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# Effect of quality of caregiver-adolescent relationship on sexual debut, transactional sex and on age-disparate relationships among young women in rural South Africa enrolled in HPTN 068

**Nosipho Shangase**[a], **Jess Edwards**[a], **Brian Pence**[a], **Allison Aiello**[a], **Andrea Hussong**[b], **Xavier Gómez-Olivé**[c], **Kathleen Kahn**[c], **Marie Stoner**[d], **Audrey Pettifor**[a,c]

[a]Gillings School of Global Public Health, University of North Carolina, Chapel Hill, NC

[b]Department of Psychology, University of North Carolina, Chapel Hill, NC

[c]MRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt), School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

[d]Women's Global Health Imperative, RTI International, San Francisco, California, USA.

## Abstract

**BACKGROUND:** Adolescent girls and young women (AGYW) remain burdened by the HIV epidemic. Positive caregiver-child relationships are associated with safe sexual behaviors in young people, yet, this literature often highlights the role of parent-child communication and parental monitoring, neglecting the importance of emotional relationships between a caregiver and adolescent.

**SETTING:** We used longitudinal data from HIV Prevention Trial Network 068 – conducted among 2,533 AGYW (13 – 20 years) over a period of 5 years in Agincourt, South Africa.

**METHOD:** Kaplan Meier and Cox models were used to estimate the effect of quality of caregiver-adolescent relationships (caring and closeness) on sexual debut, and log-binomial models with generalized estimating equations were used to examine the relationship between our exposures and transactional sex and age-disparate relationships.

**RESULTS:** Sexual debut was delayed among those who reported high levels of caregiver caring (hazard ratio (HR): 0.80, 95% CI: 0.69, 0.93) and caregiver closeness (HR: 0.80, 95% CI: 0.68, 0.95). AGYW who reported high quality caregiver-adolescent relationships had a lower risk of transactional sex (caring: risk ratio (RR): 0.67, 95% CI: 0.58, 0.78; closeness: RR: 0.58; 95% CI: 0.50, 0.67). Similarly, those with high quality caregiver-adolescent relationships were less likely to be in an age-disparate relationship (caring: RR: 0.68, 95% CI: 0.58, 0.79; closeness: RR: 0.77, 95% CI: 0.66, 0.90).

**Corresponding author details** **Name:** Nosipho Shangase, **Address:** Department of Epidemiology, Gillings School of Global Public Health, The University of North Carolina at Chapel Hill, 2106 McGavran-Greenberg Hall, CB# 7435, Chapel Hill, NC 27599-7435, shangase@email.unc.edu.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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**CONCLUSION:** Findings indicate, high quality caregiver-adolescent relationships are associated with delayed sexual debut, a lower risk of transactional sex and having an older partner. Family-centered interventions are needed to improve relationships between AGYW and caregivers.

### Keywords

adolescent girls and young women; caregiver-adolescent relationships; sexual behaviors; South Africa; transactional sex; age-disparate relationships

## INTRODUCTION

Globally, HIV infections among adolescent girls and young women (AGYW) are 60% higher than among male peers (15 – 24 years)[6]. In sub-Saharan Africa, AGYW remain highly burdened by the HIV epidemic[7,8], accounting for 26% of new HIV infections[9]. Risk behaviors such as early sexual debut, transactional sex and age-disparate relationships increase risk of HIV infection. In South Africa, the mean age for sexual debut (16 years)[10–12] overlaps with the age at which HIV incidence begins to rise. Further, the risk of HIV is elevated in rural communities as rural women tend to report high early sexual debut compared to those in non-rural areas[13]. Moreover, transactional sex and age-disparate relationships often place AGYW in a vulnerable position, in which they are not able to negotiate safe sex practices such as condom use[14,15].

