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Publication Details

Stoner, M. C. D., Edwards, J. K., Miller, W. C., Aiello, A. E., Halpern, C. T., Julien, A., Selin, A., Hughes, J., Wang, J. P., Gomez-Olive, F. X., Wagner, R. G., MacPhail, C., Kahn, K. & Pettifor, A. (2017). Effect of schooling on age-disparate relationships and number of sexual partners among young women in rural South Africa enrolled in HPTN 068. *JAIDS: Journal of Acquired Immune Deficiency Syndromes*, 76 (5), e107-e114.

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Abstract

Background:

Attending school may have a strong preventative association with sexually transmitted infections among young women, but the mechanism for this relationship is unknown. One hypothesis is that students who attend school practice safer sex with fewer partners, establishing safer sexual networks that make them less exposed to infection.

Setting:

We used longitudinal data from a randomized controlled trial of young women aged 13–20 years in the Bushbuckridge district, South Africa, to determine whether the percentage of school days attended, school dropout, and grade repetition are associated with having a partner 5 or more years older (age-disparate) and with the number of sexual partners in the previous 12 months.

Methods:

Risks of having an age-disparate relationship and number of sexual partners were compared using inverse probability of exposure weighted Poisson regression models. Generalized estimating equations were used to account for repeated measures.

Results:

Young women who attended fewer school days (<80%) and who dropped out of school were more likely to have an age-disparate relationship (risk difference 9.9%, 95% confidence interval [CI]: 3.9% to 16.0%; risk difference (%) dropout 17.2%, 95% CI: 5.4% to 29.0%) and those who dropped out reported having fewer partners (count difference dropout 0.343, 95% CI: 0.192 to 0.495). Grade repetition was not associated with either behavior.

Conclusion:

Young women who less frequently attend school or who drop out are more likely to have an age-disparate relationship. Young women who drop out have overall more partners. These behaviors may increase the risk of exposure to HIV infection in young women out of school.

Keywords

schooling, enrolled, age-disparate, relationships, hptn, number, sexual, effect, partners, 068, among, young, women, rural, south, africa

Disciplines

Education | Social and Behavioral Sciences

Publication Details

Stoner, M. C. D., Edwards, J. K., Miller, W. C., Aiello, A. E., Halpern, C. T., Julien, A., Selin, A., Hughes, J., Wang, J. P., Gomez-Olive, F. X., Wagner, R. G., MacPhail, C., Kahn, K. & Pettifor, A. (2017). Effect of schooling on age-disparate relationships and number of sexual partners among young women in rural South Africa enrolled in HPTN 068. *JAIDS: Journal of Acquired Immune Deficiency Syndromes*, 76 (5), e107-e114.

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Effect of Schooling on Age-Disparate Relationships and Number of Sexual Partners Among Young Women in Rural South Africa Enrolled in HPTN 068

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Received for publication March 27, 2017; accepted August 30, 2017.

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Supported by grant T32 5T32AI007001 from National Institutes of Health. Funding support for the HPTN was provided by the National Institute of Allergy and Infectious Diseases (NIAID), the National Institute of Mental Health (NIMH), and the National Institute on Drug Abuse (NIDA) of the National Institutes of Health (NIH); award numbers UM1AI068619 (HPTN Leadership and Operations Center), UM1AI068617 (HPTN Statistical and Data Management Center), and UM1AI068613 (HPTN Laboratory Center). The study was also funded under R01MH087118 and R24 HD050924 to the Carolina Population Center. Additional funding was provided by the Division of Intramural Research, NIAID, and NIH. The Agincourt Health and Socio-Demographic Surveillance System is supported by the School of Public Health University of the Witwatersrand and Medical Research Council, South Africa, and the UK Wellcome Trust (grants 058893/Z/99/A; 069683/Z/02/Z; 085477/Z/08/Z; and 085477/B/08/Z). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Presented at International AIDS Society (IAS) conference 2017; July 23–26, 2017; Paris, France.

