The Impact of HAART Awareness on Risk Behavior: Evidence from Mozambique*†

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Abstract

This paper studies the effect of increased access to highly active antiretroviral therapy (HAART) on risky sexual behavior, using data collected in Mozambique in 2007 and 2008. The survey sampled both households from randomly selected HIV positive individuals and households from the general population. Controlling for unobserved individual characteristics, our findings support the hypothesis of disinhibition behaviors, whereby risky sexual behaviors increase in response to the perceived changes in risk associated with increased access to HAART. Furthermore, men and women respond differently to the perceived changes in risk. In particular, risky behaviors increase for men who believe, wrongly, that AIDS can be cured, while risky behaviors increase for women who believe, correctly, that HAART can treat AIDS but cannot cure it. Our findings suggest that prevention programs, by just providing the correct information on HAART, may reduce disinhibition behaviors for men. On the other hand, prevention messages for women should go beyond just giving the correct information about treatment, and stress that safe behaviors should still be practiced.
1 Introduction

Access to HIV/AIDS treatment has transformed the perception of AIDS from a death sentence to a manageable chronic condition (Lakdawalla et al., 2006), no different from any other chronic disease. Expanding access to treatments has become one of the key strategies of the international community to confront AIDS. For instance, universal access to treatment is one of the stated goals of the joint United Nations programs on HIV/AIDS (UNAIDS). The call for scaling treatment, especially in low income countries, has generated a debate on how treatment may affect the dynamics of the disease.

Increased access to treatment can influence the spread of the disease in many ways. On the one hand, access to treatment may provide incentives for HIV testing by reducing the costs of finding one’s seropositivity. Once people find that they are sero-negative, they would have more incentives to adopt safer sexual behaviors (e.g. Mechoulan, 2007). On the other hand, decreased fear of contracting HIV resulting from access to treatment, may increase risky behavior, reduce serosorting and increase the mixing between higher- and lower-risk groups in the population. Moreover, as survival increases, the incidence of exposure to partners with HIV infection may increase (Hammer et al., 2006). Overall, expanding AIDS treatment can influence the risk-taking behavior of HIV-infected individuals as well as the behavior of the general population. The main concern is that, at least from a theoretical standpoint, the net impact of access to treatment on behavioral outcomes is hard to predict.

In this paper, we present an empirical analysis of the effects of highly active anti-retroviral therapy (HAART) awareness on sexual behaviors. Our measures of risky sexual behaviors consist of unprotected sex with non co-residing partners, extra-marital sexual intercourse

\footnote{Note that increased demand for testing could also lead to early detection, which would make treatment more effective.}
and abstinence. We chose these three measures of sexual behaviors to reflect the so called $A \ B$ and $C$ (abstinence, be faithful or condom) that have been promoted in HIV/AIDS prevention programs and are believe to have been in controlling the spread of the disease in some parts of sub-Saharan Africa (e.g. Singh et al., 2004). Our measures of HAART awareness consist of “the belief that HAART can cure AIDS”, “the belief that HAART can treat AIDS, but cannot cure it”, “knowing someone who is or has been under HAART treatment”, and “whether the health of that person has improved as a result of the HAART treatment”. Our goal is to test whether people adjust their sexual behaviors as they become aware of HAART.

We make three main contributions to the literature on explaining individual risk offsetting behaviors. First, the survey instrument asked individuals on their awareness of HAART. We show how these HAART awareness variables correlate strongly with sexual behaviors. In particular, we are able to contrast the “false” belief that HAART can cure AIDS with the correct assessment that HAART can treat but not cure AIDS. Second, our paper is unique in the attempt to exploit the panel structure of the data to control for unobserved individual characteristics, that may otherwise influence both sexual behavior and HAART awareness. Third, our sample covers three categories of respondents: HIV positive individuals, individuals who live in a household where there is a at least one identified HIV positive person, and individuals who live in comparison households, i.e. households where there is no identified HIV positive person. This feature of our sample allows us to directly test how response to HAART awareness varies between HIV+ positive individuals and the general population.