Strengthening caregiver-adolescent relationships may mitigate unsafe sexual behaviors in AGYW[1–3,16]. The ecological theory explains that relationships with family (e.g. parents) influence a person's development over the life course, including behaviors and decision-making skills[17]. Research indicates that high perceptions of a positive caregiver-adolescent relationship are associated with delayed sexual debut[3,18], safe sex[3,18–20] and reduced sexual activity[21]. However, this literature often highlights the role of parent-child communication[2,3,22–25,25–30] and parental monitoring[1–5], and neglects the importance of emotional relationships (caring or closeness) between a caregiver and adolescent. Further, the majority of studies on parent-adolescent relationships and sexual risk use a cross-sectional study design[3,18,19,21,24,31–33]. Therefore, research is needed to bridge the gap by using longitudinal data to provide a better understanding of the influence of caregiver-adolescent relationship on sexual behaviors in South Africa. Exploring the role of protective factors such as caregiver-adolescent relationships could be beneficial to ending the HIV epidemic in sub-Saharan Africa.

We leveraged existing longitudinal data from the HIV Prevention Trial Network (HPTN) 068 study to examine the influence of quality caregiver-adolescent relationships (caring or closeness) on sexual behavior (sexual debut, transactional sex and age-disparate relationships). We hypothesize AGYW who perceive high quality of caregiver caring and closeness have a lower risk of engaging in unsafe sexual behaviors, compared to those who perceive low quality of caregiver caring and closeness.

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# METHODS

## Study sample

Our study utilizes data from the HIV Prevention Trials Network (HPTN) 068 study – a phase III randomized controlled trial – which aimed to assess whether providing cash transfers (conditional on 80% school attendance) to AGYW and their households reduced risk of HIV acquisition among AGYW. The parent study included females aged 13 to 20 years (mean age = 15.5) at enrolment who were: 1) registered for high school in grades 8 – 11; 2) not married; 3) not pregnant; 4) had a parent or guardian in the household; and 5) resided in the Agincourt Health and Demographic Surveillance System (AHDSS) study area. In our analyses, we excluded participants with no follow-up visits after the baseline visit and participants who had HIV infection at baseline.

After the baseline visit ($T_0$), AGYW were seen annually. At each visit AGYW completed an Audio Computer-Assisted Self-Interview (ACASI), and a blood draw for HIV and HSV-2 testing. Parents or guardians completed a Computer Assisted Personal Interview (CAPI) annually. AGYW exited the study upon high school graduation. Follow-up occurred at yearly visits from one to three years after baseline ($T_1$–$T_3$), depending on AGYW's grade at study enrolment. The main study ended in 2015 and a post-study visit was conducted in 2016–2017 ($T_4$).

## Measures or variables

We analyzed the effect of quality of caregiver-adolescent relationships on unsafe sexual behaviors in the prior 12 months. Quality of caregiver-adolescent relationships was measured by asking AGYW their perceptions of their relationship with their primary caregiver (parent or guardian); it was measured at multiple times in the main study ($T_0$–$T_3$) using two measures (caring and closeness). Caregiver caring was captured by asking "how much do you feel that [your caregiver] cares about you?" with possible response options of "very much", "somewhat", or "not at all". For analyses, this question was operationalized as a binary measure by collapsing levels, "somewhat" and "not at all" into one level to avoid sparse data (0 = "not at all" or "somewhat", and 1 = "very much"). Caregiver closeness was captured by asking "how close do you feel to [your caregiver]?" with possible response options of "very close", "somewhat close" and "not at all close". For analyses, this question was operationalized as a binary measure by collapsing "somewhat" and "not at all close" to avoid sparse data (0 = "somewhat close" or "not at all close", and 1= "very close").

We explored three different sexual behavior outcomes: sexual debut, transactional sex and age-disparate relationships in the past 12 months. Sexual debut is a binary variable indicating if a AGYW had "ever had sexual intercourse". We measured time to first report of sexual debut among those who had not yet reported sexual debut by baseline. Transactional sex was defined as a dichotomous, time-varying, variable indicating whether or not a participant reported having sex in exchange for money or gifts at each study visit with any of the 3 most recent partners. AGYW who had never had sex were coded as not engaging in transactional sex. Lastly, age-disparate relationships were defined as a AGYW having a partner 5 years older or more (includes both sexual and non-sexual partners) with any of

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the 3 most recent partners. We chose a 5-year cut-off point to align our study with existing literature on age-disparate relationships[34–37], and we included both sexual and non-sexual partners to account for potential misreporting. Information on sexual behavior was collected by self-report using ACASI, which has been shown to reduce bias and reluctance to respond to sensitive questions[38].