The authors have no conflicts of interest to disclose.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.jaids.com).

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Setting: We used longitudinal data from a randomized controlled trial of young women aged 13–20 years in the Bushbuckridge district, South Africa, to determine whether the percentage of school days attended, school dropout, and grade repetition are associated with having a partner 5 or more years older (age-disparate) and with the number of sexual partners in the previous 12 months.

Methods: Risks of having an age-disparate relationship and number of sexual partners were compared using inverse probability of exposure weighted Poisson regression models. Generalized estimating equations were used to account for repeated measures.

Results: Young women who attended fewer school days (<80%) and who dropped out of school were more likely to have an age-disparate relationship (risk difference 9.9%, 95% confidence interval [CI]: 3.9% to 16.0%; risk difference (%) dropout 17.2%, 95% CI: 5.4% to 29.0%) and those who dropped out reported having fewer partners (count difference dropout 0.343, 95% CI: 0.192 to 0.495). Grade repetition was not associated with either behavior.

Conclusion: Young women who less frequently attend school or who drop out are more likely to have an age-disparate relationship. Young women who drop out have overall more partners. These behaviors may increase the risk of exposure to HIV infection in young women out of school.

Key Words: HIV, sexual risk behaviors, schooling, young women, South Africa

(*J Acquir Immune Defic Syndr* 2017;76:e107–e114)

INTRODUCTION

An estimated 5.4 million young people aged 15–24 years are living with HIV, accounting for 15% of the total burden of persons living with HIV worldwide.¹ In South Africa, the prevalence of HIV among persons of this age group is 7.1% and is 3–4 times higher in young women compared with young

men.^{1–3} Attending school may protect against sexually transmitted infections (STIs) including HIV,^{4–8} but the mechanism for this relationship is unclear. One hypothesis is that students who attend school are engaged in safer sexual networks with lower exposure to STIs.^{5,9} Compared with young women who do not attend school, girls who are in school may have fewer lifetime partners^{5,10,11} and fewer partners older than themselves.^{5,12,13} Evidence is lacking about young women who repeat grades, but we would expect them to have younger partners and safer networks if they remain in school. But to date, a temporal relationship between school attendance, grade repetition, and school dropout with sexual behaviors has not been established.^{5,10–12,14} Given that attending school has a strong preventative association with HIV acquisition in young women, a better understanding of the sexual behaviors affected by attending school would provide clarity on how to reduce transmission in this population.

This analysis uses longitudinal data from a randomized control trial (RCT) to determine whether the percentage of school days attended over the past year, school dropout, and grade repetition affect the probability of having an age-disparate relationship and number of partners among high school girls in rural South Africa. We hypothesize that young women who do not drop out of school and who attend school more frequently will have fewer partners and partners closer to their own age compared with girls who attend less school, and that young women who repeat grades will have a similar risk to those who do not repeat.

METHODS

Study Sample

This study analyzes data from the HIV Prevention Trials Network (HPTN) 068 study, a phase III RCT, to establish whether providing cash transfers, conditional on school attendance, reduced young women's risk of HIV acquisition.¹⁵ The study included 2533 young women aged 13–20 years who were registered in high school in grades 8–11 at enrollment within the rural Bushbuckridge subdistrict of Mpumalanga province, South Africa. Potential participants were excluded if they were pregnant or married at enrollment, or if they did not have a parent or guardian in the household. However, young women who became pregnant, married, or who dropped out of school during the study were not excluded. We further excluded participants who did not have at least 1 follow-up visit after baseline.

Young women were seen annually from baseline until study completion or graduation from high school, whichever came first. Each annual study visit included an audio computer-assisted self-interview (ACASI), as well as HIV and herpes simplex virus type 2 testing for those who were not positive at the previous visit. Up to 4 assessments of the young women and their parent/legal guardians were conducted from 2010 to 2015; the first one at baseline and then every 12 months thereafter. Participant attrition was minimal.¹⁶ In addition, school attendance records were collected from all schools, where the young women were registered during the study period. For this study, we used data from February, May, and August when all

participants (intervention and control) had school attendance data available and because these months were representative of normal attendance (no holidays or examinations).

