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Do Sex Workers Respond to Disease? Evidence from the Male Market for Sex[†]

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The commercial sex sector bears an importance disproportionate to its size in terms of disease transmission. Epidemiological models suggest that the behavioral response of high-activity core groups like sex workers is critical to the course of HIV and other sexually transmitted infection (STI) epidemics (Shahmanesh et al. 2008). Existing research shows that female sex workers in developing countries are paid anywhere between 9 and 66 percent more for non-condom sex (Gertler, Shah, and Bertozzi 2005; Rao et al. 2003; Robinson and Yeh 2011). Recently, Arunachalam and Shah (forthcoming) have shown this risk premium for unprotected sex is best understood as a compensating differential for increased disease risk. In locations with close to zero disease, the risk premium is close to zero and not statistically significant. However, the premium increases as disease risk increases; a one percentage point increase in the local disease rate increases the premium for non-condom sex by 33 percent. This finding is important because it indicates that the market has the ability to dampen the self-limiting feature of STI epidemics. As disease risk rises, the compensating differential rises as well, leaving the marginal sex worker indifferent between unprotected and protected sex. This could exacerbate the spread of disease.

As far as we know, there is no empirical evidence for whether this type of compensating differential exists in developing country male sex markets. In the United States, evidence is somewhat mixed. Qualitative evidence suggests male sex workers (MSW) do get paid more for non-condom sex (Reisner et al. 2008), however, Logan (2011) empirically finds that male sex workers do not place a premium on condomless sex and that clients actually place a negative value on it. In developing countries, HIV rates of MSWs are much higher than the general adult population and generally higher than female sex worker rates (UNAIDS 2009). According to a meta-analysis, men who have sex with men (MSM) have a 33-fold higher probability of infection compared to the general population of adults in Latin America (Baral et al. 2007). In Ecuador 10 percent of MSM are HIV positive compared to an HIV prevalence of 0.4 percent for the general adult population (UNAIDS 2010). Therefore, whether MSW are being compensated for non-condom sex has tremendous implications for the transmission of STIs as well as HIV/AIDS.

In this paper, we test for the existence of a risk premium for non-condom sex in male sex markets in Ecuador. We find there is a 15 percent risk premium for non-condom sex. We then test whether this is in fact a compensating differential for disease risk using two different measures of disease: STI (positive test for syphilis, chlamydia, and/or gonorrhea) and HSV (positive test for herpes simplex). We find that a one percentage point increase in the local STI (HSV) rate increases the premium for non-condom sex by 28 (8) percent; indicating there is a compensating differential for disease risk in male sex markets.

I. Survey and Data

The data used in this paper were collected in 2003 as part of a baseline survey for the Frontiers Prevention Project, a national HIV/AIDS and STI prevention project. Approximately 2,700 MSM were interviewed in eight cities (Quito, Guayaquil, Machala, Esmeraldas, Santo

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Domingo, Quevedo, Milagro, and Daule) both at work sites and meeting places. In each city, the universe of MSM sites was first mapped to develop a sample frame. Every attempt was made to maximize representativeness of the MSM population. In addition, MSM were hired and trained as survey enumerators which probably contributed to high survey response rates.

The survey includes detailed demographic characteristics, indicators of risk behavior, and labor supply information. The survey includes details of each MSM's previous three sexual experiences yielding approximately 8100 sexual transactions. However, not all these sexual transactions involve prices since this is a survey of MSM, not MSWs. Approximately 20 percent of the transactions involve a price and are associated with male sex work, yielding a sample size of approximately 1,700 transactions ($\simeq$ 800 MSM) that will be used in the analysis. Sixty-four percent of the transactions are recorded by a seller of sex (or MSW) and 36 percent are recorded by a buyer of male sex (or a client of the MSW). For each transaction, we have information about the nature of the sex act, condom use, price, type of location, and the MSM's subjective assessments of partner characteristics.