Mozambique offers an interesting setting for exploring potential disinhibition behaviors. Mozambique ranks among the 10 most affected countries in the world. The prevalence rate is estimated to be between 14 percent and 17 percent in 2009, and has remained that hight
since at least 2002 (UNGASS 2010). With a growing population, a constant prevalence rate implies that the disease is still spreading. The national effort to confront the disease include increased access to HAART. The number of patients under HAART drugs have increased from 3,314 in 2003 to 170,198 in 2009 (UNGASS 2010). Treatment coverage, however, remains low. In 2009, it was estimated that 42 percent of adults and 19 percent of children in need of HAART were receiving treatment (UNGASS 2010). Mozambique illustrates the ongoing debate on how to optimally allocate limited resources between treatment and prevention in sub-Saharan Africa (e.g. Marseille et al. 2002), if the ultimate goal is to contain the disease. In this context, as stressed by Schultz (2004), robust estimates of the magnitude of disinhibition behaviors are critical for any informed decision making, since such estimates would allow accounting for externalities (whether negative or positive) associated with increased access to HAART.

This paper is related to a strand of literature that focuses on disinhibition (or risk compensation) behaviors. The main concern is that people may alter their behavior in response to perceived changes in risk. In the specific case of HIV/AIDS and increased access to HAART, the concern is that decreases in perceived risk of contracting HIV, which occurs with more access to HAART, may lead to an increase of risky sexual behaviors (e.g. Eaton and Kalichman 2007). Such disinhibition behaviors, if large enough, may (at least partially) offset the benefits of scaling up access to HAART. This conjecture is supported by several studies in the United States and Europe which have identified an upward trend in risky sexual behaviors since the introduction of HAART in 1996 (e.g. Gremy and Beltzer 2004; Lakdawalla et al. 2006). More specifically, an association has been identified be-

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3 See Peltzman (1975) for an early study on the introduction of mandatory car seat belts in the US.
between decreased concern about HIV due to HAART availability and unprotected sex, and in particular among men who have sex with men (e.g. Dukers et al. 2001; Kalichman 1998; Lakdawalla et al. 2006; Mechoulan 2007).

Investigations of disinhibition behaviors associated with increased access to HAART in sub-Saharan Africa are, however, limited. One of the earliest studies looked at change in the use of condom by sex workers in Nairobi, Kenya (Jha et al., 2001). The findings are summarized in figure 1. There is at least some suggestive evidence that condom use by sex workers decreased when “fake” cures of AIDS were announced. Such pattern is consistent with disinhibition behaviors, although the result may not be generalizable to the general population since it uses a very selected segment of the population. Cohen et al. (2009) is one of the few studies who use population based survey to test risk compensation behavior in a sub-Saharan African context. The authors found that in Kisumu (Kenya), HAART-related risk compensation and the belief that HAART cures HIV were associated with an increased HIV seroprevalence in men but not women. While the study is very informative, by focusing on HIV seroprevalence as the outcome variables, it does not provide any direct evidence on how people adjust their sexual behavior in reaction to the introduction of HAART.

We differ from Cohen et al. (2009) in two ways. First, we focus on sexual behavior instead of HIV seroprevalence as in Cohen et al. (2009). Changes in sexual behaviors resulting from the introduction of HAART can be viewed as a first order effect, while changes in seroprevalence (as long as these changes are taking place through changes in sexual behaviors as theorized by Cohen et al. (2009)) are second order effects. Second, the panel structure our data allows us to control for unobserved individual characteristics that can influence both sexual behavior (or HIV seroprevalence) and perceptions on HAART, and thus lead to

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4The authors define risk compensation by increased sexual risk taking now that HAART is available.
biased estimates of disinhibition behaviors. This source of bias remains a concern with the results of Cohen et al. (2009) despite the careful design of their field survey.

Controlling for unobserved individual characteristics, we find suggestive evidence of disinhibition behaviors: individuals who are more aware of HAART engage more in risky sex. Moreover, men and women respond differently to the perceived changes in risk. In particular, risky behaviors increase for men who believe, wrongly, that AIDS can be cured, while risky behaviors increase for women who believe, correctly, that HAART can control AIDS but cannot cure it. These findings have two main implications. First, the results by just providing the correct information on HAART, prevention programs may reduce disinhibition behaviors for men. Prevention messages for women, however, need to go beyond the correct information on HAART and need to stress the importance of safe sexual behaviors. Second, the evidence suggests for effectively controlling AIDS, prevention program should not be traded away in order to scale up access to treatment.