Measures/Variables

We estimated the effect of school attendance and dropout on the probability of having an age-disparate relationship and number of sexual partners. Age disparity was defined as a young woman having at least 1 sexual or nonsexual partner 5 or more years older than herself at each follow-up visit. Partners with whom there is no reported sexual relationship were included to account for potential misreporting about sexual behaviors. Five years was selected as the cutoff to capture partners who are out of school and conceptually in a higher HIV prevalence pool. Young women who did not have a partner were coded as not having an age-disparate relationship. The number of sexual partners was defined as a time-varying count variable indicating the self-reported number of sexual partners in the past 12 months at each follow-up visit. Young women who had not had sex were defined as having 0 sexual partners in the past 12 months. All sexual behaviors were self-reported.

School attendance and school dropout were constructed using high school attendance registers. We expect school registers to be more accurate in our study because they were closely monitored during the trial. School attendance was defined as the average percentage of days attended out of the total number of days in February, May, and August between yearly follow-up visits. Attendance was dichotomized as high ($\geq 80\%$ of school days) versus low ($< 80\%$ of school days) attendance with those who dropped out and coded as having 0% attendance. The 80% cutoff was chosen as the original cash transfer trial provided the intervention based on this cutoff and to set a reasonable target to which to increase attendance. The original intervention did not have an impact on incident infection or school attendance.¹⁶ For further comparison, school attendance was also categorized as fewer than 50% of school days, 50%–80%, and 80% or more school days. School dropout was defined as having dropped out of school in any month between surveys (even if they returned later). Reasons for dropout and low attendance were examined using self-reported ACASI data instead of attendance records, as more detailed information was available in the ACASI survey.

We used the outcome variables from the follow-up visit after the covariates and at the end of the exposure period to determine how attendance affects behavior at the next visit. However, attendance data were averaged over the year between follow-up visits and could have overlapped with sexual behavior questions that were asked retrospectively about that same year. An additional sensitivity analysis was conducted to explore how assumptions about temporality would affect findings. We used attendance between surveys to predict the outcomes 2 visits later, controlling for confounders before attendance. For example, attendance from baseline to follow-up visit 1 was the independent variable, whereas number of partners at visit 2 was the dependent variable, controlling for confounders at baseline.

Statistical Analysis

Although young women could return after dropout, incidence of second dropout after returning to school was low in the study. Therefore, we used Kaplan–Meier curves to descriptively examine cumulative incidence of first dropout by time in years since age 13, and time in years since enrollment in the study. Young women who were older than 13 years at study enrollment were treated as late entries. In our descriptive analysis of time to first dropout, young women were removed from the risk set if they dropped out and censored at the visit before moving, graduation, study completion, or loss to follow-up.

Risks of having an age-disparate relationship and number of sexual partners were compared using Poisson regression models. To compare the risks of having an age-disparate relationship between exposure groups, we used Poisson models with a log or identity link function to estimate risk ratios or risk differences (RDs), respectively.¹⁷ The Poisson model was used to approximate the binomial model.^{18,19} To compare the counts of partners between exposure groups, we used Poisson models with log or identity link functions to estimate count ratios and count differences (CDs).²⁰ Generalized estimating equations with an exchangeable correlation matrix and robust variances were used to create 95% confidence intervals (CIs) that accounted for repeated measures over the study period and for clustering within schools.²¹

We identified a minimally sufficient set of confounders using directed acyclic graphs for each exposure–outcome relationship. Confounders included age, intervention assignment, orphan status, alcohol use, depression, anxiety, pregnancy, and socioeconomic status. Prior age-disparate relationship was included in the weights for age-disparate relationship, and prior partner number was included for number of partners in the past 12 months. Potential confounders that were examined but not included were school, grade repetition, and parental monitoring. Inverse probability of exposure weights were used to adjust for time-varying confounding.²² For each binary exposure [dropout (yes/no), grade repetition (yes/no) and attendance (high/low)], the denominator of the weights was estimated using a logistic regression model for the exposure of interest conditional on all confounders. To estimate weights for attendance as 3 categories, we used a pooled logistic regression model conditional on all confounders. To improve efficiency of our estimates, weights were stabilized by the marginal probability of exposure.