## Statistical analysis

To assess the effect of caregiver-adolescent relationship on sexual debut, we used weighted Kaplan-Meier survival curves and Cox models. In these analyses, we excluded individuals who already reported sexual debut at baseline, and participants were followed from origin until first report of sexual debut while in the study or date of censoring, respectively. Participants were censored if they migrated, were lost-to-follow up, graduated or reached the end the study period. Once an AGYW had a report of sexual debut, she was removed from the risk set at date of her first reported outcome. We used time in years since age 13 as the time scale and AGYW older than 13 at enrolment were considered to be "late entries" (11.17% of the AGYW were 13 years at baseline).

First, we used the complement of the Kaplan-Meier survival function to illustrate how incidence of first report of sexual debut varies by caregiver-adolescent relationship (caring or closeness) over time[39]. Next, we used Cox proportional hazard models to estimate the hazard ratio for the relationship between quality of caregiver-adolescent relationship and first report of sexual debut over the study period. We evaluated the proportional hazards assumption by testing a product term between exposure and time.

To examine the association between caregiver-adolescent caring or closeness and transactional sex and age-disparate relationships over the following 1-year period, we used log-binomial models. We used generalized estimating equations (GEE) with an exchangeable correlation to account for repeated measures over the study period[40]. For all models we used a time lag for the exposures and covariates[40] to determine how quality of caregiver-adolescent relationship at time $t$ affects sexual behavior reported at time $t+1$. For instance, baseline exposure and covariates predicted outcomes at follow-up visit 1.

Directed acyclic graphs (DAGs) were used to identify a minimally sufficient set of confounders for each exposure-outcome relationship. We included the following confounders: age, intervention assignment (cash transfer study arm), socio economic status (SES), orphan status and school. For all models, we used stabilized inverse probability of treatment weights to account for confounding[41]. These weights were created using logistic regression models to estimate each woman's marginal probability of exposure (caring or closeness) (numerator) and also each woman's probability of exposure conditional on confounders over time (denominator). To account for time-varying confounding being affected by prior exposure, we structured weights to be conditional on prior exposure and covariates. Furthermore, in the descriptive analysis we included a measure of depression, which was assessed using the Children's Depression Inventory, and of anxiety that was assessed using the Revised Children's Manifest Anxiety Scale. In our study, less than 10% of AGYW had missing data on exposures or confounders. To address missing data, we carried forward covariate data from the most recent prior visit.

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## RESULTS

From the 2,533 participants enrolled at baseline, we excluded 161 AGYW who either did not have at least one additional ACASI visit post baseline (n=89) or tested positive for HIV at baseline (n=72). In total, 2,372 AGYW were included in this study for the transactional sex and age-disparate relationship analysis cohort. We further excluded 620 participants who had sexually debuted at baseline, resulting in 1,752 AGYW in the sexual debut analysis cohort.

Among the 2,372 AGYW (Table 1), ages ranged from 13 – 20 years (mean = 15.48) and the majority of the participants had positive caregiver-adolescent relationships (78.0% felt their caregiver cares and/or 83.0% felt close to their caregiver). For caregiver caring, the age distribution was slightly different between the comparison groups, those who said “yes” their caregiver cares about them were slightly younger (13 – 15 yrs.: 54.4% vs. 47.4%; 16 – 18 yrs.: 41.9% vs. 43.7%; 19 – 20 yrs.: 3.7% vs. 8.9%). However, for caregiver closeness, the age distribution was similar between the groups.