In addition to the questionnaire, biologicals (urine and blood) were collected from each MSM and tested for various STIs. With this direct measure of STI status, we circumvent problems of systematic measurement error in self-reports of health status. We code a MSW or client as having an STI if he tests positive for syphilis, chlamydia, and/or gonorrhea. We also consider a more long-term viral STI, herpes simplex (or HSV), which is a cumulative measure of disease (once infected, the individual always tests positive). Unfortunately we do not have measures of HIV for these men. However, STIs are still important measures of risk because they signal non-condom sex and/or the occurrence of risky sexual activities. In addition, STIs facilitate transmission of HIV (Laga 1995). In fact, cheap and simple STI care is likely to be a highly cost effective strategy in preventing HIV transmission in developing countries.

A. *Who are These Men?*

MSM engaging in male sex markets are 23 years old on average, 21 percent have children, and 37 percent report to being in a relationship. Fourteen percent self-identify as heterosexual, 12 percent as homosexual, 44 percent as bisexual, and 19 percent as transvestite. Seventy-one percent have completed secondary school, and 38 percent have had an HIV test in the past. From the biologicals which were collected, 9 percent tested positive for syphilis, chlamydia, and/or gonorrhea and 41 percent tested positive for HSV. In terms of transaction characteristics, non-condom sex occurred in 48 percent of transactions. About 25 percent of MSM use condoms some times (i.e., used one or two times out of their last three transactions). The average transaction price is US$20 and anal sex, the riskiest type of sex, occurs in close to 75 percent of transactions. Non-condom use and average prices are much higher in the male sex market relative to the female sex market in Ecuador. For example, only 12 percent of transactions include non-condom sex in female sex markets in Ecuador and the average price of a transaction is only US$7.

B. *Local Disease Rate*

A measure of STI prevalence that captures the risk that an MSM faces in each transaction is constructed. We construct two measures of local disease prevalence (which vary by contact site within each city) by using the STI status of all other MSM who had sex in that type of site. More precisely, for each person, we generate a contact location specific STI prevalence which is the average STI prevalence of all transactions within that contact location and city, excluding each person's own transaction. More details about the construction of this measure are given in Arunachalam and Shah (forthcoming).

The first STI measure, local STI rate uses a positive test result for syphilis, chlamydia, and/or gonorrhea; and the second measure, local HSV rate uses a positive test result for HSV (or herpes). Each city has eight contact locations (internet, home, shopping mall, movie theater, nightclub, party, park, and other which indicates locations like work, beach, car, hotel, or brothel). Fifty-seven percent of the men engaged in sex in more than one of these locations in their past two to three transactions. Non-condom use ranges from a low of 36 percent (movie theater) to a high of 55 percent (party). The local STI rate ranges from a low of 4 percent (shopping mall) to 7 percent (party and other) to a high of

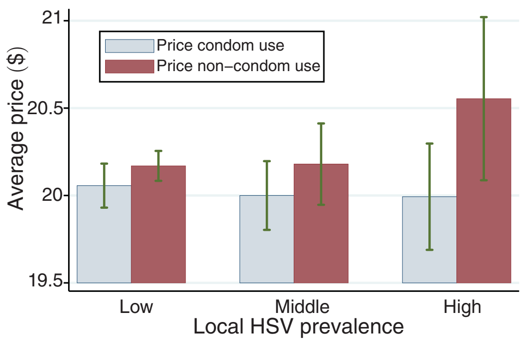

FIGURE 1. DISEASE PREVALENCE AND AVERAGE PRICE

20 percent (internet). The local HSV rate ranges from 38 percent (other), 49 percent (shopping mall), to 59 percent (internet cafe).

Figure 1 graphs the average transaction price (demeaned by city) of non-condom and condom use by low, medium, and high rates of local HSV. While this is simply raw data, the figure alludes to the main result of the paper. As local disease prevalence increases, the difference between the price of condom and non-condom sex increases—that is, the risk premium for non-condom sex increases.

II. Empirical Specification and Results

A. *Premium for Non-Condom Sex*

To test whether there is a premium for non-condom sex in the male sex market, we model the log price of a transaction as a linear stochastic function of condom use, omitting STI prevalence for the moment:

$$(1) \quad P_{ij} = \alpha + \sum_k \phi_k X_{jk} + \upsilon S_{ij} + \beta NC_{ij} + \theta_i + \varepsilon_{ij},$$

MSM are indexed by i and transactions by j, and P_{ij} is the log transaction price. To control for MSM specific variation and unobservable MSM heterogeneity, we include the MSM fixed effect (θ_i). X_{jk} are characteristics of the other person (the partner), and S_{ij} is a dummy for whether the price was reported by a sex worker or a client.[1] NC_{ij} is a dummy indicating that a condom was not used in the transaction; and ε_{ij} is a mean-zero random disturbance. All specifications are clustered at the individual level.

