Effects of interventions addressing school environments or educational assets on adolescent sexual health: systematic review and meta-analysis

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# Abstract

## Context

School-based interventions that aim to modify sexual health knowledge, attitudes and behaviors have mixed and often unsustained effects on adolescent sexual health outcomes. However, observational evidence suggests that broader school-related factors, such as school climate and academic attainment, can influence outcomes. This paper examines whether interventions modifying school-level environments or promoting student-level educational assets can promote young people’s sexual health.

## Methods

Nine databases were searched in July 2017 for randomized and quasi-experimental evaluations of interventions addressing school-level environment and/or student-level educational assets. Searches did not include language restrictions and were limited to studies published after 1990. Studies were assessed for risk of bias and synthesized narratively and meta-analytically.

## Results

Searches yielded eleven evaluations of school-level environment and student-level educational assets interventions published from 1999 to 2016. Inconsistent reporting led to unclear risk of bias for most studies and prevented all but one meta-analysis. The meta-analysis provided some evidence that school-environment interventions may delay sexual debut (pooled odds ratio=0.53 [0.43, 0.65]). Narrative synthesis of the remaining outcomes from both school-level environment and student-level educational assets interventions found mixed results on the benefits of such interventions on sexual behaviors, pregnancy and STD outcomes.

## Conclusion

Review results suggest it is plausible that school-level environment studies can impact sexual debut and student-level educational assets interventions can reduce pregnancy and STD outcomes. More rigorous evidence is needed to assess the probability that interventions addressing school-related factors can produce effects and to further understand the mechanisms by which they work to improve adolescent sexual health.

# Introduction

Adolescent pregnancy and sexually transmitted diseases (STD) remain public health concerns in the United States and internationally. Unintended pregnancy and birth, though declining globally,1 disproportionately affect young people from disadvantaged populations in terms of socio-economic status, ethnicity and educational status as well as varying by geography.2–4 Young people aged 15-24 also account for about half of new STD diagnoses.5,6 These outcomes are driven by disparities in sexual risk behaviors among socially disadvantaged youth including early sexual initiation, multiple partners and a lack of contraception or condom use among young people.7–9 Government policy has largely focused on classroom-based sex education.10,11 However, this may be insufficient to influence long-term sexual behavior change,12 given that effects are inconsistent and often unsustained,13,14 perhaps reflecting such interventions’ failure to address social factors including educational disengagement and under-attainment.15,16 Furthermore, curriculum-based sex education is becoming increasingly difficult to implement given the demands on schools to meet academic targets10,17 and may be particularly challenging to sustain in areas with conservative education policies.18 Thus, there may be a role for school-based interventions that aim to modify the school-level environment or promote student-level educational assets as ‘upstream’ (i.e., causally distal) determinants of sexual health.19

Several theoretical models have theorized the influential role of school on sexual behavior,20,21 which focus on the importance of attachments to pro-social individuals and institutions, skill development and educational engagement as factors associated with reduced sexual risk behaviors. However, these frameworks have not fully theorized the mechanisms by which school environments or educational assets might work to promote sexual health.22 The theory of human functioning and school organization23 is unique in proposing how institutional processes might facilitate student commitment to learning (i.e., to school’s ‘instructional order’) and to the school’s community and values (i.e., the regulatory order). Student commitments are theorized to be protective of student health because they facilitate the development of the practical reasoning, social affiliations and autonomy necessary for students to choose healthier over riskier behaviors (Appendix Figure 1). The institutional processes theorized to build student commitment involve: ensuring that teaching, discipline and management center on student needs; enhancing relationships between school staff and students; incorporating students’ broader development into academic education; and aligning the values of schools with their local communities.

This theory has been empirically and explicitly assessed via observational studies in relation to substance use and violence outcomes but not sexual health.24–27 Existing observational studies suggest it is plausible in that longitudinal analyses from high-income countries indicate that youth who report caring adult relationships at school,28 attachment to school,29–33 school involvement,34–36 positive attitude to school,37,38 and high educational expectations and aspirations30,31,36,39 also report fewer sexual risks, including early initiation, frequency, unprotected sex and pregnancy or birth. Multi-level studies suggest that higher rates of school-level student bonding, attitude to school and educational expectations are associated with lower rates of early sexual debut and recent sexual activity.33,39,40 Further, other academic attainment outcomes appear to be important influences of sexual health outcomes globally. A review of longitudinal studies from high-income countries found sufficient evidence that academic ability and achievement was protective of early sexual debut, contraception use and pregnancy or birth.41 Recent observational studies from low- and middle-income countries provides strong evidence that school enrolment is associated with subsequently lower rates of sexual debut and pregnancy.42,43 While such evidence points to the potential of interventions that address these factors to promote sexual health, observational studies are limited in their ability to fully control confounding by socio-economic status or other family-related factors, and also cannot tell us how possible it is to intervene on school- and education-related factors to modify sexual behavior or health. Evidence from rigorous evaluations is needed to determine whether such interventions are indeed effective at changing important school-related determinants and subsequent sexual health outcomes.