At baseline, AGYW who felt their caregiver cares about them were less likely to have sexually debuted (23.2% vs. 36.7 %). They were also less likely to have high mean depression scores (2.95 vs. 4.87), engage in transactional sex (2.8% vs. 7.2%), be in age-disparate relationships (4.6% vs. 8.8%), be in a concurrent relationship (39.0% vs. 46.8%), have a sexual partner in last 12 months (23.1% vs. 37.3%), have unprotected sex in last 3 months (6.6% vs. 12.3%), be cohabitating with a partner (15.6% vs. 23.0%) and to ever have been pregnant (7.1% vs. 12.2%). Participants who felt their caregiver cares were more likely to have both parents at home (42.5% vs. 39.6%) compared to those who responded with “somewhat/no”. Further, AGYW who felt their caregiver cares had similar levels of household wealth, CCT intervention arm assignment, orphanhood, and primary caregiver type compared to those who felt their caregiver did not care or somewhat cares. Similar patterns were observed with the second measure of caregiver-adolescent relationships (feels close to caregiver).

The incidence of sexual debut increased with age from 7.3% at age 14 to 72.2% at age 21. Among those who had not sexually debuted at baseline (figure 1), the incidence of sexual debut was lower in the group who said “yes” their caregiver cares about them (median age at sexual debut = 19 years) and compared to the “no/somewhat” group (median age at sexual debut = 18 years). With regards to feels close to caregiver, over time, the risk of sexual debut was lower among those who feel close to their caregivers (median age at sexual debut = 19 years) compared to those who responded with “no/somewhat” when asked if they feel close to their caregivers (median age at sexual debut = 18 years).

In weighted analyses to address confounding, AGYW who felt their caregiver cares about them had a lower hazard of sexual debut (hazard ratio (HR): 0.80, 95% CI: 0.69, 0.93) than AGYW who felt their caregiver did not or somewhat cares about them (Table 2). Similarly, the average hazard for sexual debut over the study period was lower among those who reported feeling close to caregiver (HR: 0.80, 95% CI: 0.68, 0.95) compared to the group who reported feeling not close or somewhat close to their caregiver.

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At baseline, 82 (3.5%) AGYW reported engaging in transactional sex, and 328 (16.7%) had engaged in transactional sex at some point over the study period. On average, the probability of engaging in transactional sex was 10.2% during each 1-year interval over the course of the study. The weighted one-year risk of transactional sex (pooled over the study years) among those who felt their caregiver cares was 10.9%, nearly half the one-year risk among those who reported “no/somewhat” when asked if they think their caregiver cares about them (risk ratio (RR): 0.58; 95% CI: 0.50, 0.67) (Table 3). Additionally, AGYW who reported feeling close to their caregiver had a lower risk of engaging in transactional sex than those who did not report feeling close to their caregiver (RR: 0.67, 95% CI: 0.58, 0.78).

With regards to age-disparate relationships, 5.4% (n = 129) and 23.0% (n = 450) AGYW reported being in an age-disparate relationship at baseline and at the post-study visit, respectively. AGYW (Table 4) who felt their caregiver cares about them were less likely to be in an age-disparate relationship (RR: 0.68, 95% CI: 0.58, 0.79) than those who felt their caregiver did not care or somewhat cared. Similarly, the one-year probability of being engaged in an age-disparate relationship (averaged over the study period) was lower (RR: 0.77, 95% CI: 0.66, 0.90) among those who felt close to their caregiver compared to those who did not feel close or felt somewhat close to their caregiver.

## DISCUSSION

In this longitudinal study of AGYW in rural South Africa, participants who reported having good relationships with their caregivers had a later age at sexual debut, and were significantly less likely to engage in transactional sex and to have older partners. The risk of sexual debut increased with age and was delayed among AGYW with positive caregiver-adolescent relationships. As young women aged in the study and became sexually active, there was also an increase in the number of young women who reported engaging in transactional sex and having older partners.

Our findings support our hypothesis that young women who perceive higher levels of caregiver caring and closeness have a lower risk of engaging in unsafe sexual behaviors, compared to those who perceive lower levels of caregiver caring and closeness. Our findings are consistent with results from prior studies conducted outside of South Africa showing that parent-child caring or closeness is associated with delayed sexual debut[18,42,43]. For instance, a longitudinal study conducted among U.S. young people (≥15 years) living in biologically intact two-parent households found young females who reported father-daughter closeness were less likely to report first sex during the study period compared to those who did not[42]. Our study supports these findings using longitudinal data and adds that positive caregiver-adolescent relationships, inclusive of both parental and non-parental guardians, among AGYW in South Africa is related to a delayed risk of sexual debut.

