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**To know or not to know? HIV-status  
disclosure and protective sexual  
practices among adolescent girls and  
boys in South Africa**

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Toska conducted the majority of the work for this paper, leading the quantitative study design, data analysis and writing. Cluver and Toska conceptualized the quantitative study, and contributed to data analysis and writing. Toska and Pantelic led the data collection and cleaning. Pantelic supported with data analyses and writing. Hodes contributed to conceptualising analyses and writing. All authors have read and approved the final text. All co-authors have reviewed and approved this author statement.

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*'We use a condom sometimes. At times my boyfriend would complain that the condom tightens his penis. He would forget to get them before I come to visit him and when I get there he would not have condoms. And sometimes I would insist on having sex with a condom and if he does not have one, we will not have sex.'*

(17 year old adolescent girl, Mdantsane – Hodes, 2015)

*'They are more committed to a secret than survival.'*

(Nurse, Gompo clinic, 20 June 2014 – Hodes, 2015)

*'When I had the test, they counselled me, and the sister told me that I must disclose to my sexual partners. But no-one is going to do that, no one can. Maybe some can, but they are scared that their partners will blame them. Because if the boy didn't go to test, he is going to say to you, "You are the one who has brought this to me," even though he doesn't know his status.'*

(18-year old adolescent girl, Gompo clinic, 23 June 2014 – Hodes, 2015)

# To know or not to know? HIV-status disclosure and protective sexual practices among adolescent girls and boys in South Africa

## Abstract

**Background:** To stem AIDS-morbidity and stop HIV transmission, UNAIDS recommends that 90% of HIV-positive people know their status by 2020, including adolescents. HIV-positive adolescents who engage in unsafe sex are at risk of transmitting HIV to partners and children. Little is known about linkages between knowing and disclosing one's HIV-positive status and practicing safe sex among adolescents.

**Methods:** This study tests whether (1) knowledge of one's own HIV-positive status, (2) disclosure of HIV-positive status to partners, and (3) knowledge of partner HIV-status – positive or negative – are associated with protective sexual practices. The study interviewed  $n=1,527$  HIV-positive and negative adolescents (10-19 years old, 57% female) in a health district in South Africa's poorest province.  $N=1,425$  adolescents who were either HIV-positive status aware or status-unaware (positive or negative) were included in the analyses,  $N=794$  of whom were HIV-positive status-aware adolescents. Interviews used standardised questionnaires and validated scales. Analyses used multivariate logistic regressions, controlling for socio-demographic covariates.

**Results:**  $n=467$  (32.8%) of the sample were sexually-active, with  $n=389$  (27.3%) reporting a boy/girlfriend. Among sexually active adolescents, 44% of HIV-positive status-aware adolescents reported protective sexual practices compared to 35% among the rest of the sample ( $p=0.067$ ). In a final multivariate regression including all three types of disclosure, knowing own HIV-positive status was associated with protective sexual practices (OR1.59, 95%CI 1.10-2.30,  $p=0.014$ ), disclosing one's HIV-positive status to a partner was not associated with protective sexual practices, while knowledge of partner HIV-status was associated with less protective sexual practices (OR0.46, 95%CI 0.28-0.74,  $p=0.002$ ). Gender did not moderate the effect of disclosure on protective sexual practices.

**Conclusion:** Knowing one's HIV-positive status has a positive effect on adolescent safer sex practices. However, these findings suggest that HIV-status disclosure in sexual relationships may not be protective for adolescents, whose ability to practice safer sex is premised on factors beyond the mere disclosure of

*HIV-positive status. Better understanding of the mechanisms through which different types of disclosure are associated with protective sexual practices is necessary to inform healthcare practices that support HIV-positive adolescents engage in safe sex.*

## **1. Introduction**

In 2014, UNAIDS issued the 90-90-90 targets to reduce AIDS-related morbidity and end the HIV/AIDS epidemic by 2030 (UNAIDS, 2014). Target 1 recommends that 90% of HIV-positive people know their HIV-status as an important precursor to initiating antiretroviral treatment and preventing HIV transmission vertically to children or horizontally to sexual partners. This target is particularly relevant in sub-Saharan Africa, the region most-disproportionately affected by the epidemic. Sub-Saharan Africa is home to 90% of the world's HIV-positive adolescents: an estimated 1.3-2.2 million vertically and horizontally-infected 10-19 year olds (UNICEF, 2013). Less than 50% of HIV-positive people in the region know their status, particularly among key populations such as adolescents. However, the evidence on the effect of knowing one's HIV-positive status and safe sex among adolescents is scarce.

