Accept quarterly prize "Y2" to stay free of STI	1,636	0.804	1	0.40	0	1
Y2: bargaining quarterly incentive offer (USD/qtr.)	1,729	14.92	10.52	15.31	1.62	83.27
WTA1&3: Accept STI tests and quarterly prize	1,594	0.662	1	0.47	0	1
Total random incentive offer (USD/yr.)	1,729	111.9	101.77	70	18.50	333.08
WTA5: Accept quarterly amount "Y3" (STI testing, no	1,665	0.860	1.00	0.35	0	1
Y3: bargaining quarterly incentive offer "Y3"	1,729	33.1	31.80	18	4.63	84.81

Notes:

[a] The sample consists of 1,745 men who have sex with men (MSM), including male sex workers (MSW). MSM defined as a man who has had sex with another man with anal penetration within the last year.

[b] Binary variable.

[c] Any condom use refers to use of condoms by respondent or male partner during last anal sex.

[d] Educational levels were: Primary =1 Middle School =2 High School =3 College =4 Graduate =5.

[e] The wealth index was constructed using data on availability of: vehicle, own house, more than five rooms in the house, laptop and desktop computers, cable television, Internet access, and household help.

[f] Willingness to accept (WTA) variables were binary responses =1 if respondent says he was willing to participate in the program, and =0 if he was not. The conditional incentive offers were random offers for *wta1* and *wta3*. The incentive offers for *wta2*, and *wta4* were follow-up questions: a bargaining experimental game to increase participation and/or reduce program costs by increasing the incentives (for those who initially said “no”) or to lower the incentive (for those who initially said “yes”).

[g] Conditional incentive offer amounts are expressed in US dollars (USD) of 2008. Data collection took place during October 1-December 15, 2008 in Mexico City; the average exchange rate was 12.97 pesos per USD (IMF, 2008).

Table 2: Testing the balance of observables across treatment conditions (offers) [a]

	(1) Random monthly incentive offer (X1)	(2) Bargaining monthly incentive offer (X2)	(3) Random quarterly incentive offer (Y1)	(4) Bargaining quarterly incentive offer (Y2)	(5) Bargaining quarterly incentive offer (Y3)
Age (in years)	0.0042	0.0986	0.0127	0.0466	0.2730
	[0.0444]	[0.0538]+	[0.1332]	[0.1909]	[0.2586]
Has HIV or STI [b]	-0.0009	1.1611	-0.0026	1.0348	2.9117
	[0.3255]	[0.3956]**	[0.9766]	[1.6794]	[1.8047]
Any condom use at last sexual act [b,c]	-0.2149	0.0239	-0.6447	-1.9480	-0.5108
	[0.3066]	[0.4097]	[0.9198]	[1.7390]	[1.9283]
Sex partners (# per month)	-0.0025	-0.0150	-0.0076	-0.0958	-0.0367
	[0.0124]	[0.0234]	[0.0372]	[0.0449]*	[0.0950]
Last sex with someone just met [b]	0.0495	-0.5031	0.1484	-0.0454	-1.0950
	[0.2010]	[0.2587]+	[0.6030]	[0.9773]	[1.2225]
Has a stable partner [b]	0.1083	0.2501	0.3249	-0.2354	1.0874
	[0.2067]	[0.2664]	[0.6202]	[1.0207]	[1.2491]
Sex worker [b]	-0.5113	-0.0329	-1.5339	-2.5095	-1.8709
	[0.3560]	[0.4870]	[1.0680]	[1.1144]*	[2.1172]
Student [b]	-0.0160	0.0170	-0.0479	-0.8064	0.1313
	[0.2126]	[0.2556]	[0.6377]	[0.9912]	[1.2521]
Highest level of education [d]	0.2344	0.6055	0.7031	1.4872	2.4562
	[0.1787]	[0.2137]**	[0.5362]	[0.8940]+	[1.0672]*
Has correct knowledge [b, f]	-0.2326	-0.4491	-0.6977	-0.6633	-1.9141
	[0.2539]	[0.2994]	[0.7617]	[1.2009]	[1.4819]
Wealth index [e]	0.1586	0.1500	0.4759	1.6207	0.7927
	[0.1429]	[0.1760]	[0.4287]	[0.7414]*	[0.8468]
Constant	4.0089	1.4348	12.0268	11.0874	19.9333
	[0.9790]**	[1.2247]	[2.9369]**	[4.7299]*	[5.8664]**
Observations	900	900	900	900	900
R-squared	0.011	0.042	0.011	0.025	0.024

Notes:
Table presents results from linear regression where dependent variables were conditional incentive offers in USD.
Robust standard errors in brackets: ** p<0.01, * p<0.05, + p<0.1
[a] The sample consists of men who have sex with men (MSM), including male sex workers (MSW). MSM defined as a man who has had sex with another man with anal penetration within the last year. The conditional incentive offers X1 and X3 were random. The incentive offers X2, Y2 and Y3 were from follow-up questions: a bargaining experimental game to increase participation and/or reduce program costs by increasing the incentives (for those who initially said "no") or to lower the incentive (for those who initially said "yes"). In the regressions, conditional incentive offer amounts are expressed in US dollars (USD) of 2008. Data collection took place during October 1-December 15, 2008 in Mexico City; the average exchange rate was 12.97 pesos per USD (IMF, 2008)
[b] Binary variable.
[c] Any condom use refers to use of condoms by respondent or male partner during last anal sex.
[d] Educational levels were: Primary =1 Middle School =2 High School =3 College =4 Graduate =5.
[e] The wealth index was constructed using data on availability of: vehicle, own house, more than five rooms in the house, laptop and desktop computers, cable television, Internet access, and household help.
[f] Correct knowledge (yes/no) was based on a battery of questions about HIV and sexually transmitted infections (STIs).