Further, positive caregiver-adolescent relationships were associated with AGYW’s lower risk of engaging in transactional sex and of age-disparate relationships. Our results align with previous cross-sectional studies that have shown parent-child relationships are associated with lower risk of engaging in unsafe sexual behaviors[18,19,21]. A study among African American males found that parent-child closeness was associated with less

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unprotected sex and fewer sexual partners[19]. Using longitudinal data our study supports the significance of caring relationships between caregivers and adolescents in shaping sexual behaviors such as transactional sex and age-disparate relationships.

Caregiver-adolescent relationships are important for positive development among young people[1–3,16,44]; higher perceptions of positive relationship are closely linked with positive health outcomes. Implicit in caregiver-adolescent relationships is the importance of mattering – which is one's perception that they matter to someone else[45,46]. For adolescents, parents are a fundamental source of mattering[46]; providing a safe space of support and assurance that buffers against the anxiety of being alone[47]. During adolescence mattering can serve as an anchor providing secure and meaningful connections and a "safety net"[46]. Research shows that mattering not only provides personal motivation but it also determines behavior[48] by encouraging behaviors that are accepted or approved by people who matter, thereby preventing unsafe and/or self-destructive behaviors[47].

To our knowledge our study is the first to use longitudinal data to explore the influence of caregiver-adolescent relationships (caring or closeness) on sexual behaviors among AGYW in rural Africa. Some limitations of this study include, the use of data from a randomized controlled trial which might limit generalizability of our results to other populations outside of the study context. At enrollment, all young women were enrolled in school and young women enrolled in school might be different from those who are not enrolled. However, enrolment rates for secondary education or high school are high throughout South Africa[49]. Also, study participants needed to have a parent or guardian in order to be enrolled in the study, therefore, they might have more caregiver support than the general population. Moreover, information on sexual behavior was collected by self-report and might be misreported. However, to minimize bias, interviews were conducted using ACASI, which allowed respondents to privately answer questions while using headphones that read out questions and answers. ACASI has been shown to reduce bias and reluctance to respond to sensitive questions[38]. Therefore, we expect bias in reporting of sexual behaviors was reduced. Lastly, caregiver-child relationships are crucial during the foundational development stages of a child. Unfortunately, we were not able to capture caregiver-child relationships prior to study participation (<13 years). In our study, we were only able to capture caregiver-child relationship among participants between the ages of 13 – 20 years at baseline, and we allowed late entries for AGYW older than 13 years. By allowing late entries we made an assumption that those who were observed from age 13 years accurately represent the experiences of AGYW who would have entered the study later (>13 years). To participate in the main study AGYW needed to be enrolled in school, therefore, those who late entered (>13 years) the study might have a protective factor keeping them in school such as having stronger relationships with their caregivers. From our study, we are not able to fully deduce if quality of caregiver-adolescent relationships is causal or if these relationships are reflective of true causal factors such as parenting or other protective factors. However, interventions targeting AGYW at an early age are needed to help young people navigate adolescence safely. Future research is needed to identify the causal factor and the strongest time point to intervene.

