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## HIV treatment optimism and its predictors among young adults in southern Malawi

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### Abstract

This study measures HIV treatment optimism and its predictors in a representative sample of young adults in southern Malawi. In 2010, 1,275 women and 470 men between the ages of 16 and 26 were asked about their exposure to people on antiretroviral therapy (ART), sexual risk behavior, HIV status, and beliefs about ART. We used confirmatory factor analysis to develop a four-item scale of the belief that HIV is a less serious health threat due to ART (reduced-severity optimism) and used a single measure to capture belief in the reduced infectivity of HIV due to ART (reduced-susceptibility optimism). Overall, respondents reported low levels of HIV treatment optimism. Being female and using ART were the largest predictors of both types of treatment optimism. We found a non-linear relationship between exposure to people on ART and reduced-severity optimism. People who knew someone on ART but did not discuss it with them had lower levels of reduced-severity optimism than people who did not know anyone on ART and people who regularly discussed treatment with someone on ART. In multivariate regression models, HIV treatment optimism was positively associated with all measures of sexual risk behavior among men but negatively associated with unprotected sex with a non-primary partner among women. Our findings suggest that the spread of ART in Malawi has not led to widespread HIV treatment optimism. This may reflect the relatively recent spread of ART, the generalized nature of the HIV epidemic, or the fact that access to ART is complicated by structural limitations that delay treatment and limited availability of second line medicines.

### Keywords

HIV treatment optimism; antiretroviral therapy; sub-Saharan Africa; Malawi; sexual disinhibition

## Introduction

In many industrialized settings, the widespread availability of antiretroviral therapy (ART) transitioned HIV from a death sentence to a more manageable chronic disease (Palella, 1998; Walensky et al., 2006). At the same time, there was growing concern that access to treatment was leading to behavioral disinhibition because people no longer perceived HIV to be a serious threat, a phenomenon referred to as HIV treatment optimism (Cassell et al., 2006; Crepaz et al., 2004; Kelly et al., 1998). Some experts have hypothesized a similar reaction among people living within the generalized HIV epidemics of sub-Saharan Africa (Abbas et al., 2006; Cassell et al., 2006; Gray et al., 2003). Over the past five years, access to ART has improved dramatically throughout much of the region. Yet little is known about if or how the recent spread of ART has altered beliefs about HIV and whether HIV treatment optimism increases risky sexual practices. In this paper, we measure HIV treatment optimism and its predictors in a population-based sample of young adults from southern Malawi.

The literature suggests there are two related components to HIV treatment optimism among men who have sex with men (MSM) in the West: a belief in the reduced infectivity of HIV because of ART's effect on viral load (i.e., "reduced-susceptibility optimism") and a belief that HIV is a less serious threat to health because of the availability of ART (i.e., "reduced-severity optimism") (Remien & Smith, 2000; Elford et al., 2002). Existing studies have found varying degrees of HIV treatment optimism (Crepaz et al., 2004; Stolte et al., 2004; Van de Ven et al., 2000). While these studies find evidence that the endorsement of optimistic beliefs is associated with sexual risk behavior among MSM, there remains an ongoing debate about whether HIV treatment optimism causes sexual risk behavior or is simply used to justify it (Cox et al., 2004; Elford et al., 2002; Kalichman et al., 2006, 2007; Mackellar et al., 2011).

Relatively little research exists on HIV treatment optimism in sub-Saharan Africa, which is likely to differ in meaningful ways from the experience of MSM populations in concentrated epidemics. ART access and delivery vary across the region, but in general, people rely on generic first-line treatments (Chien, 2007; Harries et al., 2010), initiate treatment at more advanced stages of the disease, and experience more severe side effects and less favorable outcomes (Lawn et al., 2005; Lawn et al., 2008) compared to treatment users in the West. The generalized nature of the HIV epidemic in sub-Saharan Africa, combined with structural barriers around treatment, may limit the prevalence of optimistic beliefs and weaken the relationship between HIV treatment optimism and risk behavior.

We draw upon three recent studies from East Africa to inform our perspective. First, a 2006 population-based study conducted in Kenya found that beliefs about risk compensation due to ART were associated with HIV infection in men but not women (Cohen et al. 2009). Beliefs that HIV is a more controllable disease since ART were not associated with HIV infection in either sex. Unfortunately, the study did not report on the prevalence of these beliefs. Second, a study from Uganda developed an HIV treatment optimism scale for HIV positive women (Kaida et al., 2009). They found that women were generally skeptical about the ability of ART to reduce the transmission and severity of HIV. However, women who expressed more optimistic beliefs about treatment were more likely to engage in unprotected sex. Lastly, a prospective cohort study from Uganda hypothesized that directly observing the health benefits of a household member on ART could increase optimistic beliefs about treatment and risky sexual behavior. While the authors found that lower AIDS-related anxiety and the belief that AIDS is curable were associated with sexual risk behavior, they found no evidence of increased optimism nor behavioral disinhibition after sustained interaction with someone on ART (Bechange et al., 2010).