Table 3: Willingness to accept conditional economic incentives for prevention of HIV & other STIs among men who have sex with men in Mexico City [a]

	(1) wta1: Accept monthly talks & STI tests for random $"X1" USD per month	(2) wta2: Accept monthly talks & tests for bargaining $"X2" USD per month	(3) wta3: Accept quarterly prize of random "Y1" USD to stay free of STI	(4) wta4: Accept quarterly prize of bargaining $"Y2" USD to stay free of STI	(5) wta1&3: Accept monthly talks & STI tests and quarterly prize for X1*12+Y1*4 USD per year	(6) wta5: Accept quarterly prize without monthly talks for $"Y3" USD to stay free of STI
Conditional incentive	0.0750	0.0519	0.0326	-0.0085	0.0039	0.0015
	[0.015]**	[0.015]**	[0.005]**	[0.003]**	[0.001]**	[0.002]
Conditional incentive squared	-0.0066	-0.0069	-0.0009	-0.0000	-0.0000	-0.0001
	[0.001]**	[0.001]**	[0.000]**	[0.000]	[0.000]**	[0.000]**
Age (in years)	0.0248	0.0030	-0.0304	-0.0232	0.0314	0.0276
	[0.118]	[0.117]	[0.106]	[0.105]	[0.126]	[0.084]
Age squared	-0.0009	-0.0002	0.0005	0.0005	-0.0009	-0.0007
	[0.003]	[0.003]	[0.002]	[0.002]	[0.003]	[0.002]
Has HIV or STI [b]	-0.1470	0.0276	-0.0432	0.0155	-0.1444	0.0310
	[0.053]**	[0.044]	[0.046]	[0.040]	[0.054]**	[0.028]
Any condom use at last sexual act [b,c]	-0.0015	0.0314	0.0097	0.0561	-0.0524	-0.0097
	[0.041]	[0.040]	[0.037]	[0.038]	[0.042]	[0.027]
Male sex partners (last month)	0.0005	0.0137	0.0020	-0.0013	0.0023	0.0041
	[0.002]	[0.004]**	[0.002]	[0.002]	[0.002]	[0.003]
Last sex act with a partner whom respondent had just met [b]	0.0622	-0.0420	-0.0133	-0.0168	0.0472	0.0299
	[0.028]*	[0.028]	[0.026]	[0.025]	[0.031]	[0.020]
Has a stable partner [b]	-0.0287	0.0023	0.0022	-0.0105	-0.0487	0.0394
	[0.029]	[0.028]	[0.026]	[0.025]	[0.031]	[0.019]*
Sex worker [b]	-0.0202	-0.1735	-0.0648	-0.0039	-0.0541	-0.0052
	[0.066]	[0.090]+	[0.064]	[0.057]	[0.071]	[0.055]
Student [b]	-0.0043	-0.0300	-0.0058	0.0303	-0.0220	0.0332
	[0.029]	[0.027]	[0.026]	[0.025]	[0.031]	[0.019]+
Highest level of education [d]	-0.0192	-0.0158	-0.0231	-0.0005	-0.0240	-0.0236
	[0.023]	[0.024]	[0.021]	[0.021]	[0.025]	[0.016]
Wealth index [e]	-0.0020	-0.0158	-0.0171	-0.0142	-0.0081	-0.0176
	[0.019]	[0.017]	[0.017]	[0.016]	[0.020]	[0.013]
Observations	1,153	1,148	1,158	1,149	1,134	1,172
Pseudo R-squared	0.0483	0.147	0.0651	0.137	0.0462	0.108
Observed probability (WTA)	0.735	0.763	0.788	0.815	0.683	0.869

Notes: Table presents probit regression marginal effects. Robust standard errors in brackets: ** p<0.01, * p<0.05, + p<0.1

[a] The sample consists of men who have sex with men (MSM), including male sex workers (MSW). MSM defined as a man who has had sex with another man with anal penetration within the last year. Willingness to accept (WTA) variables were binary responses =1 if respondent says he was willing to participate in the program, and =0 if he was not. The conditional incentive offers were random offers for *wta1* and *wta3*. The incentive offers for *wta2*, *wta4* and *wta5* were follow-up questions: a bargaining experimental game to increase participation and/or reduce program costs by increasing the incentives (for those who initially said "no") or to lower the incentive (for those who initially said "yes"). In the regressions, conditional incentive offer amounts were expressed in US dollars (USD) of 2008. Data collection took place during October 1-December 15, 2008 in Mexico City; offers were made in current Mexican pesos, and converted into USD for purposes of analysis at the period average exchange rate of 12.97 pesos per USD (IMF, 2008).

[b] Binary variable.

[c] Any condom use refers to use of condoms by respondent or male partner during last anal sex.

[d] Educational levels were: Primary =1 Middle School =2 High School =3 College =4 Graduate =5.

[e] The wealth index was constructed using data on availability of: vehicle, own house, more than five rooms in the house, laptop and desktop computers, cable television, Internet access, and household help.