We also examined effect measure modification of the relationship between school attendance and partner age difference by time-varying age of the young woman. Young women aged over the study period to age 23. Stratified estimates were examined to determine whether the magnitude of the association varied across strata of young women's ages (13–14 years, 15–16 years, 17–18 years, and 19–23 years).

RESULTS

Of 2533 young women included in the parent study, 163 were excluded because they did not have at least 1 additional ACASI visit after baseline. A total of 2360 young women were included in our analysis cohort, of which 6.1% (N = 144) ever dropped out of school during the study period.

Approximately 14% (N = 20) of those who dropped out returned to school, and 10.0% (N = 2) of those who returned dropped out a second time. Roughly 4% (N = 97) attended less than 80% of school days from baseline to the first follow-up visit. Young women who attended more school ($\geq 80\%$ of school days) from baseline to the first follow-up were less likely at baseline to have repeated a grade (33.4% vs. 53.6%), be in the intervention arm (52.0% vs. 67.0%), use any alcohol (8.4% vs. 16.5%), ever been pregnant (8.0% vs. 16.7%), or ever had sex (25.5% vs. 46.4%) (Table 1). Young women with low attendance had a similar level of wealth, mother's educational level, parental monitoring, orphanhood, and unprotected sex compared with young women with high attendance.

The average percentage of days not attended each month increased over the study period from 2.1% in May 2011 to 11.1% in August 2014 and was similar by study arm. Cumulative incidence of first dropout increased over the study period from baseline, when all young women were enrolled, to 12.0% at the end of the study period (Fig. 1). When looking at cumulative incidence over time since age 13 years, the risk of dropout increased from 0% in those age 13 years to 27.8% in girls 8 years older at the age of 21 years but was similar by intervention arm. The most common reason that young women reported for dropping out of school was that they were pregnant or had a child (N = 66; 43.7%). Other common reasons were that they were sick or disabled (N = 19; 12.6%) or not doing well in school (N = 18; 11.9%). The most common reasons reported for not attending school were being sick or disabled (N = 1664; 77.0%), other (N = 158; 7.3%), having to help at home (93, 4.3%), or being pregnant or having a child (N = 89; 4.1%). The main reason for attending school was to get a job in the future (N = 1814; 76.5%).

Over the study period, out of 4993 women visits, 8.0% (N = 397) of women reported having an age-disparate relationship, and the median number of partners in the past 12 months was 0 (interquartile range = 0–1). The weighted risk of having an age-disparate relationship was 17.8% in young women with low attendance compared with 7.8% in young women with high attendance (Table 2). Young women who attended fewer than 80% of school days had a 9.9% higher 1-year risk (95% CI: 3.9% to 16.0%) of having an age-disparate relationship compared with young women who attended 80% or more school days, accounting for confounding. The weighted effect was similar for those attending fewer than 50% but not as strong in those attending 50%–80% of school days. The weighted risk of having an age-disparate relationship for young women who dropped out was 25.2% compared with 8.0% in young women who did not drop out. Young women who dropped out of school had a higher 1-year risk of having an age-disparate relationship (RD: 17.2%; 95% CI: 5.4% to 29.0%), but young women who repeated a grade had a similar 1-year risk compared with those who did not drop out (RD: –0.2%; 95% CI: –2.0% to 1.6%), accounting for confounding.