The remainder of the paper is organized as follows. We begin by providing a conceptual framework to motivate our empirical results in section 2. Next, we discuss our survey, and show a summary of the main variables used in the analysis in section 3. We discuss our empirical strategy in section 4, and report our estimation results in sections 5. Section 6 concludes.

Cohen et al. (2009) conduct their field survey in two steps. First, they administer a survey including questions on sexual behaviors and perceptions on HAART. The second step consists of HIV testing of respondents. Note that individuals who knew their sero-prevalence were excluded from the sample. The approach prevents respondent to associate their answers to the HIV test, and therefore adjust the formers. However, it does not solve the issue associated with unobservable individual characteristics.
2 Access to HAART and Risky Sexual Behavior

When people become aware of HAART, they may adjust their sexual behavior to account the decline in the costliness of the new treatable disease. Such a response may create a compensation effect that partially reduces the benefits of expanded treatment. Such possible offsetting behaviors have been discussed in the economic literature in the context of other safety (e.g. Peltzman, 1975) and health issues (e.g. Oza, 2009).

We start by thinking of individuals as deriving utility from both safe sex, and risky sex (e.g. unprotected sex with non co-residing partner). The marginal utility of risky sex is greater than that of safe sex. The cost of Risky sex is, however, higher than that of safe sex. In particular the cost of risky sex includes the probability of contracting HIV and the ensuing disutility from developing AIDS (this includes the physical pain after the individual develops AIDS, the monetary costs from lost earnings, stigma, premature death etc.). Safe sex is, on the other hand, costless (in terms of contracting AIDS). Standard economic reasoning implies that at the optimum, the marginal utility of risky sexual behaviors is equalized to the marginal costs. Starting from the optimal choice of risky sexual behavior and safe sexual behavior, the introduction of HAART lowers the cost of risky sex. Holding everything else constant, risky sex becomes relatively cheaper compared to safe sex. The effect is an increase.

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6A long debated issue is the introduction of seat belts in cars in the US. For instance, Lave and Weber (1970) and Peltzman (1975) argued that seat belt use might produce careless driving and in turn greater risks for non-occupants. As a result, mandatory seat belt laws might increase total fatalities rather than reduce them. However, empirical analyses focusing on the safety regulation of motorized vehicles have generated mixed results. For instance, Cohen and Einav (2003) found that while seat belts usage has a small negative effect on traffic fatalities, but they did not find any evidence suggesting that seat belts usage increases reckless driving. In contrast, using data from recreational boats, McCarthy and Talley (1999) found that the passenger was less likely to wear a personal floatation device (PFD) when the driver had received a formal training. Oza (2009) hypothesizes that the introduction of over-the-counter access to the “morning after pill” lowered the risk of unintended pregnancies, but also lowered the opportunity costs of unprotected sex. She is able to show for women who were exposed to the policy, abortion rates decreased while STIs increased, corroborating disinhibition behaviors.

7We abstract from other sexually transmitted diseases and birth control.
in the demand of risky sex, as the basic law of demand would predict. To the extent that risky sex and safe sex are substitutes, we would expect a decrease in the demand of safe sex as people become more aware of HAART (i.e. the price of risky sex decreases, while everything else is kept constant).

This framework while overly simplified provides a framework for interpreting our empirical results. Considering our independent variables, we could argue that the cost of risk sex is lower when “HAART is believed to cure AIDS” than when “HAART is believe to treat AIDS but not cure it”. Similarly, the cost of risky sex is lower for someone who “has seen the health of an HAART patient improved” than for “someone who only knows a patient under HAART treatment”. Thus, we hypothesize that disinhibition is stronger for respondents who believe, wrongly, that “HAART can cure AIDS” than those who believe that HAART can treat AIDS, and for those who have been in contact with some one whose health has improved after that person started an HAAR treatment than those who know someone under treatment. Furthermore, if access to HAART indeed make safe sex relatively expensive, then safe sex (abstinence in our case) would react negatively to HAART awareness.

Obviously this framework leaves out adjustments in sexual behavior that could limit disinhibition. An important externality of HAART is that it increases the benefits of testing, and therefore leads to increase demand for testing. As mentioned earlier, people who discover that they are HIV negative may decrease their demand of risky sex, especially if prevalence is high is among potential sexual partners (e.g. Ahituv et al., 1996).