Categorizing individuals based on their level of exposure to other people on ART may improve our understanding of the mechanisms through which HIV treatment optimism develops. In sub-Saharan Africa, there is little evidence of behavioral disinhibition among ART patients (Bunnell et al., 2006; Kennedy et al., 2007; Venkatesh et al., 2011). However, people on ART have regular interaction with health facilities and are likely to encounter targeted messages about HIV prevention, thus potentially offsetting any optimism-related risk behavior. Little is known about how ART might affect the beliefs of the general population. Studies from the region have shown that knowing someone with HIV, and particularly knowing someone who died of AIDS, is associated with higher perceived risk of infection and less risky sexual behavior (Macintyre et al., 2001; Palekar et al., 2008). Yet perceived risk and related behaviors may be changing with the continued spread of ART, particularly as people interact with others on treatment.

## Context

Eleven percent of the reproductive age population in Malawi is HIV positive (NSO & ORC Macro, 2011). ART was first introduced in urban Malawian hospitals as early as 2000, but access was extremely limited (van Oosterhout et al., 2007). ART became more widely available to the predominately rural population of Malawi when it was extended, free of charge, to rural district hospitals between 2005 and 2006. The initial eligibility criteria for ART required that infected individuals be clinically staged as WHO criteria 3 or 4, meaning that most people waited until they were very sick to initiate treatment (Harries et al., 2006). Recently, CD4 machines have spread to some district hospitals permitting more people to become eligible for ART based on CD4 count rather than only on external symptoms. As of 2010, around 250,000 people were actively receiving ART out of an estimated 1 million infected (Ministry of Health [Malawi], 2010, 2011). Nonetheless, limited availability of treatment and great distances to hospitals still constrain access to ART and may consequently influence the prevalence of HIV treatment optimism.

## Methods

The data for the present study come from Tsogolo la Thanzi<sup>1</sup> (TLT; “Healthy Futures” in Chichewa), a population-based panel study of young men and women living in and around the southern Malawian town of Balaka. ART is available in Balaka from both the district hospital and a private clinic. In 2009, a gender-stratified random sample of young adults between the ages of 15 and 25 was selected from a complete household listing of all residents living within a seven-kilometer radius of the town center. In total, 1493 women and 571 men were interviewed at the first wave, representing 95% of recruited respondents. This study uses data from the 5<sup>th</sup> wave (2010) when a special module on HIV treatment optimism was added to the regular survey.

### HIV treatment optimism scale

TLT interviewers asked respondents whether they strongly agreed (4), agreed (3), disagreed (2) or strongly disagreed (1) with statements designed to assess beliefs about HIV in the era of ART.<sup>2</sup> The statements were drawn from the literature on HIV treatment optimism in the West and the limited literature from sub-Saharan Africa (Bechange et al. 2010; Brennan et al. 2009; Kaida et al. 2009; Van de Ven et al. 2000). We amended the wording to fit the local context and added additional questions based on eight focus group discussions. We focus here on statements intended to measure the constructs of susceptibility and severity.

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<sup>1</sup>(removed for review)

<sup>2</sup>We refer to antiretroviral therapy as ART in accordance with the scholarly literature. In Malawi, however, people refer to “ARVs” or “new tablets”. The survey questions reflect these local terms.

The reduced-susceptibility construct was measured with a single statement: “I believe that new tablets (ARVs) can make people with HIV less likely to spread the virus.” For analytic purposes, we collapsed the response categories for reduced-susceptibility into strongly agree/agree and strongly disagree/disagree. For reduced-severity optimism, we conducted a confirmatory factor analysis with seven additional statements. Three statements had standardized factor loadings less than 0.40 and were dropped from the model.<sup>3</sup> Four statements were included in the scale: “Now that we have treatment, prevention isn’t as important as it used to be”, “AIDS is on the decline because of ARVs”, “ARVs can rid your body of the virus”, and “Living with HIV on ARVs is like living without HIV”. Model fit was evaluated using the model  $\chi^2$  fit statistic, Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Tucker-Lewis fit Index (TLI), and the Standard Root Mean Square Residual (SRMR). The final measure of severity optimism demonstrated excellent fit ( $\chi^2=1.68$ ,  $P$ -value=0.43; RMSEA=0.00,  $P$ -value=0.97; CFI=1.00; TLI=1.00; SRMR=0.01). All standardized factor loadings were statistically significant and accounted for large proportions of observed variance (see Table 2). We summed the four items to create a reduced-severity optimism scale (range: 1–16; Cronbach’s alpha: 0.71).