Table 4: Heterogeneity Analysis

	(1)	(2)	(3)	(4)	(5)	(6)
A. Full Sample [a]	*wta1*	*wta2*	*wta3*	*wta4*	*wta1&3*	wta5
Conditional incentive	0.0750	0.0519	0.0326	-0.0085	0.0039	0.0015
	[0.015]**	[0.015]**	[0.005]**	[0.003]**	[0.001]**	[0.002]
Conditional incentive squared	-0.0066	-0.0069	-0.0009	-0.0000	-0.0000	-0.0001
	[0.001]**	[0.001]**	[0.000]**	[0.000]	[0.000]**	[0.000]**
Observations	1,153	1,148	1,158	1,149	1,134	1,172
Pseudo R-squared	0.0483	0.147	0.0651	0.137	0.0462	0.108
Observed probability (WTA)	0.735	0.763	0.788	0.815	0.683	0.869
B. Restricted Sample 1: Population at highest risk [b]						
Conditional incentive	0.1293	0.0120	0.0501	-0.0085	0.0099	0.0001
	[0.043]**	[0.039]	[0.014]**	[0.019]	[0.002]**	[0.002]
Conditional incentive squared	-0.0089	-0.0004	-0.0013	0.0007	0.0000	0.0000
	[0.004]*	[0.003]	[0.000]**	[0.001]	[0.000]**	[0.000]
Observations	96	85	97	94	95	61
Pseudo R-squared	0.221	0.203	0.432	0.146	0.392	0.269
Observed probability (WTA)	0.781	0.835	0.804	0.819	0.726	0.951
C. Restricted Sample 2: Has HIV or STI [c]						
Conditional incentive	0.1333	0.0905	0.0679	0.0390	0.0071	0.0034
	[0.074]+	[0.042]*	[0.019]**	[0.018]*	[0.003]*	[0.003]
Conditional incentive squared	-0.0084	-0.0088	-0.0017	-0.0011	-0.0000	-0.0001
	[0.006]	[0.003]**	[0.001]**	[0.000]*	[0.000]+	[0.000]
Observations	94	94	95	97	94	97
Pseudo R-squared	0.189	0.280	0.215	0.351	0.186	0.442
Observed probability (WTA)	0.606	0.777	0.747	0.835	0.564	0.897
D. Restricted Sample 3:Low-wealth population [d]						
Conditional incentive	0.1734	0.0795	0.0520	-0.0049	0.0086	0.0056
	[0.032]**	[0.030]**	[0.009]**	[0.006]	[0.002]**	[0.003]+
Conditional incentive squared	-0.0140	-0.0087	-0.0014	-0.0000	-0.0000	-0.0001
	[0.003]**	[0.002]**	[0.000]**	[0.000]	[0.000]**	[0.000]**
Observations	266	260	266	259	264	269
Pseudo R-squared	0.129	0.188	0.165	0.106	0.140	0.149
Observed probability (WTA)	0.729	0.804	0.793	0.834	0.689	0.903
E. Restricted Sample 4: without "appropriate" condom use [e]						
Conditional incentive	0.0538	0.0555	0.0328	-0.0089	0.0016	0.0046
	[0.032]+	[0.029]+	[0.009]**	[0.006]	[0.001]	[0.004]
Conditional incentive squared	-0.0056	-0.0073	-0.0010	-0.0000	-0.0000	-0.0001
	[0.002]*	[0.002]**	[0.000]**	[0.000]	[0.000]+	[0.000]*
Observations	315	312	321	313	312	325
Pseudo R-squared	0.0475	0.185	0.109	0.203	0.0346	0.158
Observed probability (WTA)	0.717	0.756	0.791	0.792	0.683	0.877

Notes: Table presents probit regression marginal effects. Robust standard errors in brackets: ** p<0.01, * p<0.05, + p<0.1

[a] Full sample consists of all men who have sex with men (MSM), including male sex workers (MSW) with information on relevant variables. Willingness to accept (WTA) variables were binary responses =1 if respondent says he was willing to participate in the program, and =0 if he was not. The conditional incentive offers were random for *wta1* and *wta3*. The incentive offers for *wta2*, *wta4* and *wta5* were follow-up questions: a bargaining experimental game to increase participation and/or reduce program costs by increasing the incentives (for those who initially said "no") or to lower the incentive (for those who initially said "yes"). In the regressions, conditional incentive offer amounts were expressed in US dollars (USD) of 2008. Data collection took place during October 1-December 15, 2008 in Mexico City; offers were made in current Mexican pesos, and converted into USD for purposes of analysis at the period average exchange rate of 12.97 pesos per USD (IMF, 2008).

[b] Sample population at the highest risk was defined as male sex workers or those with more than 9 sex partners per month.

[c] Participants who declared to currently having been infected with HIV or with other sexually transmitted infection (STI).

[d] Low-wealth sample were participants with a wealth index below the 25 percentile of the distribution; the wealth index was constructed using data on availability of: vehicle, own house, more than five rooms in the house, laptop and desktop computers, cable television, Internet access, and household help.

[e] Appropriate condom use during the last sex act was defined as when respondent used a condom when he had a penetrative role only, or when partner used it when respondent had a receptive role only, or when both used it regardless of sexual roles.

Table 5: Elasticity of accepting HIV/STI prevention with respect to conditional incentives; and individual-level effects among MSM & MSW in Mexico City

	(1)	(2)	(3)	(4)	(5)
A. Average effects	wta1: Accept monthly talks & STI tests for random $"X1" USD per month	wta2: Accept monthly talks & tests for bargaining $"X2" USD per month	wta3: Accept quarterly prize of random "Y1" USD to stay free of STI	wta4: Accept quarterly prize of bargaining $"Y2" USD to stay free of STI	wta1&3: Accept monthly talks & STI tests and quarterly prize for X1*12+Y1*4 USD per year
Conditional incentive marginal effect	0.0750	0.0519	0.0326	-0.0085	0.0039
	[0.015]**	[0.015]**	[0.005]**	[0.003]**	[0.001]**
Conditional incentive squared	-0.0066	-0.0069	-0.0009	-0.0000	-0.0000
	[0.001]**	[0.001]**	[0.000]**	[0.000]	[0.000]**
WTA probability (observed, mean)	73.5%		78.8%		68.3%
B. Individual-level effects					
Case #1: Lower SES, higher-risk MSW [a]					
Lower incentive (25 percentile) USD	2.31		6.94		55.51
WTA probability at low incentive	0.6697		0.7061		0.6498
WTA probability at 2x(low incentive)	0.7412		0.8226		0.8089
Computed elasticity	0.1069		0.1649		0.2447
Case #2: Higher SES, lower-risk MSM [b]					
Lower incentive (25 percentile) USD	2.31		6.94		55.51
WTA probability at low incentive	0.7032		0.7757		0.6101
WTA probability at 2x(low incentive)	0.7709		0.9207		0.7789
Computed elasticity	0.0963		0.1870		0.2767

Notes:

Robust standard errors in brackets: ** p<0.01, * p<0.05, + p<0.1

The marginal effects are from probit regressions that control for all covariates presented in Table 1.
Mean probability is the observed mean of the dependent variable: willingness to accept (WTA) conditional economic incentives for prevention of HIV and other STIs, which is a binary indicator = 1 if the participant is willing to participate and =0 otherwise.