Research to date shows high rates of unprotected sex with other adolescents (Cataldo *et al.*, 2012), low rates of knowing one's own status (Lowenthal & Marukutira, 2013), and low rates of disclosure of HIV-status to sexual partners (Birungi *et al.*, 2009; Dempsey *et al.*, 2012; Mbalinda *et al.*, 2015; Nöstlinger *et al.*, 2015; Ankunda, Atuyambe & Kiwanuka, 2016). Negotiating safe sexual practices is particularly challenging for HIV-positive adolescents, many of whom experience difficulties in learning and accepting their status (Lam, Naarking & Wright, 2007), and withhold their HIV-status to sexual partners (Dempsey *et al.*, 2012; Hardon & Posel, 2012; Mburu *et al.*, 2014; Nöstlinger *et al.*, 2015). World Health Organisation guidelines recommend disclosure to adolescents of their own status (WHO, 2011), but recommend prior counselling on potential benefits and risks of disclosure to others (WHO, 2013).

The paucity of research of associations between HIV-status disclosure and safe sex was highlighted in a recent systematic review (Maccarthy *et al.*, 2012). A community-based study among 15-49 year old South Africans indicates that knowing one's HIV-status positively affects safe sexual behaviour: those who had ever tested were more likely to report condom use at last sex in a recent national community-based prevalence study in South Africa (Shisana *et al.*, 2009). However, studies among HIV-positive adolescents from Uganda report inconsistent associations between knowing own HIV-positive status and protected sex (Obare & Birungi, 2010; Beyeza-Kashesya *et al.*, 2011). A study

comparing HIV-positive adolescents who knew their status (n=732) to adolescents who did not know their status (n=2,213), found that HIV-positive adolescents who knew their status were significantly more likely to report using contraception and current condom use (Obare & Birungi, 2010). A second study comparing HIV-positive (n=276) to HIV-negative (n=501) youth (15-24 years old) reported lower rates of condom use among HIV-positive adolescents, 38% vs. 24% respectively (Beyeza-Kashesya *et al.*, 2011).

Only two known studies worldwide test associations of disclosure of status from HIV-positive adolescents to their sexual partners using samples recruited from adolescents attending healthcare facilities, only in Uganda and the United States. The Ugandan study found lower, but not statistically significant, rates of condom use among HIV-positive adolescents who had disclosed to their partners in Uganda compared to those who had not disclosed to their partners (Birungi *et al.*, 2009). The second study – using a U.S.-based sample – reported that disclosure of status to partners was not associated with safe sex (Dempsey *et al.*, 2012). A single study among n=282 HIV-positive 15-24 year olds in Tanzania tested whether knowing partner's HIV-status was associated with sexual risk-taking (Mhalu, Leyna & Mmbaga, 2013). In multivariate analyses, it concluded that knowing partner's HIV-status was associated with lower odds of having multiple sexual partners, but found no significant association with unprotected sex (Mhalu, Leyna & Mmbaga, 2013).

Qualitative research from sub-Saharan Africa suggests that disclosure in sexual and romantic relationships is shaped by complex factors. Knowing one's partner's status (Alemayehu *et al.*, 2014), stigma (Li *et al.*, 2010), medication-taking (Marhefka *et al.*, 2010), desire for love and acceptance (Zamudio-Haas *et al.*, 2012; Busza *et al.*, 2013), and progression of HIV disease (Cooper *et al.*, 2007) are factors associated with reduced HIV-status disclosure in sexual relationships. In particular, HIV-positive adolescent girls are at a greater risk of unwanted pregnancy and vertical HIV transmission due to complex factors associated with limited ability to negotiate condom use, age-disparate sexual partnerships and stigma due to their HIV-positive status (Maccarthy *et al.*, 2012; Toska *et al.*, 2015). Quantitative research to date does not report any gender-disaggregated analyses of how disclosure of HIV-status in sexual relationships is associated with safe sex among HIV-positive adolescents.

This study adds to the limited existing evidence on how disclosure *to* and *by* HIV-positive adolescents is associated with protective sexual practices, using a community-traced sample of adolescents eligible for antiretroviral treatment and community controls from South Africa. Analyses compares HIV-positive adolescents who know their status (HIV-positive status-aware) to adolescents

who do not know their status (status-unaware, whether HIV-positive or negative). To test potential associations between disclosure types and protective sexual practices amongst adolescent girls suggested by qualitative research, analyses were first run on the full sample (n=1,527), followed by moderator and gender-disaggregated analyses. The effect of combinations of types of disclosure on protective sexual practices was also estimated for both adolescent boys and girls.

## **2. Methods**

This study was designed using integrated quantitative and qualitative methods: preliminary qualitative research findings guided quantitative measures, particularly items on disclosure, a preferred practice in studies of adolescent health (Pluye and Hong, 2014). A mixed-methods approach also guided analyses, with emerging quantitative findings framing the thematic focus of qualitative research, and additional topics followed up through in-depth interviews (Creswell, 2013). The study protocol was reviewed and approved by Research Ethics Committees at the Universities of Cape Town (CSSR 2013/4), Oxford (SSD/CUREC2/12-21), and Eastern Cape Departments of Health and Basic Education, and ethical review boards of facilities.