Table 1 reports the regression results. We begin with a parsimonious specification regressing the log transaction price on non-condom use in column 1; we then control for partner characteristics in column 2. While we do not have direct data on partners and therefore cannot include partner fixed effects, we attempt to control for partner heterogeneity by using reports of partner characteristics. The empirical results are similar whether we control for partner characteristics or not, suggesting demand side heterogeneity may be an unlikely source of bias.

The coefficient of 0.14 on non-condom sex in column 1 represents a 15 percent risk premium for unprotected sex, which increases slightly to 16 percent when we control for partner characteristics (column 2). This result is statistically significant at the 0.05 percent level. While most partner characteristics are not significant determinants of price, a large premium is paid when the partner is thought to be HIV positive. MSM were asked if they thought their partner had HIV, and 5 percent of MSM reported positively. Interestingly, though slightly lower than the MSW average, this is a fairly good estimate of HIV prevalence for this population.

B. *Is it a Compensating Differential?*

At this point it appears that this risk premium should be a compensating differential for disease. However, Arunachalam and Shah (forthcoming) theoretically show that this premium could simply come from male disutility from condom use. For example, risky partners might

[1] The majority of transactions are reported by male sex workers and the partner is his client. However, in some cases we have data from clients and the partner is a male sex worker. Therefore we term the other person in the transaction a partner, since he could be a sex worker or a client. We pool all transactions and control for seller/buyer status in each regression as sample sizes become small otherwise. However, if we estimate equation (1) separately by buyer/seller status the coefficients are fairly similar to the pooled results, but standard errors get larger. For example, the coefficient on non-condom use for the regression in column 1 of Table 1 for sellers only (male sex workers) is 0.12 and 0.20 when estimated for buyers only.

Table 1—Does the Male Sex Market Respond to Disease?

	(1)	(2)	(3)	(4)
No condom use	0.14 (0.07)**	0.15 (0.07)**	0.05 (0.09)	−0.07 (0.13)
Local STI rate			−0.05 (0.34)	
No condom × local STI rate			1.41 (0.83)*	
Local HSV rate				−0.39 (0.21)*
No condom × local HSV rate				0.55 (0.32)*
Thinks partner has HIV		0.72 (0.39)*	0.7 (0.39)*	0.71 (0.38)*
Rich partner		0.17 (0.12)	0.19 (0.13)	0.2 (0.13)
White partner		0.07 (0.05)	0.08 (0.06)	0.07 (0.06)
Regular partner		0.08 (0.05)	0.08 (0.05)	0.07 (0.05)
Constant	1.66 (0.09)***	1.49 (0.11)***	1.49 (0.11)***	1.66 (0.13)***
Sample size	1,589	1,520	1,477	1,477

Notes: Transaction-level regressions, individual fixed effects (FE) models clustered at individual level. Dependent variable is log price in US dollars (mean is 2.18). All regressions control for seller or buyer status.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

be risky precisely because they experience great disutility from non-condom use, so that we are effectively capturing differences in willingness-to-pay. To assess this directly, we test the compensating differential explanation by looking at the responsiveness of the non-condom premium to local disease risk.

We test whether the compensating differential responds to local disease environment by estimating equations of the form:

$$(2)\quad P_{ij} = \alpha + \sum_k \phi_k X_{jk} + \upsilon S_{ij} + \beta NC_{ij} + \gamma STI_{ij} + \delta(NC_{ij} \times STI_{ij}) + \theta_i + \varepsilon_{ij}.$$

Here, MSM are once again indexed by i and transactions by j, and P_{ij} is the log transaction price. Again, to control for MSM specific variation and unobservable MSM heterogeneity, we include the MSM fixed effect (θ_i). The only difference from equation (1) is that we now include STI_{ij} which is the local STI (or HSV) rate; and $NC_{ij} \times STI_{ij}$ which is the interaction of non-condom sex and the local STI (HSV) rate.