### **HIV status and ART use**

The TLT study utilized an experimental design that involved the randomizing of HIV testing and counseling to the same one-third sample at each wave and to another one-third at Wave 4. By Wave 5, approximately two-thirds of the entire TLT sample had been tested through TLT. Additionally, the survey included a question about the respondent’s likelihood of being HIV positive. We considered respondents to be HIV positive if they tested positive through TLT or if they indicated that they were certain they were HIV positive. The survey included a direct question about whether or not a respondent was on ART.

### **Exposure to people on ART**

Respondents were asked whether they had a partner, household member, other relative, friend/neighbor, or other acquaintance who was on ART and, if so, how many people they knew to be on ART in each category. They were then asked how often they talked to the person they were closest to in each category about ART (never, only at the beginning, occasionally, often). We operationalized exposure to people on ART as a three category variable: not knowing anyone on ART, knowing someone on ART but never or only initially talking to them about it, and knowing someone on ART and talking to them about ART occasionally or often.

### **Sexual risk**

We use two measures of sexual risk: a dichotomous indicator for having two or more sexual partners in the past 12 months and a dichotomous indicator for having inconsistent condom use with a non-primary partner, defined as a non-spouse or non-steady boy/girlfriend.

### **Sociodemographic variables**

Multivariate models included controls for variables likely to influence beliefs about ART and sexual behavior: gender, age, years of education, household goods (an index of nine goods designed to approximate household economic status), monthly income divided into quartiles, and marital status. Marital status was measured as married, formerly married, and

<sup>3</sup>The excluded statements were: “I am less worried about getting HIV now that treatments have improved”, “If I had HIV, I could live a long and healthy life”, and “ARVs make it difficult to tell/know who has HIV and who doesn’t”.

never married. Models of sexual risk by gender collapsed men's marital status into married and unmarried given the scarcity of formerly married men in our young sample (n=8).

### Statistical analysis

We identified the predictors of HIV treatment optimism using a series of nested multivariate linear (reduced-severity optimism) and logistic (reduced-susceptibility optimism) regression models. Models were weighted to account for TLT's gender-stratified sampling design. We then used multivariate logistic regression to assess the relationship between HIV treatment optimism and sexual risk behavior by gender. All analyses were performed in Stata 12.0 (StataCorp, 2011).

### Results

1280 women and 472 men were interviewed at TLT's Wave 5. Respondents with missing data on HIV treatment optimism were excluded from the analysis (n=7). Table 1 presents descriptive characteristics for the analytic sample. The mean age for the study population was 20 years and half of participants had never been married. Seven percent of female respondents were known to be HIV positive and 2% were on ART. Less than 1% of men were HIV positive and none reported being on ART. The majority of participants had some exposure to people on treatment: half knew someone on ART but did not discuss it with them. Eighteen percent knew someone and regularly discussed their treatment with them, while the remaining 32% reported not knowing anyone on ART. Men were more than twice as likely as women to report having more than one partner and having unprotected sex with a non-primary partner in the last 12 months.

Table 2 presents descriptive statistics for the susceptibility and severity optimism measures. Respondents were more likely to disagree or strongly disagree with each of the five optimistic statements. Severity optimism scores were concentrated on the low end of the scale, indicating low levels of reduced-severity optimism. The most commonly affirmed statements were "AIDS is on the decline because of ARVs" (35% agreement) and the measure of reduced-susceptibility optimism, "I believe that ARVs can make people with HIV less likely to spread the virus" (37% agreement).

Table 3 presents the results of the multivariate regression models examining the sociodemographic, HIV status, and interpersonal exposure associations with severity and susceptibility optimism. Women were more likely than men to ascribe to both kinds of optimism. Age was positively associated and education was negatively associated with both measures of optimism. Individuals with higher income were less likely than individuals with no income to indicate high levels of reduced-severity optimism. Additionally, being unmarried was negatively associated with reduced-severity optimism. These relationships were not attenuated when HIV status and exposure to people on ART were added to the models. Women on ART were considerably more optimistic about both reduced-severity and reduced-susceptibility. Finally, respondents who knew someone on ART but did not discuss it with them had significantly lower levels of reduced-severity optimism than did people who did not know anyone on ART as well as people who knew someone on ART and had regular discussions about it (result not shown).