The sample consists of men who have sex with men (MSM), including male sex workers (MSW). MSM defined as a man who has had sex with another man with anal penetration within the last year. The conditional incentive offers were random offers for *wta1* and *wta3*. The incentive offers for *wta2*, *wta4* and *wta5* were follow-up questions: a bargaining experimental game to increase participation and/or reduce program costs by increasing the incentives (for those who initially said "no") or to lower the incentive (for those who initially said "yes"). In the regressions, conditional incentive offer amounts were expressed in US dollars (USD) of 2008. Data collection took place during October 1-December 15, 2008 in Mexico City; offers were made in current Mexican pesos, and converted into USD for purposes of analysis at the period average exchange rate of 12.97 pesos per USD (IMF, 2008).

Panel B presents the probabilities and elasticities (for doubling the incentive offer) at the lower 25% of the incentive level for two illustrative cases:

[a] Case #1: A 21-year-old male sex worker (MSW) with a prevalent sexually transmitted infection (STI) or who is HIV-positive, who did not use a condom in the last sexual act, had sex with man he had just met, who does not have a stable partner, is not currently a student, finished middle school, and had a low wealth index (25 lower percentile).

[b] Case #2: A 21-year-old man who has sex with other men (MSM), who does not have an STI or HIV and used a condom in the last sexual act, which was not with a man he had just met; who has a stable partner, is currently a student, finished high school, and had a high wealth index (75 upper percentile).

Table 6: Switching point for accepting program for prevention of HIV/STI among men who have sex with men in Mexico City

	Positive Switchers		Negative Switchers	
	(1)	(2)	(3)	(4)
A. Summary	Switched to **yes** from *wta1* to *wta2*	to **yes** from *wta3* to *wta4*	Switched to **no** from *wta1* to *wta2*	Switched to **no** from *wta3* to *wta4*
Switchers (N) [a]	238	147	186	104
Proportion of switchers from total sample	0.1364	0.0842	0.1066	0.0596
Conditional incentive offer (USD) to switch	$9.33/mo.	$22.44/qtr.	$3.34/mo.	$9.19/qtr.
Total conditional yearly incentive offer (USD) to switch	$201.69/yr.		$76.78/yr.	
B. Specific characteristics (mean) by switching group				
Age (in years)	21.79	21.76	21.38	21.5
Age squared	480.83	479.33	463.08	468.02
Has HIV or other sexually transmitted infection (STI) [b]	0.16	0.13	0.08	0.08
Any condom use at last sexual act [b,c]	0.95	0.95	0.91	0.85
Appropriate condom use [f]	0.68	0.70	0.73	0.65
Male sex partners (last month)	3.42	2.68	2.60	3.14
Last sex with someone just met [b]	0.26	0.30	0.36	0.40
Has a stable partner [b]	0.41	0.36	0.41	0.44
Sex worker [b]	0.06	0.06	0.08	0.08
Student [b]	0.47	0.48	0.52	0.40
Highest level of education [d]	3.00	3.12	3.03	3.05
Wealth index [e]	-0.10	-0.01	-0.03	0.04
WTA1: Accept monthly talks & STI tests for "X1"	0.00	0.36	1.00	0.64
X1: random monthly incentive offer (USD/mo.)	3.24	3.74	4.77	4.37
WTA2: Accept monthly talks & tests for "X2"	1.00	0.58	0.00	0.46
X2: bargaining monthly incentive offer (USD/mo.)	9.33	7.08	3.34	5.64
WTA3: Accept quarterly prize "Y1" to stay free of STI	0.67	0.00	0.80	1.00
Y1: random quarterly incentive offer (USD/qtr.)	9.73	11.22	14.30	13.12
WTA4: Accept quarterly prize "Y2" to stay free of STI	0.79	1.00	0.69	0.00
Y2: bargaining quarterly incentive offer (USD/qtr.)	9.08	22.44	12.78	9.19
WTA1&3: Accept STI tests and quarterly prize	0.00	0.00	0.80	0.64
Total random incentive offer (USD/yr.)	77.83	89.75	114.41	104.98

Notes:
The table reports arithmetic means for each variable according to switching group.
[a] The sample consists of men who have sex with men (MSM), including male sex workers (MSW) who, during the bargaining game switched their willingness to accept (WTA) response from "no" to "yes" (positive switchers), and those who changed from "yes" to "no" (negative switchers). In the table, conditional incentive offer amounts are expressed in US dollars (USD) of 2008. Data collection took place during October 1-December 15, 2008 in Mexico City; offers were made in current Mexican pesos, and converted into USD for purposes of analysis at the period average exchange rate of 12.97 pesos per USD (IMF, 2008).
[b] Binary variable.
[c] Any condom use refers to use of condoms by respondent or male partner during last anal sex.
[d] Educational levels were: Primary =1 Middle School =2 High School =3 College =4 Graduate =5.
[e] The wealth index was constructed using data on availability of: vehicle, own house, more than five rooms in the house, laptop and desktop computers, cable television, Internet access, and household help.
[f] Appropriate condom use during the last sex act was defined as when respondent used a condom when he had a penetrative role only, or when partner used it when respondent had a receptive role only, or when both used it regardless of sexual roles.