### **2.1. Participants and procedures**

The study recruited 1,527 adolescents, 1,060 of whom were HIV-positive adolescents, residing in the Eastern Cape province of South Africa. To recruit HIV-positive adolescents, every public health facility in the study area, a mixed rural-urban health sub-district, was mapped in 2013. All clinics providing antiretroviral treatment (ART) to >4 adolescents were included in the sample (n=53). Clinical registers were used to identify all patients aged 10-19 who were ART-eligible, regardless of clinic attendance (N=1,202): 1,060 HIV-positive adolescents were interviewed (90.1% of eligible sample, 4.1% refused, 0.9% were excluded due to severe cognitive delays, 1.2% excluded due to other reasons and 3.7% could not be traced). To ensure that adolescents not engaged in care during recruitment were included in the sample, eligible participants identified in health facilities were traced in their homes, communities or schools ('community-tracing'). To prevent the possibility of stigma from participation in HIV-related research, the study centred on adolescent use of health and social services, rather than narrowly on HIV-specific research questions. Adolescents from neighbouring homes and some co-resident siblings/cousins were also interviewed (N=467). The study sampled sero-assorted adolescents: HIV-

positive status-aware, HIV-negative status-aware adolescents and status-unaware adolescents (whether positive or negative). Voluntary informed consent was obtained from adolescents and caregivers. No incentives were provided, but all participants received a small gift pack and a certificate of participation.

## 2.2. Data Collection Tools

Data collection utilised tablet-based questionnaires, a method documented to improve data quality and reduce missing data (Jaspan *et al.*, 2007; Gorbach *et al.*, 2013). Questionnaires and consent forms were translated and back-translated in consultation with research assistants fluent in the rural and urban vernacular spoken by young people (Harkness & Schoua-Glusberg, 1998). All materials were piloted with a ‘teen advisory group’ of HIV-positive and HIV-affected adolescents. Interviews lasted approximately 90 minutes and were conducted in the adolescent’s language of choice: English or Xhosa using mobile-assisted self-interviews on tablets. In cases of low literacy, researchers trained in ethics and interviewing vulnerable adolescents read out the questions and inputted answers. During the consent process, participants were assured that confidentiality and anonymity would be maintained, except in cases of significant harm or requested assistance. Where participants reported serious risk of harm (such as on-going abuse, recent rape or suicidal attempts), referrals were made to relevant child protection and health services. The study’s principal investigator, who is a social worker, oversaw referrals and follow up support.

## 2.3. Quantitative measures

**Sex and relationship-related factors:** Questions on *sexual experiences*: age of sexual debut, type of contraception and condom use at most recent sexual encounter, were adapted from other studies with HIV-positive youth (Bauermeister *et al.*, 2012). A dichotomous variable was created for ‘*protective sexual practices*’ (1=abstinence or condom use, 0=unprotected sex at most recent sexual encounter).

**Disclosure to and from adolescents:** *Adolescent knowledge of HIV-positive status* was assessed triangulating data from their healthcare workers, their primary caregivers and the adolescent themselves during the consent process. To prevent unintentional disclosure of HIV-status to participants, interviewers followed a screening protocol to confirm the adolescents’ understanding of their HIV-positive status. The screening tool involved a set of questions about recent history of health, illness, use of healthcare services and medication-taking



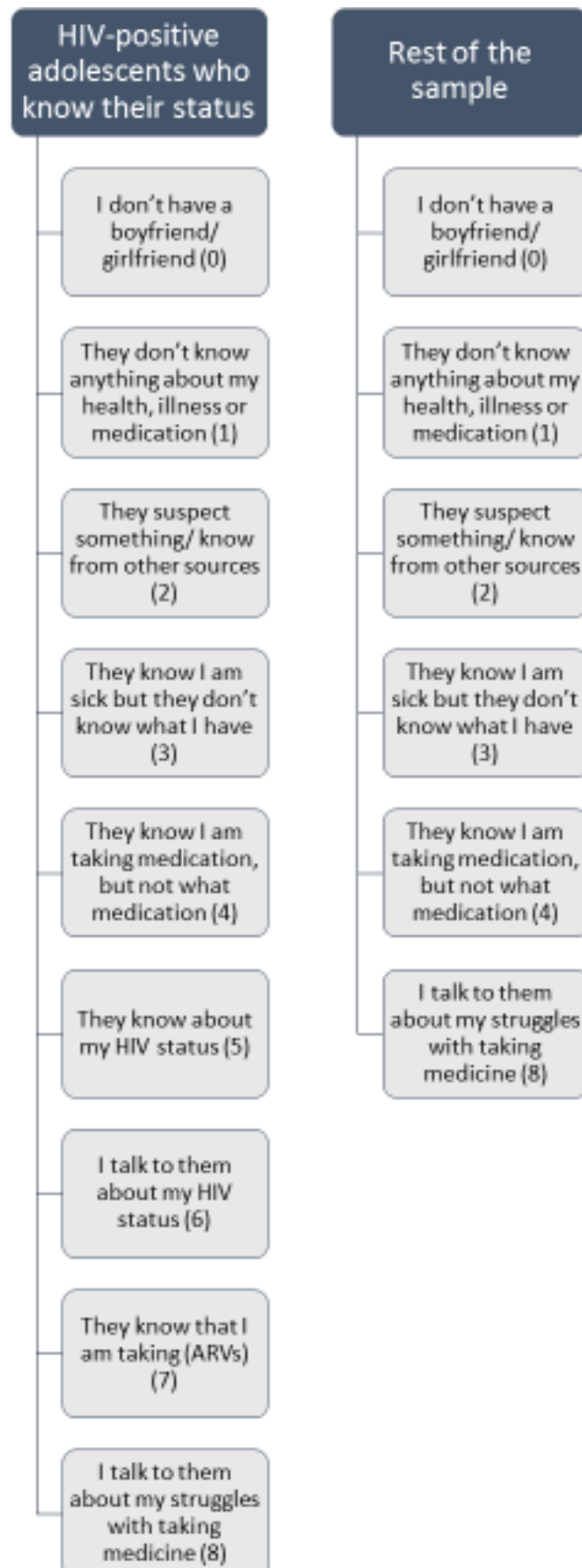
without specific mention of HIV or ART unless the adolescents disclosed this themselves. Those who did not know their HIV-positive status responded to a questionnaire with questions about ‘illness’ and ‘medication’ instead of ‘HIV’ and ‘ART’, respectively.