Table 4 presents crude and adjusted odds ratios from logistic regression models examining the association between the two measures of HIV treatment optimism and two measures of sexual risk. Models were run separately by gender because the predictors of sexual risk behavior vary systematically by gender in this context (Clark, Kabiru, & Mathur, 2010). We found that men who hold more optimistic views about HIV treatment were more likely to have multiple partners. Indeed, men who affirmed the statement "I believe new tablets

(ARVs) make people with HIV less likely to spread the virus” had twice the odds of having multiple partners. Men with higher scores on the reduced-severity optimism scale were also more likely to report inconsistent condom use with a non-primary partner in the last year. In contrast, the measures of treatment optimism were not associated with women’s reports of multiple partners and were negatively associated with a woman’s likelihood of inconsistent condom use with a non-primary partner.<sup>1</sup>

## Discussion

This study was one of the first to examine measures of HIV treatment optimism among a population-based sample of young adults in sub-Saharan Africa. We developed a four-item scale with adequate reliability and rigor to measure reduced concern about HIV in light of ART (reduced-severity). A limitation of the study was our use of a single measure to capture the belief that ART makes HIV less easily transmissible (reduced-susceptibility). Nonetheless, the similarity in sociodemographic associations between our two measures of treatment optimism is encouraging.

Our respondents generally disagreed with the optimism statements. Being female and taking ART were associated with more optimistic beliefs about treatment. Additionally, we identified a complicated relationship between exposure to people on ART and optimism. Knowing someone on ART but not discussing it was associated with lower reduced-severity optimism. One possible explanation is that people who know someone on ART are exposed to realistic portrayals of HIV and the challenges of treatment seen through the experience of people they know. In contrast, those who regularly communicate with someone on ART are likely to be emotionally closer to that individual and more prone to be hopeful about their future, thus more optimistic about the possibilities of ART. On the other hand, people who do not know anyone on ART are only exposed to media messages about ART that are universally positive and lack nuance.

We found some evidence that HIV treatment optimism is associated with sexual risk behavior among young adults in Malawi. Men who were more optimistic engaged in riskier sexual behavior. With a cross-sectional research design, we cannot conclude that men engage in risky behavior because of treatment optimism. It is also possible that men who engage in riskier behavior justify their actions by identifying with more optimistic beliefs (Elford et al., 2000; Huebner et al., 2011) or that there is some unmeasured characteristic associated with both risk behavior and treatment optimism. Surprisingly, we found a negative relationship between unprotected sex with a non-primary partner and treatment optimism among women. This finding deserves further study and suffers from the same cross-sectional weaknesses; one possible interpretation, however, is that women who are more skeptical about treatment are also more fatalistic about their ability to prevent infection.

Most studies of behavioral disinhibition do not measure HIV treatment optimism directly, but it is often the implicit mediator connecting ART with risk behavior. In sub-Saharan Africa, the evidence thus far does not support behavioral disinhibition among people on ART or among people who live with someone on ART (Apondi et al., 2011; Bechange et al., 2010; Bunnell et al., 2006; Kennedy et al., 2007). Our findings show that the spread of ART in Malawi has not yet led to widespread treatment optimism. Although we find some evidence of an association between treatment optimism and risky sexual behavior among

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<sup>1</sup>Women’s models include controls for HIV status and ART but these did not alter the relationship between optimistic beliefs and sexual behavior.



men, levels of optimism are low among young adults in southern Malawi. Thus, major concerns about behavioral disinhibition due to ART are not justified in our study population.

The spread of ART in sub-Saharan Africa is proceeding differently from that in the more concentrated epidemics in the West. The low prevalence of HIV treatment optimism we find among young adults in Malawi may reflect the relatively recent introduction of ART or it may simply reflect justifiable skepticism given the reality of ART in an environment familiar with medical shortages, a scarcity of second- and third- line treatments, and treatment delays. We hope that researchers continue to measure and monitor the phenomenon of HIV treatment optimism as ART use increases and treatment conditions evolve.