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Our study contributes to the literature by providing stronger evidence for the relationship between caregiver-adolescent relationship and sexual behaviors, more specifically that positive caregiver-adolescent relationships promote safe sexual behaviors. Family-centered interventions such as the Parenting for Lifelong Health (PLH)[50] are needed to build positive caregiver-adolescent relationships. Although PLH was created to address child abuse and to improve positive parenting, it can be tailored to AGYW and their caregivers to improve positive relationships as a HIV prevention strategy.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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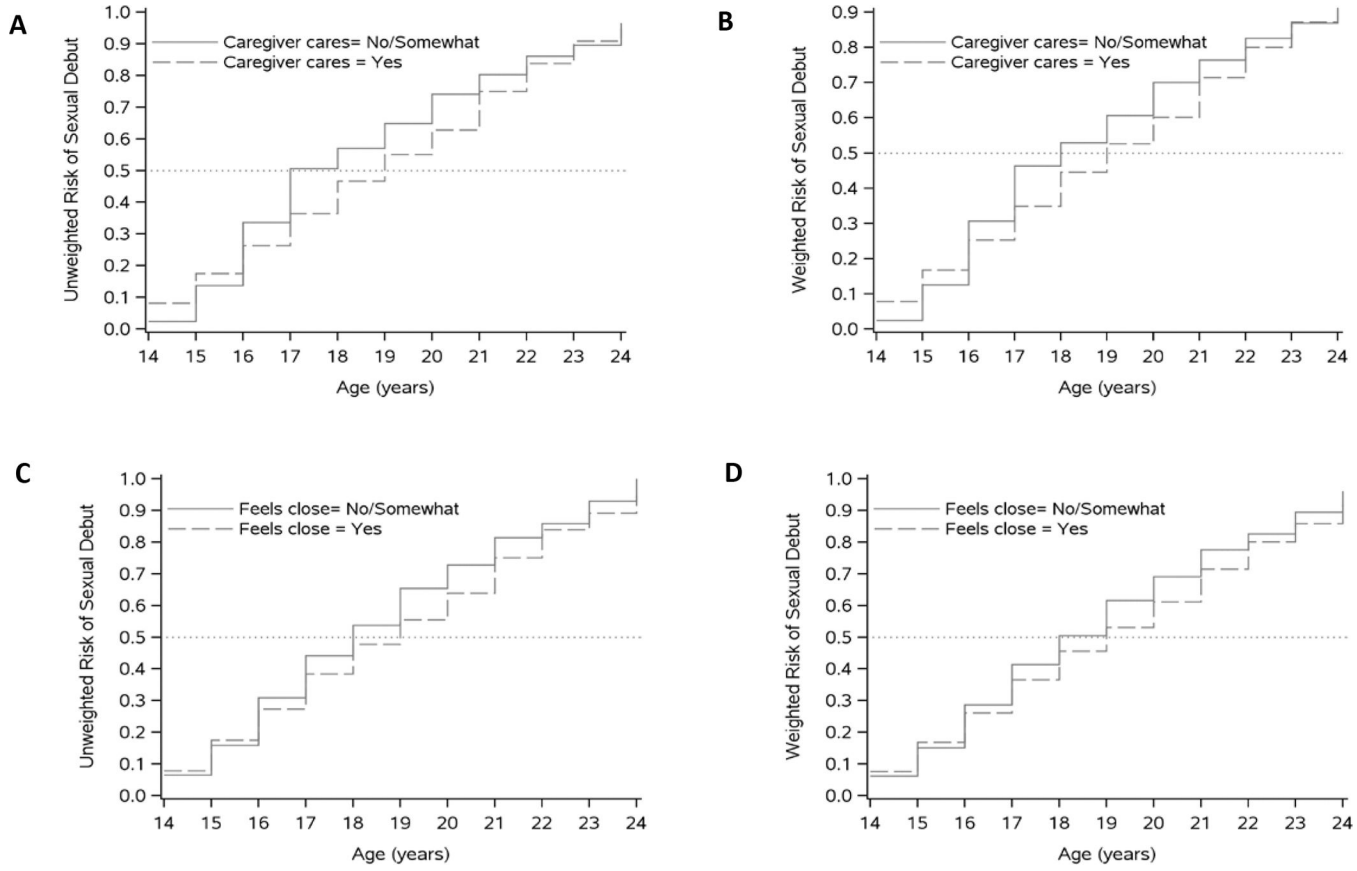



**Figure 1.**

Survival curves for the relationship between caregiver-adolescent relationships and risk of sexual debut among young women enrolled in HPTN 068 (2011–2017). A & C) Unweighted; B & D) Weighted. Adjusted curves weighted for the following covariates: age, CCT treatment arm, orphan status, SES, school. Solid lines represent participants with poor caregiver-adolescent relationships (no/somewhat). Dashed lines represent individuals with positive caregiver-adolescent relationship (yes).