**Disclosure to partners** was measured by adolescent report using an 8-point gradient of disclosure levels (Figure 1). Levels of disclosure were conceptualised as incremental, based on qualitative literature and piloting with HIV-positive youth (Lam, Naar-king & Wright, 2007; Michaud *et al.*, 2009; Peele *et al.*, 2012). Adolescents who did not know their status were asked if they had told their boyfriend/ girlfriend that they were taking medication. The variable was coded into a binary variable: 1=partner knows adolescent is HIV-positive and/ or taking ARVs, 0=partner does not know.

Participants were asked whether they were in a relationship and whether they knew their *partner’s HIV-status*, with response options: HIV-positive, HIV-negative, or HIV-status unknown. This variable was coded as 1=knows HIV-status of partner is either HIV-positive or HIV-negative, 0=does not know partner HIV-status.

**Socio-demographic characteristics:** Items adapted from the South African census (Statistics South Africa (SSA), 2011) measured key socio-demographic factors such as adolescent age, gender, language, urban/ rural location, and formal/ informal housing, and relationship to primary caregiver. Household poverty was measured through an index measuring lack of eight highest socially-perceived necessities for children, corroborated by >80% of the population in the nationally-representative Social Attitudes Survey (Pillay, Roberts & Rule, 2006). The index included necessities such as shoes and three meals a day. It was dichotomised as 1=lacking at least one basic household necessity and 0=access to all basic household necessities.

**Figure 1: Levels of Disclosure from adolescents to their partners (boyfriend or girlfriend)**



## **2.4. Data analyses**

Analyses were conducted using SPSS22.0. Missing data was minimal (<1%), due to careful in-field data checking and the use of mobile-assisted technology. All analyses compared outcomes between two sub-groups: HIV-positive adolescents who knew their status ('HIV-positive status-aware', n=794) and the rest of sample who were unaware of their status ('status-unaware', n=631). Adolescents who had tested HIV-negative in the last year were excluded from the analyses (n=102).

Quantitative analysis followed a four-stage process. First, socio-demographic frequencies were calculated for the full sample, comparing HIV-positive status-aware adolescents to status-unaware adolescents. Second, chi-square tests compared rates of the different types of disclosure among adolescent girls and boys. Third, multivariate regressions explored associations between safe sex and the three types of HIV-status disclosure, using a sequential approach. Three models were run: one with each type of disclosure (knowledge of own HIV-positive status, sharing HIV-positive status with sexual partners, and knowledge of partner status) added as an independent variable in a multivariate regression model, controlling for age, gender, poverty, rural/urban residence, formal/informal housing type, language, and caregiving arrangement.

Fourth, moderation analyses for gender and each type of disclosure was tested using multivariate regression models. Each type of disclosure and an interaction term with gender were added as independent variables, controlling for age, gender, poverty, rural/urban residence, formal/informal housing type, language, and caregiving arrangement.

## **3. Results**

### **3.1. Socio-demographic characteristics (Table 1)**

Adolescent age ranged from 10-19 years old (mean=13.9, SD=2.9). The sample was 55% female, 96% spoke Xhosa at home. Just over one-fifth lived in rural areas (22%), with 17% living in informal housing (shack in a separate plot or someone's yard). Nearly two thirds (66%) could not afford basic household necessities, including warm clothes, 3 meals a day or medical expenses. About half of the adolescents lived with at least one of their biological caregivers (48%).