Results for the weighted effect of school attendance, school dropout, and grade repetition on number of sexual partners were similar to patterns observed for age disparity

TABLE 1. Baseline Characteristics of Young Women Aged 13 to 20 by Average School Attendance From Baseline to Visit 1 in Agincourt, South Africa From March 2011 to December 2012 (N = 2360)*

	Average School Attendance From Baseline to Visit 1					
	Low (<80%) (N = 97)		High (≥80%) (N = 2263)		Total (N = 2360)	
	N (%)	Median (IQR)	N (%)	Median (IQR)	N (%)	Median (IQR)
Young women's age at baseline, yr		16 (15–17)		15 (14–17)		15 (14–17)
Age 13–14	20 (20.6)		730 (32.3)		750 (31.8)	
Age 15–16	38 (39.2)		965 (42.6)		1003 (42.5)	
Age 17–18	26 (26.8)		477 (21.1)		503 (21.3)	
Age 19–20	13 (13.4)		91 (4.0)		104 (4.4)	
Household wealth (assets)						
Low	28 (28.9)		578 (25.6)		606 (25.7)	
Middle to low	26 (26.8)		605 (26.8)		631 (26.8)	
Middle	19 (19.6)		547 (24.2)		566 (24.0)	
High	24 (24.7)		529 (23.4)		553 (23.5)	
Intervention arm	65 (67.0)		1177 (52.0)		1242 (52.6)	
Ever repeated a grade	52 (53.6)		756 (33.4)		808 (34.2)	
Any alcohol use	16 (16.5)		189 (8.4)		205 (8.7)	
Children's depression index score		4 (1–8)		2 (1–5)		2 (1–5)
Children's manifest anxiety score		5 (2–8)		4 (1–7)		4 (1–7)
Ever pregnant	16 (16.7)		180 (8.0)		196 (8.4)	
Age-disparate relationship	16 (16.5)		123 (5.4)		139 (5.9)	
Ever had sex	45 (46.4)		577 (25.5)		622 (26.4)	
Any unprotected sex in the past 3 mo	11 (12.2)		161 (7.6)		172 (7.7)	
Single or double orphan	33 (35.1)		603 (28.0)		636 (28.3)	
Parent/guardian monitoring score		10 (8–12)		10 (7–12)		10 (8–12)
Mother's educational level						
No school	16 (17.8)		378 (18.2)		294 (18.2)	
Some primary	20 (22.2)		416 (20.0)		436 (20.1)	
Completed primary	7 (7.8)		93 (4.5)		100 (4.6)	
Some high school	26 (28.9)		617 (29.7)		643 (29.7)	
Completed high school	16 (17.8)		496 (23.9)		512 (23.6)	
University or technical school	5 (5.6)		77 (3.7)		82 (3.8)	

*Missing at baseline: school attendance N = 10; wealth N = 4; alcohol use N = 3; depression N = 107; anxiety N = 33; ever pregnant N = 27; ever had sex N = 3; unprotected sex N = 139; single or double orphan N = 109; parental monitoring N = 40; mother's educational level N = 205.
IQR, interquartile range.

(Table 3). The weighted mean number of partners in the past 12 months was 0.44 among women with high attendance compared with 0.60 among those with low attendance. Young

women who attended fewer than 80% of school days had 0.079 more partners (95% CI: −0.24 to 0.182) compared with young women who attended 80% or more school days over

TABLE 2. Unweighted and Weighted Risks, Risk Ratios (RRs), RDs, and 95% CIs for the Effect of School Attendance, School Dropout, and Grade Repetition on the Probability of Having an Age-Disparate Relationship in HPTN 068 From 2011 to 2015*