Table 7: Determinants of switching willingness to participate in HIV/STI prevention program for MSM and MSW in Mexico City

	(1)	(2)	(3)	(4)
	Probability of switching to **yes** from *wta1* to *wta2*	Probability of switching to **yes** from *wta3* to *wta4*	Probability of switching to **no** from *wta1* to *wta2*	Probability of switching to **no** from *wta3* to *wta4*
Follow-up conditional incentive offer (USD) [a]	0.0294	0.0025	-0.0196	-0.0027
	[0.003]**	[0.000]**	[0.003]**	[0.001]**
Age (in years)	-0.0924	-0.0714	-0.0410	-0.0002
	[0.058]	[0.065]	[0.077]	[0.061]
Age squared	0.0021	0.0017	0.0010	-0.0001
	[0.001]	[0.002]	[0.002]	[0.001]
Has HIV or STI [b]	0.0404	0.0450	-0.0165	-0.0111
	[0.030]	[0.036]	[0.031]	[0.022]
Any condom use at last sexual act [b,c]	0.0533	0.0496	0.0300	-0.0299
	[0.009]**	[0.018]**	[0.023]	[0.024]
Male sex partners (last month)	0.0020	-0.0019	-0.0056	-0.0006
	[0.001]*	[0.002]	[0.002]*	[0.001]
Last sex act with a partner whom respondent had just met [b]	-0.0224	-0.0149	0.0117	0.0178
	[0.014]+	[0.017]	[0.019]	[0.015]
Has a stable partner [b]	0.0286	-0.0034	0.0260	0.0182
	[0.015]+	[0.017]	[0.019]	[0.015]
Sex worker [b]	0.0449	0.0996	0.1222	-0.0145
	[0.038]	[0.065]	[0.072]+	[0.029]
Student [b]	0.0229	0.0219	0.0338	-0.0161
	[0.015]	[0.018]	[0.019]+	[0.014]
Highest level of education [d]	-0.0033	0.0151	0.0134	0.0110
	[0.012]	[0.013]	[0.016]	[0.013]
Wealth index [e]	-0.0264	0.0008	0.0007	0.0098
	[0.009]**	[0.011]	[0.012]	[0.010]
N (switchers and non-switchers)	1,120	1,130	1,120	1,130
Pseudo R-squared	0.367	0.0613	0.0745	0.0374
Observed probability (of switching)	0.146	0.0885	0.113	0.0655

Notes:
Table presents probit regression marginal effects. Robust standard errors in brackets: ** p<0.01, * p<0.05, + p<0.1
The sample consists of men who have sex with men (MSM), including male sex workers (MSW). MSM defined as a man who has had sex with another man with anal penetration within the last year. Willingness to accept (WTA) variables were binary responses =1 if respondent says he was willing to participate in the program, and =0 if he was not. The conditional incentive offers were random offers for *wta1* and *wta3*. The incentive offers for *wta2*, *wta4* and *wta5* were follow-up questions: a bargaining experimental game to increase participation and/or reduce program costs by increasing the incentives (for those who initially said "no") or to lower the incentive (for those who initially said "yes").
[a] The follow-up incentive offer is the non-random bargaining offer (X2, Y2). In the regressions, conditional incentive offer amounts were expressed in US dollars (USD) of 2008. Data collection took place during October 1-December 15, 2008 in Mexico City; offers were made in current Mexican pesos, and converted into USD for purposes of analysis at the period average exchange rate of 12.97 pesos per USD (IMF, 2008).
[b] Binary variable.
[c] Any condom use refers to use of condoms by respondent or male partner during last anal sex.
[d] Educational levels were: Primary =1 Middle School =2 High School =3 College =4 Graduate =5.
[e] The wealth index was constructed using data on availability of: vehicle, own house, more than five rooms in the house, laptop and desktop computers, cable television, Internet access, and household help.

Table A.1: Parameter Values and Sources for Benefit-Cost Calculations

Parameter	Low	High	Source
A. General			
HIV prevalence:			
Adults (general population)	0.3%	0.3%	UNGASS (2010)
Male sex workers (p1)	8.9%	8.9%	UNGASS (2010)
Men who have sex with men (p2)	9.9%	10.2%	UNGASS (2010)
Discount rate (r)	3%	3%	Gold et al. (1996) & Haddix et al. (2003)
B. Intervention Costs			
Latex gloves	$0.03	$0.03	IDA (2007)
Test tube (red cap)	$0.16	$0.16	IDA (2007)
Blood lancet	$0.01	$0.01	IDA (2007)
Cotton pads	$0.01	$0.01	IDA (2007)
Test tube (screw cap)	$0.19	$0.19	IDA (2007)
Vacutainer® needle	$0.10	$0.10	IDA (2007)
Oraquick ® HIV rapid tesst	$2.00	$4.00	WHO (2005)
HIV Confirmatory Test: *Western Blot*	$15.41*	$17.54**	INSP (2008)
Percentage receiving confirmatory tests	30%	50%	INSP (2008)
Health promoter salary (per hour)	$5.10	$5.10	SHCP (2007)
Pre-counseling time (mins.)	15	20	PAHO (2010)
Post-counseling (mins.)	20**	45**	PAHO (2010)
Yearly conditional economic incentives (α)	$80	$160	Q.a13a-a17a
C. Projected Benefits			
HIV incidence (new cases)	1.8%	1.8%	EPP, UNAIDS (2010)
Program participation rates (*wta*)	61%	95%	Q.a13-a17
Percentage free of STIs	9.4%	50%	Q.a2-a5
Program effectiveness	16%	60%	Sangani et al. (2004); Baird et al (2009); World Bank (2010)
Highly active antiretroviral therapy (per person per year)	$5,585	$7,688	Bautista et al. 2003 & 2006; Aracena-Genao 2005 & 2008

Notes: Table presents the low and high parameters for estimating costs and benefits

Q. refers to a question number from the survey presented in this paper.

Unit prices are expressed in US dollars of 2008

* reactive; ** non-reactive

Table A.2: Benefit Cost Estimations Under Different Scenarios for Conditional Economic Incentives for HIV/STI Prevention among Men who have sex with Men in Mexico City