We abstract from other potential complementarities from the expansion of HAART (e.g. Dow et al., 1999). In particular, individuals may invest in other health inputs or in their firms because their chances of surviving increases with HAART. This would imply that access to HAART may affect other health outcomes as well as broader economic outcomes.

Using the National Longitudinal Survey of Youth (NLSY-1979) Ahituv et al., (1996), estimate that a 1 percent increase in the prevalence of AIDS in the state of residence increases the propensity to use a condom significantly and up to 50 percent for the most prevalence-responsive groups.
3 Data

The data were collected in 2007 and 2008 in 4 provinces of Mozambique (Maputo City, Maputo Province, Sofala, Manica). The survey was designed to collect data in order to assess the impact of the scale-up of HAART in Mozambique. The project began in 2004 and had a 4-year duration. The HIV/AIDS patients of the survey were identified at the health facility where they received treatment and were interviewed at home along with the rest of the household. The questionnaire includes information on consumption, time use, labor force participation and earnings, education as well as other health measures of the identified patient and their household members. It also included questions on adherence to treatment, health of adults and children, anthropometric measurements, and quality of life.

A group of comparison households were included in the sample, in which there was no identified HIV positive persons, to control for general trends in socio-economic circumstances. The comparison households were randomly selected in the neighborhood of each HIV household. The first wave of the survey, conducted between August and December of 2007, included 658 HIV households and 341 comparison households. In the second wave, one year later, HIV households that could not be found and interviewed were not replaced, but comparison households were. The panel consists of 896 households interviewed in both waves: 616 HIV households and 280 comparison households. At the individual level, there are 616 identified HIV positive patients, 2579 individuals living in HIV households but not identified as HIV positive, and 1431 individuals belonging to comparison households.

In addition to health and socio-economic questions, respondents where interviewed on their sexual behavior, their knowledge on HIV, and on HAART. Questions on sexual behaviors include the number of sexual partners during the 12 months preceding the survey, the relationship to each sexual partner and whether a condom was used during the last sexual
act with that partner. Each respondent was also asked to assess the likelihood of his or her partner being HIV positive. For the analysis, relationships are reduced to two categories: co-residing partners (whether legally married or not), and all other partners. Four questions are used to assess the respondent HAART awareness: whether the respondent thought (wrongly) that AIDS could be cured, that AIDS could be treated (but not cured), whether the respondent knew any person who was under HAART treatment, and whether that person health has improved.

Table 1 contains a summary of the key variables used in the study. While the proportion of individual reporting a risky sexual intercourse (unprotected sexual intercourse with a non co-residing partner) is relatively small (7 percent in 2007 and 8 percent in 2008), more than a third of the married sub-sample (37 percent in 2007 and 42 percent in 2008) reports an extra-marital sex during the last 12 months preceding the survey. Abstinence is practiced by around 18 percent of the sample. This would suggest, that a prevention program should focus on the use of condom since abstinence is low, and extra-marital sex is relatively high. The low rate of unprotected sex with non co-residing partners, is by itself encouraging from the disease containment perspective. All all our variables, in particular the sexual behaviors as well as the HAART awareness, are self-reported.

HAART awareness variables are summarized in columns 4-7. About 8 percent of respondents in 2007 and 6 percent in 2007 report that AIDS can be cured, while around 80 percent report that AIDS can be treated (controlled), but cannot be cured. About 45 percent of respondents know someone currently under HAART treatment (column 6), and on average 42 percent (column 7) think that the health of the person under HAART has improved as a result of the treatment.
4 Empirical Strategy

The general hypothesis we wish to test is whether ART awareness increases risk sexual behavior, i.e. there is a behavioral disinhibition or risk compensation. Our primary interest is estimating how individuals adjust their sexual behavior as they become aware of ART and form their perceptions on how ART’s are effective at treating AIDS, or (falsely) at curing AIDS. To proceed, we specify the following regression.

$$\begin{align*}
y_{it} = \beta_0 + \beta_1 A_{it} + \beta_2 X_{it} + \delta_i + \epsilon_{it} 
\end{align*}$$

where $y$ is a behavioral outcome, $A$ is a variable summarizing HAART awareness and $X$ summarizes other variables that could influence sexual behavior, $t$ indexes time periods (2007 and 2008), and $i$ indexes individuals. In this specification, $\delta_i$ is a time-invariant individual level variable which is unobserved, and which may be correlated with $A$.