	Unweighted			Weighted		
	Risk (%)	RR (95% CI)	RD (%; 95% CI)	Risk (%)	RR (95% CI)	RD (%; 95% CI)
School attendance-binary*						
Low	22.7	3.04 (2.34 to 3.94)	15.2 (9.8 to 20.7)	17.8	2.28 (1.59 to 3.23)	9.9 (3.9 to 16.0)
High	7.5	1	0	7.8	1	0
School attendance-categorical†						
<50 percent	24.9	3.34 (2.38 to 4.68)	17.4 (9.5 to 25.5)	19.6	2.32 (1.16 to 4.63)	11.8 (2.7 to 20.8)
50%–80%	20.9	2.80 (1.97 to 3.98)	13.4 (6.4 to 20.5)	18.3	2.49 (1.55 to 3.98)	10.4 (−2.2 to 22.9)
≥80%	7.5	1	0	7.9	1	1
School dropout‡						
Yes	27.3	3.62 (2.75 to 4.77)	19.8 (12.8 to 26.8)	25.2	3.17 (1.96 to 5.10)	17.2 (5.4 to 29.0)
No	7.5	1	0	8.0	1	0
Grade repetition‡						
Yes	10.6	1.52 (1.24 to 1.87)	3.6 (1.8 to 5.5)	6.8	0.97 (0.74 to 1.26)	−0.2 (−2.0 to 1.6)
No	7.0	1	0	7.0	1	0

*No. cases/exposed of 4942 visits: attendance low N = 61/240, high N = 333/4702; <50% N = 30/107, 50–80% N = 31/133, ≥80% N = 333/4702; dropout yes N = 50/158, no N = 342/4776; grade repetition yes N = 189/1811, no N = 208/3184.

†Controlled for confounding using inverse probability of treatments weights including age, intervention assignment, orphan status, socioeconomic status, alcohol use, depression, anxiety, and previous age-disparate relationship.

‡Grade repetition-weighted for age, alcohol use, depression, anxiety, orphan status, pregnancy, school, intervention assignment, and previous age-disparate relationship.

a 1-year period, accounting for confounding. No difference in outcomes was observed when comparing attendance categories of less than 50% and 50%–80% of school days. Young women who dropped out of school had 0.343 more partners (95% CI: 0.192 to 0.495) compared with those who did not drop out, whereas young women who repeated a grade had a similar 1-year count of partners compared with those who did not (CD: −0.006; 95% CI: −0.060 to 0.049).

When stratified by age, the percentage with an age-disparate relationship was higher for young women who were

aged 19–23 years (N = 44, 16.4%) and 17–18 years (N = 166, 12.0%) than those aged 15–16 years (N = 151, 6.4%) and 13–14 years (N = 36, 3.7%). Young women who had low attendance in school (<80%) had a higher risk of having an age-disparate relationship among the 13–14 (RD 22.7%; 95% CI: 2.4% to 43.0%) and 17–18 year olds (RD 16.7%; 95% CI: 5.9% to 27.5%), accounting for confounding (Table 4). The weighted effect of attending school on age disparity was slightly reduced among the 15–16-year-old age group (RD 2.3%; 95% CI: −4.7% to 9.3%) and the 19–23-year-old age

TABLE 3. Unweighted and Weighted Count Ratios (CRs), CDs, and 95% CIs for The Effect of School Attendance, School Dropout, and Grade Repetition on Number of Sexual Partners in HPTN 068 From 2011 to 2015*

	Unweighted			Weighted		
	Mean	CR (95% CI)	CD (95% CI)	Mean	CR (95% CI)	CD (95% CI)
School attendance-binary†						
Low	0.661	1.69 (1.43 to 2.01)	0.271 (0.161 to 0.381)	0.597	1.94 (0.96 to 1.48)	0.079 (−0.24 to 0.182)
High	0.390	1	0	0.436	1	0
School attendance-categorical†						
<50%	0.755	1.93 (1.49 to 2.50)	0.365 (0.174 to 0.556)	0.430	1.06 (0.75 to 1.49)	0.024 (−0.122 to 0.170)
50%–80%	0.585	1.50 (1.23 to 1.83)	0.195 (0.081 to 0.310)	0.506	1.24 (0.95 to 1.62)	0.099 (−0.034 to 0.232)
≥80%	0.390	1	0	0.407	1	0
School dropout‡						
Yes	0.821	2.11 (1.74 to 2.55)	0.432 (0.281 to 0.582)	0.748	1.85 (1.50 to 2.28)	0.343 (0.192 to 0.495)
No	0.389	1	0	0.405	1	0
Grade repetition‡						
Yes	0.553	1.72 (1.54 to 1.92)	0.232 (0.181 to 0.282)	0.366	0.98 (0.85 to 1.14)	−0.006 (−0.060 to 0.049)
No	0.321	1	0	0.371	1	0