## **3.2. Sexual practices of adolescents by knowledge of HIV-positive status (Table 1)**

Just under a third (n=392, 27%) of the full sample reported having a boy/girlfriend, with a third (n=467, 33%) ever having had sex. Among HIV-positive status-aware sexually-active adolescents (n=294), 21% (n=66) had disclosed HIV-positive status or medication-taking to their partner, and nearly a quarter 24.5% (n=72) knew their partner's HIV-status (positive or negative). HIV-positive status-aware adolescents were more likely to be sexually active and in a relationship. Nearly half (44%) of HIV-positive status-aware sexually-active adolescents reported using condom at last intercourse compared to just over a third in the rest of the sample (35.3%,  $p=0.067$ ).

## **3.3. Protective sexual practices and disclosure rates by gender (Table 2)**

Amongst sexually-active adolescents, girls were less likely to report protective sexual practices than adolescent boys (19.7% vs. 76.3%,  $X^2$  (df)=144.4 (1),  $p<.001$ ), more likely to have disclosed to their partner (18.4% vs. 4.0%,  $X^2$  (df)=19.7 (1),  $p<.001$ ), and to know their partner's HIV-status (32.3% vs. 13.9%,  $X^2$  (df)=19.5 (1),  $p<.001$ ).

## **3.4. Associations between type of HIV-status disclosure and safe sex**

There were three main findings regarding associations between type of HIV-status disclosure and protective sexual practices (Table 3). First, in Model 1, knowing one's HIV-positive status was associated with higher likelihood of protective sexual practices (OR1.62 95%CI 1.14-2.32,  $p=.008$ ). In Model 2, disclosing one's HIV-positive status or medication-taking to one's partner was not associated with protective sexual practices (OR0.61 95%CI 0.32-1.16,  $p=0.133$ ). In Model 3, knowledge of a partner's HIV status was associated with a lower likelihood of protective sexual practices (OR0.46 95%CI 0.28-0.74,  $p=0.002$ ). In this final model with all three types of disclosure entered together alongside covariates, knowledge of adolescent's own HIV-positive status remained associated with protective sex in the full sample (OR1.59 95%CI 1.10-

2.30,  $p=0.014$ ), while disclosure of one's HIV-status to partners was not statistically associated with protective sexual practices.

Of potential covariates: age, gender, poverty, rural/ urban residence, formal/ informal housing type, and caregiving arrangements, only age, gender, and poverty remained significantly associated with protective sexual practices. In all regression analyses, older and female adolescents, and those who could not access all eight basic necessities were more likely to report lower rates of protective sexual practices ( $p<0.001$ ,  $p<0.001$ , and  $p=0.016$  respectively). None of the moderation effects between gender and disclosure types were significant (Table 4).

## 4. Discussion

This working paper documents rates of disclosing one's HIV-positive status to partners and knowing partner's HIV-status. A third of HIV-positive status-aware adolescents knew their partner's status, which is comparable to studies among HIV-positive adolescents in Uganda and Tanzania (Mhalu, Leyna & Mmbaga, 2013; Mbalinda *et al.*, 2015; Ankunda, Atuyambe & Kiwanuka, 2016), but lower than that among HIV-positive adolescents in Kenya (Obare *et al.*, 2010). In all but one study, less than half of the adolescents knew their partner's status. Further analyses on HIV-positive adolescents who are in relationships where both partners are aware of each-other's status would provide key insights into sero-sorting practices and the potential risk for passing on HIV to sexual partners.

Just under a fifth of HIV-positive status-aware adolescents in this study had told their partner about their HIV-positive status or ART-taking. This rate was lower than rates reported by four studies among HIV-positive Ugandan and Kenyan adolescents (Obare *et al.*, 2010; Mbalinda *et al.*, 2015; Nöstlinger *et al.*, 2015; Ankunda, Atuyambe & Kiwanuka, 2016). All but one of these studies however report that less than 50% of HIV-positive adolescents in relationships had disclosed their HIV-positive status to their partners suggesting high levels of reluctance to share HIV-positive status among this young population.

The study then quantitatively explored how different types of HIV-status disclosure are associated with safer sexual practices among HIV-positive adolescents. These findings indicate that knowing one's own HIV-positive status was associated with protective sexual practices, but knowing your partner's status was associated with higher likelihood of unprotected sex among this community-traced adolescent cohort in South Africa. No significant associations were found between disclosing your status to your partner and protective sexual

practices. These effects did not differ between girls and boys, though rates of disclosure to partners and knowledge of partner HIV-status were higher among adolescent girls.

Adolescents who knew their HIV-positive status were one and a half times more likely to report protective sexual practices than those who did not know their status, whether HIV-positive or HIV-negative. The findings on patterns of safe sex by disclosure type confirm qualitative evidence from South Africa and Zimbabwe. This qualitative research has found that while knowledge of HIV-positive status has an empowering effect among HIV-positive adolescent girls, knowledge of male sexual partner's HIV-status may trump this positive gain (Zamudio-Haas *et al.*, 2012; Toska *et al.*, 2015). To safeguard their sexual and romantic relationships, adolescents are willing to give up condom use compensating for their self-perceived loss of desirability by being HIV-positive (Hodes & Morrell, 2016).