There are two main sources of concern with regression (1). The first concern is an omitted variable ($\delta_i$) bias that could bias $\beta_1$ in one direction or the other. For instance, people who engaged in risky sex may have an incentive to seek out information about HAART. The resulting spurious positive association between risky sexual behaviors and HAART, would create an upward bias. Conversely, people who engage in risky sex may be “in denial” about HIV/AIDS and therefore less aware of treatment possibilities, creating a negative association between risky sexual behavior and ART awareness, hence a downward bias. It is quite plausible that these two effects could offset each other so that $\beta_1 = 0$. Because of the panel structure of our data, we can use individual fixed effects to control for unobservable individual characteristics.

The second concern is a reverse causation bias, which may arise from non random place-
ment of HIV/AIDS programs (including prevention, voluntary counseling and HAART treatment). The main concern is policy makers may place HIV/AIDS programs in places where HIV prevalence is high which may correspond to places with riskier sexual behaviors. Thus, by attracting more HIV/AIDS programs, risky sexual behaviors may be contributing to increase HAART awareness among the population. We can, however, argue the following. First, given the way we sampled the households, they are all within a reasonable distance of a health facility delivering HAART, so that the fixed effects would control any differences of exposure to HAART that non random placement of HAART delivery centers. Second, for other HIV/AIDS programs on prevention, we do not expect big changes in intensity across areas over one year, between our two survey rounds. Therefore, we argue that while there might have been a placement bias initially, it is less likely that any change in perceptions about HAART over one year could be due to a differential change of prevention program placement across areas.

5 Results and Discussions

5.1 Risky sexual behaviors and HAART awareness

Our dependent variables are risky sex (any unprotected sexual intercourse with a non-cohabiting partner), extra-marital (any sexual intercourse by a married person with a partner other than their spouse), and abstinence (no sexual intercourse during the 12 months preceding the survey). Given the cultural context of sub-Saharan Africa where men have relatively higher bargaining power than women in choices on sexual conducts, we conjectured that the associations of HAART awareness and sexual behaviors may vary systematically between men and women. Consequently, we run separate
regressions for men and women. We use linear probability models, and the standard errors are clustered at the health facility-district level.

In tables 2 to 4 we report household fixed effects estimation results. The estimated coefficients indicate how different measures of HAART awareness associate with risky sexual behaviors, for men and for women. Disinhibition behavior corresponds to a positive sign in tables 2 and 3 (more unprotected sex with non co-residing partners, and more extra-marital sex, respectively), and to a negative sign in table 4 (less abstinence). The signs of the point estimates shown in these three tables broadly support the presence of disinhibition behaviors, except in four instances (table 2 columns 3, 5, and 8; and table 3 column 5) where the sign runs against disinhibition behavior.

We now focus on coefficients which are significant. Table 2 shows the demand for risky sex (unprotected sex with non co-residing partner). The point estimates indicate that the for men, the belief that AIDS can be cured is associated with more risky sex (column 2). The estimated coefficient is .066 and is significant at the 10 percent level. For women, the demand of risky sex correlates significantly and positively with “knowing someone who is currently under HAART treatment (column 9), and “knowing that the HAART patient’s health has improved” (column 12): the point estimates are .026 and .027, and are significant at the five percent and at the 10 percent levels, respectively. Extra-marital sex (table 3) correlates significantly and positively with the “belief that AIDS can be cured” (column 2) and “knowing someone currently under HAART treatment (column 8), for men. For women, only the “belief that AIDS can be treated” correlates significantly and positively. In table 4, the dependent variable is abstinence (individuals who have started their sexual life, but have not been sexually active during the 12 months preceding the survey). From columns 7-9, it can be seen that “knowing someone under HAART treatment” correlates significantly and
negatively with abstinence for both men and women. On the other hand, the “belief that AIDS can be cured” (column 3) and “knowing that a HAART patient health has improved” (column 9) correlate significantly and negatively with abstinence for women but not for men.