*Number of 4942 visits: attendance low N = 240, high N = 4702; <50% N = 107, 50–80% N = 133, ≥80% N = 4702; dropout yes N = 158, no N = 4776; grade repetition yes N = 1811, no N = 3184.

†Weighted for confounding using inverse probability of treatments weights including age, intervention assignment, orphan status, socioeconomic status, alcohol use, depression, anxiety, and previous partner number.

‡Grade repetition-weighted for age, alcohol use, depression, anxiety, orphan status, pregnancy, school, intervention assignment, and previous partner number.

group (RD 13.2%; 95% CI: -4.1% to 30.5%). However, few young women were in the oldest age group, which may have resulted in a lack of precision for this estimate.

In a sensitivity analysis, the weighted effect of attending fewer than 80% of school days versus 80% or more was similar for age disparity (RD: 13.2%; 95% CI: 3.3% to 23.1%) and number of partners (CD: 0.256; 95% CI: 0.032 to 0.481) 2 follow-up visits later, accounting for previous confounders (Supplemental Digital Content 1, <http://links.lww.com/QAI/B80>). The weighted effect of school dropout was stronger on age disparity (RD: 28.0%; 95% CI: 8.2% to 47.8%) and number of partners (CD: 0.584; 95% CI: 0.188 to 0.908) 2 follow-up visits later, accounting for previous confounders.

DISCUSSION

In our study, the percentage of young women attending fewer than 80% of school days on average in the past year was relatively low (4.1%) but increased with age and time since enrollment. Low attendance in school was associated with the probability of having an age-disparate relationship. School dropout (6.1%) was associated with both having an age-disparate relationship and with having more sexual partners. Conversely, ever repeating a grade was not associated with either outcome.

Our results support the hypothesis that young women who stay in school and who attend school more frequently

have partners closer to their own age and fewer partners than young women who attend less school or drop out. These findings based on longitudinal data are consistent with those from previous studies, indicating that young women who are in school have fewer lifetime partners,^{5,10,11} and fewer partners older than themselves compared with young people who do not attend school.^{5,12–14,23} Most notably, our results are similar to a cross-sectional study in South Africa that found that young men who were in school were less likely to be HIV infected, but both young men and women in school had fewer lifetime partners, and young women had fewer partners more than 3 years older than themselves.⁵ Another recent study in Zimbabwe found that age-disparate relationships were associated with incident HIV infection and that completion of secondary school was inversely associated with age-disparate relationships. Students might have a safer sexual network structure, thereby putting them at lower risk of HIV infection.

In the HTPN 068 study, school attendance was associated with incident HIV-infection; partner number and partner age difference were also associated with HIV infection.^{16,24} Age disparity has been associated with prevalent HIV infection in several cross-sectional studies from sub-Saharan Africa^{3,25–27} and with incident HIV infection in Zimbabwe and Uganda.^{13,28} Conversely, age disparity did not seem to be associated with incident HIV infection in other studies from South Africa and Uganda.^{29–32} Although age disparity and number of partners seem to be factors in the relationship between time spent in school and risk of HIV infection, how these behaviors further increase the risk of HIV warrants further investigation.