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**Table 1**

Sociodemographic characteristics of the study population, Tsogolo la Thanzi, Wave 5

Variable	Percentage or Mean		
	Women (N=1275)	Men (N=470)	All (N=1745)
Age, range: 16–26 (mean)	20.6	20.0	20.4
Years of education, range: 0–14 (mean)	7.5	8.0	7.6
Household goods index, range: 0–9 (mean)	2.6	2.9	2.6
Income quartiles (%)			
1 lowest	62.0	30.9	53.6
2	6.7	11.7	8.0
3	16.2	24.7	18.5
4 highest	15.1	32.8	19.9
Marital status (%)			
Married	51.5	18.9	42.8
Never married	39.2	79.4	50.0
Formerly married	9.3	1.7	7.2
HIV positive (%)	7.1	0.4	5.3
Using ART (%)	2.0	0.0	1.4
Exposure to people on ART (%)			
Do not know anyone on ART	30.5	37.7	32.4
Know someone on ART but do not discuss	51.5	44.7	49.6
Know someone on ART and regularly discuss	18.0	17.7	17.9
Sexual behavior (%)			
Multiple sexual partners in last 12 months	6.3	16.4	9.0
Inconsistent or no condom use with a non-primary partner	5.7	15.7	8.4

**Table 2**

## HIV treatment optimism measures and components

Variable	% Agreement	Mean (sd) <sup>a</sup>	Standardized factor loading	% Variance explained
Reduced-severity optimism				
Now that we have treatment, prevention isn't as important as it used to be.	20.2	1.72 (1.00)	0.54	28.6
AIDS is on the decline because of ARVs.	34.8	2.08 (1.16)	0.59	34.7
ARVs can rid your body of the virus.	17.1	1.61 (0.97)	0.75	56.1
Living with HIV on ARVs is like living without HIV.	27.7	1.91 (1.07)	0.63	39.7
Reduced-susceptibility optimism				
I believe new tablets (ARVs) make people with HIV less likely to spread the virus.	36.7	2.18 (1.20)	---	---

<sup>a</sup>1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree

Table 3

Multivariate linear and logistic regression models predicting reduced severity and reduced susceptibility optimism among young adults in Balaka, Malawi (N=1745)

	Severity scale		Susceptibility	
	Model 1	Model 2	Model 3	Model 4
	$\beta$	$\beta$	OR	OR
<b>Gender</b>				
Male (ref)	0	0	1	1
Female	0.637 ***	0.655 ***	1.949 ***	1.908 ***
Age	0.072 **	0.066 *	1.057 *	1.051 *
Years of education	-0.288 ***	-0.281 ***	0.898 ***	0.898 ***
Household goods	-0.060	-0.051	0.984	0.988
<b>Income quartiles</b>				
1 lowest (ref)	0	0	1	1
2	-0.060	-0.013	0.934	0.944
3	-0.150	-0.07	1.244	1.275
4 highest	-0.435 *	-0.408 *	0.901	0.920
<b>Marital status</b>				
Married (ref)	0	0	1	1
Never married	-0.466 *	-0.468 *	0.934	0.924
Formerly married	0.156	0.061	0.977	0.910
<b>HIV status and ART use</b>				
HIV negative or unknown status (ref)		0		1
HIV positive and not on ART		0.226		1.449
HIV positive and on ART		1.909 **		2.844 *
<b>Exposure to people on ART</b>				
Do not know anyone on ART (ref)		0		1
Know someone on ART but do not discuss		-0.539 ***		0.925
Know someone on ART and regularly discuss		-0.040		0.962
Constant	7.436 ***	7.684 ***	0.138 ***	0.162 **

Models are weighted to account for the gender stratified sampling design

\* p<0.05,  
\*\* p<0.01,  
\*\*\* p<0.001

**Table 4**

Odds ratios from logistic regression models demonstrating associations between measures of treatment optimism and sexual risk behavior

	<b>Men (N=470)</b>		<b>Women (N=1275)</b>	
	<b>Crude OR (95% CI)</b>	<b>Adjusted OR (95% CI)<sup>I</sup></b>	<b>Crude OR (95% CI)</b>	<b>Adjusted OR (95% CI)</b>
2+ sexual partners, last 12 months				
Reduced severity optimism scale	1.21 (1.10, 1.33) ***	1.22 (1.09, 1.36) ***	0.99 (0.92, 1.06)	0.97 (0.90, 1.05)
Reduced susceptibility optimism item	2.48 (1.48, 4.15) **	2.04 (1.19, 3.52) *	1.00 (0.63, 1.59)	0.97 (0.60, 1.57)
Inconsistent condom use with non-primary partner, last 12 months				
Reduced severity optimism scale	1.11 (1.01, 1.23) *	1.13 (1.01, 1.26) *	0.92 (0.85, 1.00) *	0.91 (0.84, 1.00) *
Reduced susceptibility optimism item	1.49 (0.86, 2.57)	1.18 (0.66, 2.11)	0.33 (0.18, 0.59) ***	0.33 (0.18, 0.61) ***

<sup>I</sup> Adjusted models control for age, years of education, marital status, household goods index, income quartiles, interpersonal experience with ART, and HIV status/ART use

\* p<0.05,

\*\* p<0.01,

\*\*\* p<0.001