Overall, while the signs of the point estimates are consistent with disinhibition, it is difficult to draw any conclusive evidence because. Because ART awareness is endogenous as discussed earlier, these estimates should be interpreted as correlations, providing at best the direction of the causal effects.

5.2 Controlling for unobservable individual characteristics

To control for unobserved individual characteristics, we repeat exactly the same regressions, but control for individual fixed effects. The results are reported in tables 5 to 7. Consistent with the results discussed above, the signs of point estimates are broadly consistent with disinhibition behavior.

We show our results on the demand of risky sex in table 5. Conditional on all individual time-invariant characteristics, men who believe that “AIDS can be cured” (column 2) are 9 percent (significant at the one percent level) more likely to engage in risky sex, while women believe that “AIDS can be treated” are 4 percent (significant at the five percent level) more likely to engage in risky sex. Knowing a person whose health has improved after a HAART treatment negatively impacts the men’s demand for risky sex, hence running against risk compensation behavior.

Estimations of the demand of extra-marital sex are shown in table 6. Consistent with the demand for risky sex discussed above, we find that the demand for extra-marital sex is 12 percent higher (significant at the 10 percent level) for men who believe that “AIDS can be cured” (column 2), and for women who believe that “AIDS can be treated”. More
notably, men who have the correct information that “AIDS can be treated” (column 5) are 10 percent less likely to engage in extra-marital sex. Estimation results for abstinence are presented in table 7. Abstinence decreases for women who believe that “AIDS can be cured” (column 3), and for men who know someone under HAART treatment.

There are three interesting findings from this set of results. First, it is apparent that men’s risky behaviors (risk sex, and extra-marital sex) are elastic to the “false” belief that HAART can cure AIDS, while women risky behaviors are elastic to the “correct” belief that AIDS can controlled but not be cured by HAART. Second, the results suggest that the correct knowledge on HAART reduces risky behaviors for men. From a prevention perspective, it may be easier to correct the “false” belief by providing the correct information. This suggests that, by simply providing the correct information on HAART, prevention programs may reduce disinhibition for men. Prevention messages for women, however, should go beyond just giving the correct information about treatment, and should stress the need for safer sexual behaviors. That prevention campaigns, if not well targeted, may not be effective across the entire population, and thus may raise redistributitional issues has been argued in a different context by de Walque (2007). Third, the negative association between abstinence (our measure of safe sexual behavior) and HAART awareness, seems to corroborate our conjecture that access HAART change the relative costs of safe and risk sex, making risky relatively cheaper.

Each regression shown in table 8 includes two HAART awareness at the time, “belief that AIDS can be cured” and ”belief that AIDS can be treated”, and “know someone under HAART treatment” and “know someone whose health has improved as a result of HAART treatment”. To save space, we have dropped the regressions that pool men and women. The last row reports the probability of an F-test that the estimated coefficients for the two
awareness variables are equal in each specification. We can use these estimates to assess the conjectures that we made section 2. Columns 1 and 5 for men, and column 10 for women corroborate our conjecture that disinhibition effects are greater when HAART is believed to cure AIDS than when HAART is believed to treat AIDS. We also hypothesized in section 2 that disinhibition effect would be greater for respondents who have seen an HAART patient health improves than for respondents who only know someone under HAART treatment. That hypothesis is supported only in column 4 for women, but rejected in columns 3, 4, 11 and 12. It is worth mentioning that these two variables are nested, so that collinearity could become a concern. Nevertheless, the tests on the beliefs that “AIDS can be cured”, and “AIDS can be treated” seem to reenforce the theory that risk sexual behaviors increase in response to the cost of contracting AIDS because of the introduction of HAART.

5.3 The role of HIV status

The sample includes three categories of respondents: identified HIV+ persons, persons who live in a household with an identified HIV+ person, and comparison households. We are able to employ this structure of our sample to test whether sexual behavior response to HAART awareness varies with HIV status. We interact the individual’s category with each HAART awareness variable. The estimations are reported in tables 9 to 11.

Of particular interest is the behavioral response to identified HIV+ person, i.e. the HAART awareness variable interacted with HIV+. The signs of the point estimates are consistently negative for risky sex (table 9), and positive for abstinence (table 11). This suggests that HIV+ persons are less likely to experience disinhibition. The results suggest,

10We hypothesized that disinhibition effect would be greater for those who ”believe that AIDS can be cured” than for those who “believe that AIDS can be treated but not be cured”, and for those “who know an HAART patient whose health has improved” than those “who know someone under HAART treatment”.
however, that HIV+ men who believe that AIDS can be cured are more likely to engage in extra-marital sex (table 10 column 5).