This paper's findings provide support for UNAIDS' Fast Track targets: knowledge of own HIV-positive status remained strongly associated with protective sexual practices, even when adolescents knew their partner status or disclosed their HIV-positive status to their partners. However, research on *how* knowledge of HIV-positive status supports safe sex, whether through HIV-positive adolescents becoming more cautious in engaging in sex, more convincing in negotiating safe sex, or through self-stigma, avoiding sexual and romantic relationships altogether, remains sparse. This is partly due to the complexity of unbundling pathways between protective mechanisms – both social and clinical – and risk behaviours. Further research is needed to test potential mechanisms to support protective behaviours, to inform interventions among HIV-positive adolescents and at-risk populations.

Among HIV-positive status-aware adolescents, protective sexual practices were not associated with disclosure of their HIV-positive status or medication-taking to a partner. These findings support WHO disclosure guidelines, which recommend that HIV-positive adolescents are counselled on the risks and benefits of disclosure to their partners. This study's findings suggest that guidelines on counselling HIV-positive adolescents should focus on knowledge of own HIV-positive status and promoting safe sex with all sexual partners as the first priority, which may be more valuable than focusing on promoting disclosure to sexual partners or knowledge of partner's HIV status.

Adolescents who knew their partner's status were more than two times less likely to report protective sexual practices, when controlling for potential covariates. These associations may be explained by qualitative research which reports that fear of rejection, exposure and stigma discouraged HIV-positive

adolescents from disclosing to their partners (Zamudio-Haas *et al.*, 2012; Toska *et al.*, 2015). These factors could operate through several mechanisms. For example, HIV-positive status-aware adolescents who knew their partners were HIV-negative may have not felt confident to disclose their HIV-positive status to their partner. In turn, their HIV-negative partner may use their HIV-negative status to justify not needing to use condoms during sex, as suggested by qualitative research within the same study (Toska *et al.*, 2015). Among HIV-positive status-aware adolescents in relationships (n=228), 9.6% (n=22) had HIV-positive partners and 25.9% (n=59) were in sero-discordant relationships. Given the small sub-sample of adolescents in relationships with HIV-positive partners, more complex analyses were not possible using this dataset. Additional analyses are needed to understand how sero-concordance (both adolescent and partner having the same HIV-status) and two-way disclosure (an adolescent who knows their partner's status and has disclosed to their partner) affect safe sexual practices.

The associations between disclosure and protective sexual practices reported in this article raise concerns about the quality of disclosure *from* HIV-positive adolescents to their sexual partners. If disclosure is encouraged, adolescents may require more support in ensuring that this then leads to safer sex. HIV-positive adolescents in two studies from Uganda and South African study reported stronger motivation for contraception use to prevent pregnancy than any other sexually-transmitted infections, including HIV (Birungi *et al.*, 2009; Toska *et al.*, 2015). Focusing on adolescents' motivation to prevent pregnancy and STIs may enable healthcare providers to support adolescent efforts to negotiate safe sex with all partners. These findings suggest that disclosure counselling for HIV-positive adolescents could be enhanced by improving patient confidentiality, by addressing adolescent fears on the dangers of disclosure, and by empowering HIV-positive adolescents to negotiate safer sex.

Sexually-active adolescent girls were more likely to report unprotected sex compared to adolescent boys. Given the high rates of defaulting from antiretroviral treatment for prevention of mother-to-child-transmission during pregnancy among HIV-positive adolescent girls (Fatti *et al.*, 2014), this is an urgent and alarming finding. However, this paper's results highlight the protective effect of knowing one's HIV-positive status in the full sample, even among those who knew their partners HIV-status. Policy and programming must prioritise knowledge of adolescents' own HIV-positive status to ensure that HIV-positive adolescents benefit from the protective effect of HIV-positive status awareness.

The analyses presented here also confirm that poverty – lack of access to basic necessities – is strongly associated with risky sexual practices. Research on

potential factors that mitigate poverty and its negative outcomes – reduced school enrolment, hunger, non-adherence – should be conducted. Further analyses should explore the causal pathways between poverty and unprotected sex among HIV-positive adolescents, particularly girls, in light of their increased vulnerability to onwards HIV transmission and poor sexual and reproductive health outcomes.