Attending fewer school days was associated with age-disparate relationships and school dropout was associated with having both an age-disparate relationship and having more partners. However, grade repetition was not associated with either behavior. This pattern suggests that the effect of school attendance on partner age and partner number is more strongly related to the amount of time spent in a school environment than with educational success. In addition, young women who repeat grades may be exposed to younger men and be less likely to have an age-disparate relationship. It is important to note that there is a cyclical relationship between grade repetition, school attendance, and school dropout. Our results indicate that young women who have repeated a grade are more likely to have low attendance in school and young women who have low attendance are more likely to later repeat a grade. Grade repetition and low attendance were also markers for later school dropout. Although grade repetition may not be directly associated with age disparity or number of sexual partners, it seems to be a warning sign for later low attendance and school dropout, which are associated with these partnering behaviors.

Our study uses longitudinal data to test the hypothesis that young women in school have younger and fewer partners. However, we use data from an RCT in which all young women were in school at study enrollment. A previous study using data from the trial found evidence

TABLE 4. Weighted Risk Ratio (RR) and RD With 95% CIs for the Association Between Low Attendance in School Versus High Attendance and Having an Age-Disparate Relationship Stratified by Time-Varying Age of the Young Woman*

	Risk (%)§	RR (95% CI)†	RD (%; 95% CI)‡
Unstratified association		2.69 (1.92 to 3.77)	13.0 (6.3 to 19.7)
Stratified by age			
Age 13–14			
Low	25.9	8.07 (3.40 to 19.19)	22.7 (2.4 to 43.0)
High	3.2	1	0
Age 15–16			
Low	9.2	1.33 (0.61 to 2.87)	2.3 (-4.7 to 9.3)
High	6.9	1	0
Age 17–18			
Low	27.7	2.52 (1.66 to 3.82)	16.7 (5.9 to 27.5)
High	11.0	1	0
Age 19–23			
Low	26.7	1.97 (0.95 to 4.09)	13.2 (-4.1 to 30.5)
High	13.6	1	0

*Weighted for confounding using inverse probability of treatments weights including age, intervention assignment, orphan status, socioeconomic status, alcohol use, depression, anxiety, and previous age-disparate relationship.

†Likelihood Ratio Test for modification by age: $\chi^2 = 10.67$, $DF = 3$, P value = 0.014.

‡Likelihood Ratio Test for modification by age: $\chi^2 = 8.38$, $DF = 3$, P value = 0.039.

§Weighted number of cases/total exposed: age 13–14 $N = 34/881$; age 15–16 $N = 141/2156$; age 17–18 $N = 156/1296$; age 19–23 $N = 38/250$.

DF, degrees of freedom.

of selection bias: Young women who participated in the HPTN 068 were already more likely to be enrolled in school than in the underlying population.³³ Participation in an RCT may have also resulted in a Hawthorne effect, where young women may have been less likely to drop out than they would have otherwise simply because of study participation.³³ Young women in the study were also more likely to attend school than has been seen in other studies in sub-Saharan Africa, but we would expect the association between schooling and behaviors to be similar.¹⁶ Second, information on sexual behaviors and partner characteristics was self-reported in the study and may be misreported.

Last, despite the use of longitudinal data, the period for the exposure and outcome variables could overlap because school attendance and enrollment information were measured between surveys, and sexual behaviors were reported retrospectively. Although reverse causality is plausible (ie, older partners and more partners may result in low school attendance), our sensitivity analysis shows that these partnering behaviors occur more often after school dropout or after low school attendance. In fact, when restricting our period to that after dropout, the effect estimates for the associations are even stronger.

In our study, young women who attended fewer days of school were more likely to have an age-disparate relationship and those who dropped out were more likely to both have an age-disparate relationship and more sexual partners. Spending time in school imposes network and time constraints that make frequent attendees more likely to both select other (same-age) students as partners and to have fewer partners overall, thereby reducing their risk of being exposed to partners with HIV. Initiatives aimed at keeping girls in school such as DREAMS are critical to promoting safe sexual behaviors and preventing STIs.³⁴ However, effectively preventing infections in young women should also involve the development of interventions for young women out of school or who have completed school that encourage them to be part of safer networks.

ACKNOWLEDGMENTS

The authors thank all the participants in HPTN 068 and the study staff.

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