6 Conclusion

We use data from Mozambique to test for disinhibition behaviors resulting from the increased access of HAART. The main hypothesis is that people may alter their sexual behaviors in response to a perceived decrease in the opportunity costs of contracting AIDS that results from expected access to HAART. Such offsetting behaviors, if large enough could potentially offset some of the positive effects of increased access to HAART. After controlling for individuals fixed effects, we find some suggestive evidence of disinhibition behaviors, consistent with prior literature on risk-taking in the USA and Europe, following the introduction of HAART.

Our findings suggest that men and women responded differently to perceived changes in risk that occurs with greater access to HAART. Men’s demand for risky sexual behaviors increase with the “false” belief that “AIDS can be cured”, and decrease with the “correct” belief that “AIDS can be controlled but not cured”. Women’s demand for risky sexual behaviors increases only with the correct belief that “AIDS can be controlled”. It is possible that this gender difference stems from the cultural context of sub-Saharan Africa, which in general grants more autonomy on sexual choices to men than two women. Regardless of the reason, it appears that prevention programs by just providing the correct information on HAART may reduce disinhibition behaviors for men, and exacerbate it for women, so that overall women benefit less from increased access to HAART than men.

To sum up, our results suggest that scaling up access to HAART without prevention pro-
grams may not be optimal if the objective is to contain the disease, since people would adjust
their sexual behavior in response to the perceived changes in risk. Therefore, prevention pro-
grams need to include educational messages about HAART, and address the changing beliefs
about HIV in the era of increasing HAART availability. Finally, prevention messages would
need to account for the difference gender difference of disinhibition behaviors. From a dif-
ferent perspective, our results provide a framework for assessing public effects of occasional
media coverage of “false” cures for AIDS.(e.g. Amon, 2008; Herbst, 2005)11 Our findings
suggest, that men may respond to these types of announcement by increasing their demand
of risky sexual behaviors, hence contributing to the spread of the disease.

11 For instance, in 2007 the president of Gambia declared that he could cure AIDS. Despite having raised
some concerns, his discovery is still celebrated here [http://www.statehouse.gov.gm/hiv-aids.htm](http://www.statehouse.gov.gm/hiv-aids.htm)
References


Figure 1: Percent condom use in a cohort of sex workers: Nairobi, 1985-99

Source: Jha et al. (2001)
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<th>Year</th>
<th>Risky</th>
<th>Extra-marital</th>
<th>Abstinence</th>
<th>AIDS can be:</th>
<th>Know ART</th>
<th>Know health</th>
<th>Impoved</th>
<th>Age</th>
<th>Married</th>
<th>HIV+ Person</th>
<th>Lives with HIV+pers.</th>
<th>Comp. household</th>
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* significant at 10%; ** significant at 5%, *** significant at 1%

Robust standard errors in brackets
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Robust standard errors in brackets
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Standard errors in brackets
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Robust standard errors in brackets
Table 6: Demand of extra marital sex by married individuals and ART awareness in Mozambique (individual fixed effects estimates)

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Standard errors in brackets
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Robust standard errors in brackets
Table 7: Abstinence and ART awareness in Mozambique (individual fixed effects estimates)

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Standard errors in brackets

* significant at 10%; ** significant at 5%, *** significant at 1%
Robust standard errors in brackets
### Table 8: Sexual behavior and ART awareness in Mozambique (individual fixed effects estimates)

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Standard errors in brackets

* significant at 10%; ** significant at 5%, *** significant at 1%

Robust standard errors in brackets
Table 9: HIV Status, demand of risky sex and ART awareness in Mozambique (individual fixed effects estimates)

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Standard errors in brackets
* significant at 10%; ** significant at 5%, *** significant at 1%

Robust standard errors in brackets
Table 10: HIV Status, demand of extra marital sex by married individuals and ART awareness in Mozambique  
(individual fixed effects estimates)

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Standard errors in brackets
* significant at 10%; ** significant at 5%, *** significant at 1%
Robust standard errors in brackets