This study has several limitations and strengths. First, similar to other studies among adolescents in the region (Birungi *et al.*, 2009; Zamudio-Haas *et al.*, 2012; Toska *et al.*, 2015), rates of self-reported disclosure to sexual partners were very low. These low rates and sub-sample sizes may have limited the statistical power of the analyses included here. Second, the analyses presented here are based on cross-sectional data which limits our ability to draw conclusions about causal relationships and directionality. Third, knowledge of adolescent's own HIV-positive status was dependent on whether the participants felt comfortable disclosing to their interviewers. Though the research team triangulated information from participant, caregivers and healthcare providers, it is likely that some HIV-positive adolescents who knew their status concealed this from interviewers. Fourth, small sub-sample sizes may have affected these findings. For example, it was not possible to conduct separate analyses for whether adolescents reported their sexual partner's HIV-status to be positive or negative due to small sample size. Adolescent boys also reported very low rates of disclosure to partners (4%) and knowledge of partner status (14%). Fifth, some of the study measures, for example, disclosure of HIV-status or medication-taking to a sexual partner, were based on adolescent self-reports and could not be verified. However, the study documented no reasons to expect greater desirability bias for disclosure compared to other self-reported constructs. Sixth, the study was not able to reach 9.1% of the eligible sample, which may exclude particularly vulnerable adolescents from the sample. However, the community-tracing methodology did ensure that adolescents were sampled outside of clinical facilities, and accompanying qualitative research with especially vulnerable adolescents – including severely physically and mentally disabled – helped to include the perspectives of these marginalised groups. It is the only study to include both vertically and horizontally-infected adolescents amongst the HIV-positive sample. Finally, the study was conducted in a health sub-district in South Africa, which limits the generalisability of its findings. However, by choosing a high HIV-prevalent region in the poorest province, it is possible to draw some parallels with other resource-limited settings in the region.



## **5. Conclusion**

Understanding the challenges that adolescents face in learning about their status, disclosing it to sexual partners, and learning about their partner's status are critical to successfully stemming the HIV/AIDS epidemic by 2030. Moreover, understanding sexual risk-taking within sexual partnerships, as behaviours negotiated or imposed not solely by individuals, must be the focus of future research. A greater elucidation of the mechanisms through which different types of disclosure are associated with greater or lower rates of protective sexual practices is necessary to inform practices that support HIV-positive adolescents engage in safe sex.

**Table 1: Sample socio-demographic and relationship characteristics by knowledge of HIV-positive status**

<i>Category</i>	<i>Factor</i>	<i>Knows HIV- positive status (n=794)<sup>1</sup></i>	<i>Rest of the sample (n=631)</i>	<i>Total sample (n=1,425)</i>	<i>p-value</i>
Gender	Female (%)	55.6	44.4	55.2	0.749
Age	Age in years (mean, SD)	14.5 (2.8)	13.2 (2.8)	13.9 (2.9)	≤.001
	15-19 years old (%)	46.3	31.6	39.7	≤.001
Residence	Rural (%)	18.6	25.6	21.6	<b>0.002</b>
Ethnicity	Xhosa (%)	97.1	95.3	96.3	0.091
Housing Type	Informal (%)	18.9	15.4	17.3	0.080
Poverty	Missing any of the basic 8 necessities (%)	68.9	62.0	65.8	<b>0.007</b>
Caregiving arrangement	Living with biological parent (%)	42.6	55.0	48.2	≤.001
Sexual and romantic relationships	Has a boyfriend or girlfriend (%)	28.8	25.4	27.3	0.171
	Ever had intercourse (vaginal or anal) (%)	37.0	26.8	32.5	≤.001
	Sexually active and in a relationship (%)	22.4	16.7	19.9	<b>0.008</b>
<i>Among sexually-active adolescents</i>		<i>Knows HIV- positive status (n=294)</i>	<i>Rest of sample (n=173)</i>	<i>Total sample (n=467)</i>	<i>p-value</i>
<b>Protective sexual practices</b>	Used condoms at last sexual intercourse	43.9	35.3	40.7	0.067
<b>Disclosure</b>	Disclosure of HIV-positive status or ARV/ medication-taking to partner	20.8	-	13.1	n/a
	Knowledge of partner status	24.5	27.2	25.5	0.521

*Notes:* This table includes the results of a series of chi-square tests with knowing one's HIV-positive status as an outcome. The first two columns display proportional percentages within groups, the third column displays proportional percentages between groups. <sup>1</sup> All values displayed are numbers (%) except for age in years which displays mean (SD).

**Table 2: Rates of protective sexual practices by disclosure type and gender among sexually-active adolescents (N=467)**

<i>Disclosure type</i>	<i>Rates of protective sexual practices</i>			
	<i>Girls (n=294)</i>	<i>Boys (n=173)</i>	<i>Total (n=467)</i>	<i>p- value</i>
Total rates of protective sexual practices	19.7	76.3	40.7	<b>≤.001</b>
Knowledge of HIV-positive status	63.9	61.3	63.0	0.563
Disclosure of HIV-positive status or ARV/ medication-taking to partner	18.4	4.0	13.1	<b>≤.001</b>
Knows partner HIV-status (positive or negative)	32.3	13.9	25.5	<b>≤.001</b>

*Notes:* This table includes the results of a series of chi-square tests with knowing one's HIV-positive status as an outcome. The first two columns display proportional percentages within groups, the third column displays proportional percentages between groups.