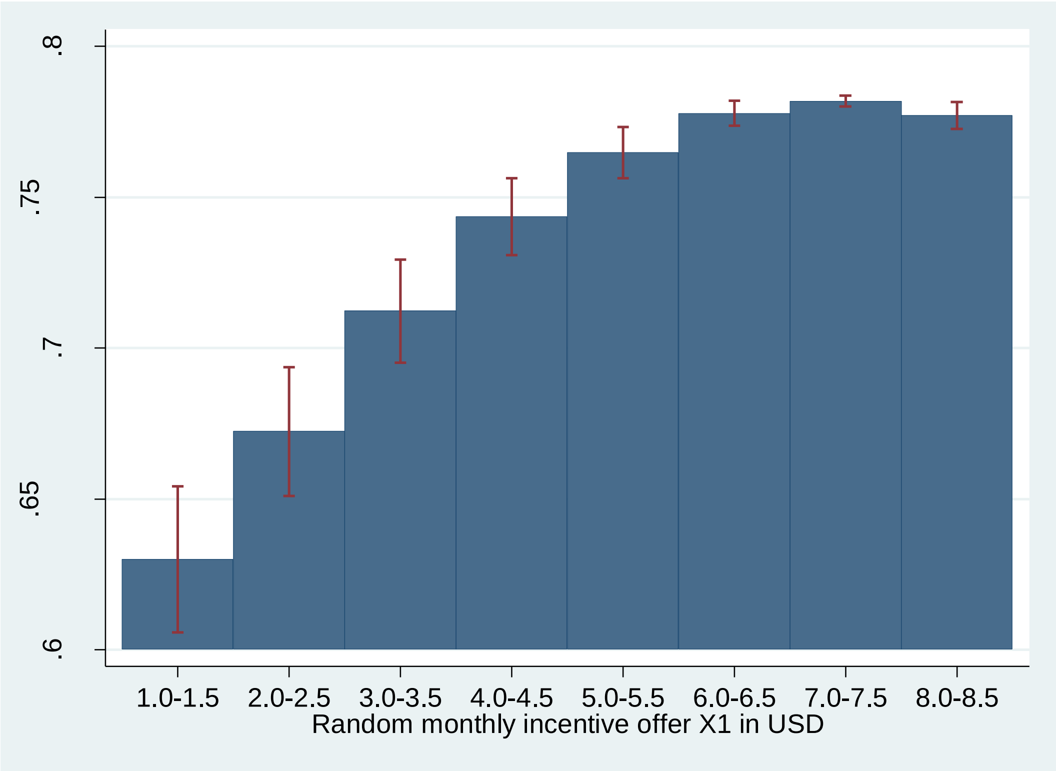
	(1)	(2)	(3)	(4)	(5)	(6)
A. Scenario 1						
Testing sessions per year	2	2	2	2	2	2
Program duration (years)	2	2	2	1	1	1
Time horizon (years)	25	25	25	25	25	25
Incidence per 10,000 MSM	180	180	180	180	180	180
Effectiveness in reducing incidence	16%	30%	60%	16%	30%	60%
ART costs per person per year $USD	5,585	5,585	5,585	5,585	5,585	5,585
Benefit-Cost Ratio	1.45	2.72	5.45	2.86	5.37	10.74
B. Scenario 2						
Testing sessions per year	2	2	2	2	2	2
Program duration (years)	5	5	5	1	1	1
Time horizon (years)	25	25	25	25	25	25
Incidence per 10,000 MSM	180	180	180	180	180	180
Effectiveness in reducing incidence	16%	30%	60%	16%	30%	60%
ART costs per person per year $USD	7,688	7,688	7,688	7,688	7,688	7,688
Benefit-Cost Ratio	0.84	1.57	3.13	3.94	7.39	14.78

Notes:

The table presents simulations for a hypothetical cohort of 10,000 men who have sex with men (MSM), including male sex workers (MSW) based on assumptions listed in Table A.1 and results presented in the main section of this paper. Main costs include the conditional economic incentives, STI testing, supplies and human resources.

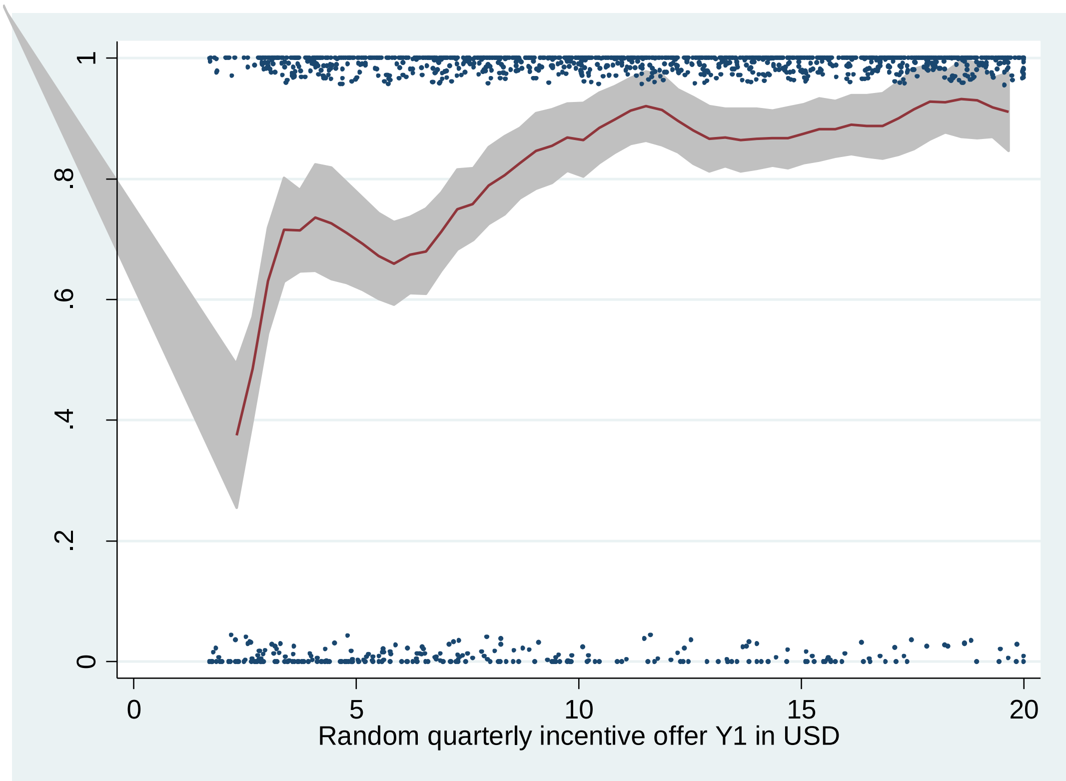
Benefits are direct (individual) antiretroviral treatment costs forgone as a result of HIV infections averted. Time horizon of 25 years includes 10 years of asymptomatic HIV and 15 years of use of highly-active antiretroviral therapy. Benefits and costs discounted at 3% per annum. Benefit cost ratio over unity implies cost savings in the long run.