The main coefficient of interest is δ, which is the interaction between non-condom sex and local STI prevalence. The response of the price of protected sex to disease risk is given by γ; the risk premium for unprotected sex when the sex worker faces no disease risk is given by β; and δ captures the increase in the premium for non-condom sex as local STI rates increase.

Column 3 of Table 1 displays the regression results of equation (2) when the disease measure is the local STI rate. Column 4 displays the results when the disease measure is the local HSV rate. The results in column 3 indicate that a one percentage point increase in the local STI rate increases the premium for non-condom sex by approximately 28 percent. Once the interaction with STI is included, the risk premium for non-condom sex when disease prevalence is zero decreases to 5 percent and is no longer statistically significant. The results show that the risk premium is largely generated by disease risk. We also see that the effect of local STI rate on the price for protected sex is negative but not statistically significant.

Though we pool all three STIs together, syphilis incidence has increased dramatically primarily among men who have sex with men and disproportionately affects those with HIV infection. Syphilis is usually a proxy for risky male homosexual behavior, while gonorrhea is generally a proxy for risky heterosexual behavior (CDC 1997, 2010). We generate the local STI prevalence measure using only syphilis outcomes. The main result holds and is of a similar magnitude (though standard errors increase). Interestingly, when we generate similar measures for only chlamydia or gonorrhea, the results do not hold. Therefore, it appears that syphilis infection is driving the compensating differential for disease risk, which is what we would expect since this is a population of men who have sex with men.

The results for HSV are similar but smaller in magnitude. A one percentage point increase in the local HSV rate increases the premium for non-condom sex by approximately 8 percent. Once again the coefficient on non-condom sex is not statistically significant once we include the disease interaction, and the coefficient is actually negative. This suggests that local disease does seem to be driving the premium. Price is also decreasing in HSV and this is significant at the 0.10 level. The theoretical model presented in Arunachalam and Shah (forthcoming) suggests that the negative coefficient on disease (both STI and HSV) implies that the partner is also responsive to disease risk.

Interestingly, the percent increase in the premium for non-condom sex is quite similar across male and female sex markets in Ecuador. However, because the average transaction price is so much higher in the male sex market (US\$20 versus US\$7) the amount of the premium is higher in the male sex market. The only partner characteristic which strongly increases price in the male sex market is when the partner is believed to be HIV positive.

We also estimate equation (2) using a random effects model in case there is concern that the fixed effects models using within MSM variation result in biased estimates. The coefficients on the main result (δ) for both STI measures are remarkably similar in magnitude to the fixed effects models, and are statistically significant at the 0.05 percent level (results available upon request). Hausman test results suggest we can reject random effects in favor of the fixed effects models.

III. Men and their Disease Status

It seems natural to expect that one's disease status would impact the size of the compensating differential. On the one hand, we expect disease free men to charge more for non-condom sex since they are taking on a larger risk than someone who is already infected with an STI. However, biological evidence suggests that HIV transmission is facilitated in the presence of untreated STIs. Therefore someone with an STI who engages in non-condom sex may be more at risk of being infected with HIV; we might expect him to charge more for non-condom sex. Which of these potential effects dominates is an empirical question.

Ideally we would reestimate equation (2) by STI status. Unfortunately sample sizes become too small to reliably interpret the results of the interaction. Therefore, we estimate equation (1) by STI status. The coefficient on non-condom use for men who do not have an STI suggests a 19 percent premium. The non-condom premium for men with an STI is no longer statistically significant (and the coefficient is 0.06). Therefore, the results suggest that it is the disease-free men who are charging the premium. This might be due to the fact that Ecuador's HIV epidemic is concentrated among high risk groups, and that men with STIs would charge more in countries with a generalized HIV epidemic.

IV. Conclusion

The fact that MSWs are compensated more in higher disease environments suggests that STI and HIV epidemics may not be self-limiting. We find that a one percentage point increase in the local STI rate increases the premium for non-condom sex by 28 percent. It is important to note that Ecuador does not have a generalized HIV epidemic; the epidemic is concentrated among high risk groups like male and female sex workers. It would be interesting to understand how these findings vary by country HIV prevalence.

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