**Table 3: Regression models of associations between types of disclosure and protective sexual practices amongst all adolescents (n=1,425)**

<i>Variables</i>	<i>Model 1</i>			<i>Model 2</i>			<i>Model 3</i>		
	<i>OR</i>	<i>95%CI</i>	<i>p-value</i>	<i>OR</i>	<i>95%CI</i>	<i>p-value</i>	<i>OR</i>	<i>95%CI</i>	<i>p-value</i>
Age	<b>0.58</b>	<b>0.54-0.62</b>	<b>≤.001</b>	<b>0.59</b>	<b>0.55-0.63</b>	<b>≤.001</b>	<b>0.61</b>	<b>0.56-0.65</b>	<b>≤.001</b>
Gender	<b>0.17</b>	<b>0.12-0.26</b>	<b>≤.001</b>	<b>0.18</b>	<b>0.12-0.26</b>	<b>≤.001</b>	<b>0.18</b>	<b>0.12-0.27</b>	<b>≤.001</b>
Rural residence	0.77	0.52-1.16	0.210	0.78	0.52-1.18	0.238	0.77	0.51-1.15	0.202
Informal housing	0.99	0.64-1.55	0.980	0.98	0.63-1.54	0.942	0.99	0.63-1.55	0.968
Xhosa language	0.65	0.25-1.67	0.371	0.64	0.25-1.65	0.359	0.66	0.26-1.70	0.387
Living with biological caregiver	0.79	0.56-1.11	0.175	0.81	0.57-1.13	0.212	0.81	0.57-1.14	0.226
Poverty	<b>0.63</b>	<b>0.43-0.92</b>	<b>0.016</b>	<b>0.64</b>	<b>0.44-0.93</b>	<b>0.019</b>	<b>0.63</b>	<b>0.43-0.92</b>	<b>0.016</b>
<i>HIV+ status awareness</i>	<b>1.63</b>	<b>1.14-2.32</b>	<b>0.008</b>	<b>1.72</b>	<b>1.20-2.48</b>	<b>0.003</b>	<b>1.59</b>	<b>1.10-2.30</b>	<b>0.014</b>
<i>Disclosure of HIV+ status to partner</i>	Not included			0.61	0.32-1.16	0.133	0.83	0.42-1.65	0.600
<i>Knowledge of partner's status</i>	Not included			Not included			<b>0.46</b>	<b>0.28-0.74</b>	<b>0.002</b>

**Table 4: Regression moderation models of gender for each type of disclosure and protective sexual practices (n=1,425)**

<i>Variables</i>	<i>Model 1</i>			<i>Model 2</i>			<i>Model 3</i>		
	<i>OR</i>	<i>95%CI</i>	<i>p-value</i>	<i>OR</i>	<i>95%CI</i>	<i>p-value</i>	<i>OR</i>	<i>95%CI</i>	<i>p-value</i>
Age	<b>0.61</b>	<b>0.56-0.66</b>	<b>≤.001</b>	<b>0.61</b>	<b>0.56-0.65</b>	<b>≤.001</b>	<b>0.61</b>	<b>0.56-0.65</b>	<b>≤.001</b>
Gender	<b>0.24</b>	<b>0.13-0.42</b>	<b>≤.001</b>	<b>0.18</b>	<b>0.12-0.27</b>	<b>≤.001</b>	<b>0.16</b>	<b>0.10-0.26</b>	<b>≤.001</b>
Rural residence	0.76	0.51-1.15	0.193	0.76	<b>0.51-1.15</b>	<b>0.197</b>	0.77	0.51-1.15	0.199
Informal housing	1.00	0.64-1.57	1.00	0.99	0.63-1.55	0.963	0.99	0.63-1.55	0.956
Xhosa language	0.69	0.27-1.79	0.448	0.65	0.25-1.69	0.381	0.65	0.25-1.67	0.369
Living with biological caregiver	0.82	0.58-1.15	0.254	0.81	0.57-1.14	0.219	0.81	0.57-1.13	0.214
Poverty	<b>0.62</b>	<b>0.43-0.91</b>	<b>0.015</b>	<b>0.62</b>	<b>0.43-0.91</b>	<b>0.015</b>	<b>0.62</b>	<b>0.42-0.91</b>	<b>0.014</b>
<i>HIV+ status awareness</i>	4.00	0.93-17.11	0.062	<b>1.59</b>	<b>1.10-2.31</b>	<b>0.014</b>	<b>1.60</b>	<b>1.11-2.33</b>	<b>0.013</b>
<i>HIV+ status awareness*Gender</i>	0.59	0.26-1.32	0.199	Not included			Not included		
<i>Disclosure of HIV+ status to partner</i>	0.86	0.43-1.72	0.666	0.42	0.01-12.65	0.620	0.81	0.41-1.60	0.51
<i>Disclosure of HIV+ status to partner*Gender</i>	Not included			1.44	0.24-8.61	0.692	Not included		
<i>Knowledge of partner's status</i>	<b>0.45</b>	<b>.27-.73</b>	<b>≤.001</b>	<b>0.46</b>	<b>0.28-0.74</b>	<b>0.002</b>	0.19	0.03-1.12	0.067
<i>Knowledge of partner's status*Gender</i>	Not included			Not included			1.69	0.61-4.63	0.311

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