Figure 1: Proportion willing to accept conditional economic incentives to participate in HIV prevention program with monthly talks



Notes: Sample includes 1,628 individuals who stated their willingness to accept conditional economic incentives to participate in 2-hour prevention talks each month at a random incentive offer of USD$X1 per month. The bars represent the proportion of individuals willing to accept the HIV prevention program. Error lines reflect ±1.96 standard errors.

Figure 2: Willingness to accept quarterly STI testing and conditional economic incentives to stay free of sexually transmitted infections



Notes: Non-parametric, locally-weighted regressions with a sample of 1,645 individuals who stated their willingness to accept quarterly STI testing and a quarterly conditional economic incentive of USD$Y1 for staying free of sexually transmitted infections (STI). The line represents the proportion of individuals willing to accept the HIV prevention program. The dots represent referendum (no/yes) responses, jittered for visualization purposes. The gray area reflects the 95% confidence intervals.

Appendix A: Willingness to Accept Questionnaire (Selected Items)

- **WTA 1.** WOULD YOU BE INTERESTED IN PARTICIPATING IN THE TALKS AND THE TESTS IF YOU RECEIVED $_"x1"__ PESOS PER MONTH? Yes =1 or No =0
    - *COMPUTER WILL **RANDOMLY** PICK NUMBER "X1" FROM LIST: $0 TO $200 PESOS IN $25-PESO INTERVALS*
    - *IF ANSWER IS YES, THEN COMPUTER PROPOSES A LOWER INCENTIVE: X2 = X1 * 0.7*
    - *IF ANSWER IS NO, THEN COMPUTER PROPOSES A HIGHER INCENTIVE: x2= ($200 + X1) /2*
- **WTA 2**. WOULD YOU PARTICIPATE IN THE TESTS AND ATTEND THE TALK FOR $ "x2" PESOS PER MONTH? Yes =1 No =0

- **WTA 3**. IF YOU WERE GIVEN A PRIZE FOR REMAINING STI-FREE FOR A PERIOD OF 3 MONTHS, WOULD YOU REMAIN FREE OF STIs IF YOU RECEIVED A PRIZE OF $"Y1" PESOS EVERY THREE MONTHS? Yes =1 No =0
    - *COMPUTER WILL PROVIDE RANDOM NUMBER "Y1"as FOLLOWS: Y1 = X1*3*
    - *IF YES, THEN PROPOSE A LOWER INCENTIVE: Y2=Y1*0.7*
    - *IF NO, THEN PROPOSE A HIGHER INCENTIVE AS FOLLOWS:Y2 = Y1*2*

- **WTA 4**. WOULD YOU REMAIN FREE OF STIs IF YOU RECEIVED A PRIZE OF $"Y2" PESOS EVERY THREE MONTHS? Yes =1 No =0

- **WTA 5**. WOULD YOU BE WILLING TO REMAIN FREE OF STIs WITHOUT RECEIVING A PAYMENT TO ATTEND THE MONTHLY TALKS, BUT RECEIVING A PRIZE OF $ "Y3" EVERY THREE MONTHS? Yes =1 No =0
    - *COMPUTER WILL CALCULATE "Y3" AS FOLLOWS: Y3 = Y1+MAX(X1,X2)*3*

Appendix B: Benefit-Cost Analysis

In this appendix we summarize an *ex-ante* benefit-cost calculation comparing the costs of a conditional economic incentives program for HIV/STI prevention with the potential benefits in terms of avoided HIV treatment costs in the future. The costs were those generated by the prevention intervention in the present study: conditional economic incentives (CEIs) to reduce risks for HIV and other sexually transmitted infections (HIV/STI). Depending on the potential effectiveness of the prevention intervention, financial returns (or benefits) were obtained as potential savings from the government's point of view in the long term. These potential savings were determined by the reduction in the total cost of highly-active antiretroviral therapy (ART) in the target population: men who have sex with men (MSM), including male sex workers (MSW). The potential savings would accrue to society because Mexico currently provides universal access to ART at a relatively high cost of about $300 million USD per year (UNGASS, 2010). The potential reductions in ART expenditures would be driven by decreases in the incidence (new cases of infection) of HIV in MSM/MSW, which are the population groups accounting for over two thirds of infections in Mexico (Magis-Rodríguez and Hernández-Avila, 2008).

<u>A.1. Costs of the prevention program</u>

The prevention costs include direct costs of counseling & testing (CT), and the costs generated by the conditional economic incentives. The direct costs include human resources, medical and laboratory equipment used in CT. To estimate direct costs, we compiled information related to prices for each input. The human-resource time necessary was determined for pre- and post-test counseling, as well as testing time (sample taking and test processing): 15-20 minutes for counseling and 15-30 minutes for taking samples (PAHO, 2010). The gross wage per hour (in USD) for each person involved in CT was estimated with information on the monthly wage and the number of hours worked per week for a health promoter according to job description and salary tabulator; with data adjusted for inflation using the annual consumer price index (Banxico, 2010; SHCP, 2007). We also considered the unit costs for the rapid HIV test used in health centers and the inputs necessary for each prevention consultation event by each patient; with Western Blot used as confirmatory test (IDA Foundation, 2010; Rodríguez, 2007). The conditional incentives cost was computed for a hypothetical cohort of 10,000 persons at high risk of infection, assuming that between 50 and 80% of the cohort would receive a CEI of USD$80 per year (i.e., on average 50-80% would be free of STIs at 6-month interval testing sessions). Hence the cost of the prevention package per person per year includes rapid tests, pre- and post-counseling, as well as prevention reinforcement and STI testing sessions every 6 months. The costs of CEI were assumed to compensate for the individual costs: loss of benefits from unprotected sex and other sexual risk behaviors; and the explicit loss of premium wage differentials for male sex workers (Brent, 2010).