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**Table 1.**

Baseline characteristics of adolescent girls and young women aged 13 to 20 years in Agincourt, South Africa (2011–2012)*

| | Total (N=2,372) | | Caregiver Cares | | | | Feels Close to Caregiver | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Yes (N=1,843) | | No (N=519) | | Yes (N=1,959) | | No (N=402) | |
| | N | % | N | % | N | % | N | % | N | % |
| Age in years, mean (range) | 15.48 (13 – 20) | | 15.40 (13 –20) | | 15.74 (13 – 20) | | 15.48 (13 – 20) | | 15.47 (13 – 20) | |
| 13–15 | 1,262 | 53.20 | 1,008 | 54.69 | 250 | 48.17 | 1,049 | 53.55 | 205 | 51.00 |
| 16–18 | 1,000 | 42.16 | 769 | 41.73 | 226 | 43.55 | 819 | 41.81 | 179 | 44.53 |
| 19–20 | 110 | 4.64 | 66 | 3.58 | 43 | 8.29 | 91 | 4.65 | 18 | 4.48 |
| Randomization arm | 1,214 | 51.18 | 934 | 50.68 | 276 | 53.18 | 989 | 50.48 | 219 | 54.48 |
| Household wealth (assets) | | | | | | | | | | |
| Low | 600 | 25.34 | 438 | 23.80 | 156 | 30.12 | 479 | 24.49 | 117 | 29.18 |
| Middle to Low | 627 | 26.48 | 503 | 27.34 | 123 | 23.75 | 516 | 26.38 | 108 | 26.93 |
| Middle | 580 | 24.49 | 445 | 24.18 | 134 | 25.87 | 481 | 24.59 | 98 | 24.44 |
| High | 561 | 23.69 | 454 | 24.67 | 105 | 20.27 | 480 | 24.54 | 78 | 19.45 |
| Children’s depression inventory, mean (range) | 3.38 (0 – 16) | | 2.95 (0 – 16) | | 4.87 (0 – 16) | | 3.12 (0 – 15) | | 4.63 (0. – 16) | |
| Children’s manifest anxiety, mean (range) | 4.49 (0 – 14) | | 4.29 (0 – 14) | | 5.20 (0 – 14) | | 4.31 (0 – 14) | | 5.38 (0 – 14) | 87.44 |
| Engaged in Transactional sex | 82 | 3.69 | 48 | 2.76 | 34 | 7.19 | 64 | 3.49 | 18 | 4.83 |
| Sexually debuted | 620 | 26.12 | 428 | 23.19 | 191 | 36.66 | 501 | 25.55 | 119 | 29.46 |
| Engaged in age-disparate relationship | 129 | 5.53 | 83 | 4.57 | 45 | 8.82 | 98 | 5.08 | 30 | 7.61 |
| Involved in concurrent relationship | 236 | 41.62 | 153 | 39.03 | 81 | 46.82 | 175 | 38.21 | 60 | 55.56 |
| Had sexual partner(s) in last 12 months | 615 | 26.29 | 421 | 23.14 | 190 | 37.25 | 497 | 25.67 | 115 | 29.34 |
| Had unprotected sex in last 3 months | 185 | 7.86 | 121 | 6.6 | 63 | 12.3 | 144 | 7.4 | 40 | 10.1 |
| Living with partner (yes) | 105 | 17.77 | 63 | 15.56 | 42 | 22.95 | 85 | 16.04 | 31 | 24.6 |
| Ever pregnant (yes) | 193 | 8.23 | 130 | 7.12 | 62 | 12.16 | 154 | 7.95 | 38 | 9.52 |
| Single or double orphan (yes) | 710 | 29.93 | 537 | 29.14 | 172 | 33.14 | 578 | 29.5 | 130 | 32.34 |
| Parent at home | | | | | | | | | | |
| Both parent | 863 | 41.75 | 684 | 42.54 | 178 | 39.64 | 736 | 43.29 | 126 | 35.39 |
| Neither or one parent | 1,204 | 58.25 | 924 | 57.46 | 271 | 60.36 | 964 | 56.71 | 230 | 64.61 |
| Primary caregiver | | | | | | | | | | |