Table A.1 summarizes the data used from administrative records and purchase receipts from previous CT projects at the Mexican National Institute of Public Health (INSP 2008) that utilized IDA Foundation (IDA Foundation, 2010): an international non-profit foundation in charge of providing pharmaceutical products at affordable prices. The total costs of CT were different according to the test results; the difference is explained by the time spent to the post-counseling. If the individual is confirmed to be HIV positive the costs are higher due to additional counseling. Non-reactive confirmatory test costs (Western Blot) were estimated at a cost of $15.41 while a reactive test was estimated at a cost of $17.54.

A.2. Potential Benefits

The benefits were estimated as potential savings in highly-active antiretroviral treatment (HAART) costs from the government's perspective. The costs for HAART are generated by treatment necessary for individuals who have been infected with HIV and then been diagnosed with AIDS (presence of opportunistic infections or CD4 cell counts less than 250 by mm^3 of blood); or those who have received other clinical indication to begin HAART. Mexico has had universal access to HAART since 2003 with important budget implications (Bautista-Arredondo et al., 2008; Magis-Rodriguez et al., 2005); thus, reductions in new HIV cases would represent not only gains in terms of reduced burden of disease, but also have substantial savings for the government over the long-term horizon.

The cost of HAART was obtained from recent studies in Mexico (Aracena-Genao et al., 2008; Bautista-Arredondo et al., 2003; Bautista-Arredondo et al., 2006). The "benefits" then were the potential economic savings resulting from avoided new HIV infections in the target population: MSM and MSW. The most important components of the model assumptions were: the expected number of new HIV infections (incidence) in the absence of any interventions (status quo), the potential effectiveness CEI as a method of preventing HIV, and the number of avoided cases (i.e., the number of people who will not need ART since HIV was prevented), which depends on the overall participation rate in the program (assumed to be equal to the estimated willingness to accept).

The level of effectiveness of CEI for HIV prevention was taken from meta-analyses of the HIV prevention literature with respect to treatment of STI (Sangani et al., 2004) and recent evidence on the potential effectiveness of CEI for HIV/STI prevention (Baird et al., 2010; Medlin and de Walque, 2008; Thornton, 2008; World Bank, 2010). We used the *Estimation and Projection Package* (EPP) endorsed by UNAIDS (UNAIDS, 2010) to estimate the incidence levels in the target population in Mexico. We first constructed a historical series of prevalence for MSM (p_1) and MSW (p_2), along with historical and surveillance information (CENSIDA, 2009; Gayet et al., 2007; Magis-Rodríguez and Hernández-Avila, 2008). We complemented the series using the UNAIDS epidemiological data sheets for the years 2005-2009 (UNAIDS, 2009). The size of the MSM population was estimated to represent 3% of the total adult male population according to official sources (CENSIDA, 2009). The benefits were obtained considering the number of infections avoided in MSM from the hypothetical cohort of 10,000 individuals.

A.3. Benefit-Cost Results

The base case rate of annual HIV incidence under status quo was 1.8% (or 180 new cases per 10,000 individuals at risk). With a low level of program effectiveness, set at 16% reduction in incident cases, the total number of prevented HIV infections, assuming a 100% participation rate, was 29 per year for the 10,000 cohort. The number of HIV infections averted (HIA) changed as we changed the participation rates based on the results presented in the main section of the paper. Thus, with full participation the program would reduce the expected annual number of new cases to 151 new cases (instead of the expected 180 in the absence of the program). We used a total temporal horizon of 25 years. The estimations assumed that HAART was required in years 10 to 25 (i.e., 10 years after initial infection, on average); the estimations assumed that the expenses on HAART would stay constant during these years. The benefit-cost ratio (BCR) was the result of dividing the total discounted benefits by the total discounted costs for the participating individuals drawn from the cohort of 10,000 individuals as follows:

$$BCR = \frac{\sum_{t=10}^{t=25} \frac{B_t}{(1+r)^t}}{\sum_{t=0}^{t=T} \frac{C_t}{(1+r)^t}} \qquad \text{(A-1)}$$

Increasing participation rates has consequences for both costs (*C*) and benefits (*B*). Costs occur in the *T* years of program implementation (1, 2 or 5 in the modeling). A benefit-cost ratio above unity implies net economic savings from the perspective of the government over the long-term. A standard discount rate (*r*) of 3% was used for both costs and benefits (Gold et al., 1996; Haddix et al., 2003).

For modeling various scenarios, we used the current testing percentage of 61% as a baseline for HIV testing. Then we simulated how testing and participation would change as we doubled the incentive offers from a low initial value (as presented in Section 4.6 and Table 5), and overlaid those results back in the model to assess their impact on costs and potential savings (benefits). Under the scenarios presented for the sub-populations at higher risk (MSW, those with HIV/STI, low-wealth, and not appropriate condom use) the potential participation rates were consistently high: nearly 90%. The effectiveness of the program determined the number of participants from a hypothetical cohort of 10,000, and the effectiveness parameter. More participants implied that the costs of the program would increase, but also the potential benefits (or forgone future HIV treatment costs) would also increase, and hence the overall benefit-cost ratio was positive under the large majority of scenarios.

Table A2 summarizes the benefit-cost ratios. All but one of the 12 scenarios presented are above unity, implying cost savings in the long-run. Under conservative assumptions such as Scenario 1, column (1), (with a low effectiveness of 16% and a program of two years) the ratio was 1.45. Similarly, under Scenario 2, column (2), (with a five-year program, higher HIV treatment costs, and medium effectiveness of 30%) the ratio was 1.57, implying that each dollar spent on prevention through CEI would have about a 50% return in the long run in terms of HIV care costs avoided. Under a more optimistic set of assumptions such as Scenario 2, column (6) (with high HAART costs and high program effectiveness for one year only) the benefit-to-cost ratio becomes much higher: 14.78.