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| | Total (N=2,372) | | Caregiver Cares | | | | Feels Close to Caregiver | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Yes (N=1,843) | | No (N=519) | | Yes (N=1,959) | | No (N=402) | |
| | N | % | N | % | N | % | N | % | N | % |
| Mother or father | 1,769 | 74.58 | 1,375 | 74.61 | 389 | 74.95 | 1,464 | 74.73 | 297 | 73.88 |
| Non-parent (caregiver) | 603 | 25.42 | 468 | 25.39 | 130 | 25.05 | 495 | 25.27 | 105 | 26.12 |

[*] Missing at baseline: caregiver cares N=10; close to caregiver N=11; SES N = 4; depressive symptoms N=113; anxiety N =33; transactional sex N=152; sexual debut N=3; age-disparate relationship N=38; concurrency N=1805; had sexual partner in last 12 months N=33; unprotected sex N=18; live with partner N=1,781; pregnant N=26; parent at home N=305. Prevalent HIV cases were excluded

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**Table 2.**

Hazard ratios for the effect of quality of caregiver-adolescent relationship on sexual debut among adolescent girls and young women enrolled in HTPN 068 (2011 to 2017)

| | | | Unadjusted | | Weighted | |
|---|---|---|---|---|---|---|
| | Number of events | Person-years of follow-up | Hazard Ratio | (95% CI) | Hazard Ratio | (95% CI) |
| **Caregiver-adolescent connectedness** | | | | | | |
| Yes | 793 | 6,494 | 0.80 | (0.69, 0.93) | 0.80 | (0.68, 0.93) |
| No | 223 | 1,657 | 1 | - | 1 | - |
| **Caregiver-adolescent closeness** | | | | | | |
| Yes | 844 | 6,800 | 0.80 | (0.68, 0.94) | 0.80 | (0.68, 0.95) |
| No | 174 | 1,345 | 1 | - | 1 | - |

CI= robust confidence intervals. Adjusted models conditioned on: age, CCT intervention, orphan status, SES, school.

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**Table 3.**

Unadjusted and weighted risk ratios (RR) and 95% confidence intervals (CI) for the effect of quality of caregiver-adolescent relationship on transactional sex in HPTN 068 (2011 To 2017)

| | Unadjusted | | | Weighted | | |
|---|---|---|---|---|---|---|
| | **R (%)** | **RR** | **(95% CI)** | **R (%)** | **RR** | **(95% CI)** |
| **Caregiver-adolescent connectedness** | | | | | | |
| Yes | 10.38 | 0.53 | (0.46, 0.61) | 10.94 | 0.58 | (0.50, 0.67) |
| No/Somewhat | 19.57 | 1 | - | 18.86 | 1 | - |
| **Caregiver-adolescent closeness** | | | | | | |
| Yes | 11.35 | 0.64 | (0.55, 0.75) | 11.51 | 0.67 | (0.58, 0.78) |
| No/Somewhat | 17.70 | 1 | - | 17.11 | 1 | - |

CI= confidence intervals. R= risk. RR= risk ratio. Adjusted models conditioned on: age, CCT intervention, orphan status, SES.

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**Table 4.**

Unadjusted and weighted risk ratios (RR) and 95% confidence intervals (CI) for the effect of quality of caregiver-adolescent relationship on age-disparate relationships in HPTN 068 (2011 To 2017)

| | Unadjusted | | | Weighted | | |
|---|---|---|---|---|---|---|
| | **R (%)** | **RR** | **(95% CI)** | **R (%)** | **RR** | **(95% CI)** |
| **Caregiver-adolescent connectedness** | | | | | | |
| Yes | 10.97 | 0.63 | (0.55, 0.73) | 11.42 | 0.68 | (0.58, 0.79) |
| No/Somewhat | 17.41 | 1 | - | 16.86 | 1 | - |
| **Caregiver-adolescent closeness** | | | | | | |
| Yes | 11.67 | 0.73 | (0.63, 0.85) | 11.83 | 0.77 | (0.66, 0.90) |
| No/Somewhat | 15.99 | 1 | | 15.31 | 1 | |

CI= confidence intervals. R= risk. RR= risk ratio. Adjusted models conditioned on: age, CCT intervention, orphan status, school