Systematic reviews from outside the field of sexual and reproductive health suggest that interventions can address these school-related factors and have impacts on health outcomes. For example, a review of cash transfer programs in low- and middle-income countries found these programs consistently impacted access to education in the short term, especially when the cash transfer was conditional (i.e., enrolment or attendance is required).44 A Cochrane review of the impact of health promoting schools modifying the school ethos or environment on student health reported benefits for student health in terms of physical activity, tobacco use, nutrition and bullying victimization but not sexual health.45 This review could not assess academic-related outcomes due to a lack of reporting of relevant measures. The Cochrane review, along with several other reviews, did explore the sexual health effects of school-based interventions addressing school-level environments or student-level educational assets. 45–47 However, these reviews are now several years old and did not aim to explore intervention mechanisms. This review builds on past reviews by providing an up-to-date synthesis of evidence from evaluation studies of the effects of interventions that address school-level environments and/or student-level educational assets on sexual behavior and health. We explore the plausibility and probability that these interventions are promising sexual health interventions. By focusing on interventions that address aspects of school life in alignment with the theory of human functioning and school organization, the review also aims to examine the pertinence of this theory to adolescent sexual health outcomes. While this review did not aim to examine the effects of these interventions on educational outcomes, we have included reported academic results to provide additional context in our narrative review.

# Methods

This review followed a registered protocol (PROSPERO Record Number: CRD42017072169) and PRISMA guidelines.48 Studies were included if they reported on outcome evaluations of school-based interventions targeting adolescents (ages 10-19) that explicitly described activities that either 1) changed aspects of the school-level environment or 2) aimed to improve student-level educational assets. School-environment interventions were defined as: improving school climate or culture; increasing safety; changing policies; improving access and connection to caring adults; or providing opportunities for student engagement in the school or community. Interventions addressing educational assets were defined as modifying individual academic goal setting, attendance, attainment, interest in school and school work, relationships with teachers and staff and engagement with school. To ensure interventions met the aims of the review, the protocol was amended at the start of full-text screening to clarify that school-level or student-level intervention activities could not solely be focused on sexual health education or services, but needed to engage more broadly with school organization or student educational assets. Studies were excluded if they reported on interventions aiming solely to improve knowledge, attitudes, skills or services related to sexual health. Evaluations were included if they employed a randomized trial or quasi-experimental design, where control groups received usual treatment or a comparator intervention. Studies must have reported on at least one sexual health outcome, such as pregnancy, STDs or HIV, and sexual behaviors associated with increased risk of pregnancy or STDs. There were no language restrictions in searches or screening. We chose to limit studies to those that were published from 1990 to reduce the amount of time spent screening older references that were unlikely to yield pertinent studies and to ensure that included studies would be most applicable to current policy related to sexual health interventions in schools.

Nine bibliographic databases were searched between 5 July 2017 and 13 July 2017: BiblioMap, CINAHL Plus, ERIC, IBSS, OpenGrey, ProQuest Dissertations & Theses, PsycINFO, Medline and Web of Science Core Collection. A piloted search strategy used free-text and subject-heading searches (Appendix Figure 2). Search terms linked three concepts: school/education (population/setting); sexual behavior, pregnancy or parenthood (outcome); and intervention studies (study type). We also searched Google using the above search concepts, checked references of included studies, and contacted subject matter experts using a standard form. Citations were managed using EPPI-Reviewer 4.49

Studies were screened on title and abstract and, where necessary, on full report. Two reviewers (AP, MD) double-screened 50 titles/abstracts and 15 full reports to pilot the eligibility tool and ensure >90% agreement before the remaining references were split and screened individually. Citations identified from web searches, subject matter experts and reference checks were screened online and cross-referenced with database searches. As is customary, only included references from web searches were imported into EPPI-Reviewer 4. AP made a final check of all studies included in consultation with CB.

Data from studies were double-extracted (AP, MD) using a piloted extraction tool, including: study location; intervention description; participant information; sampling methods; sample size at baseline and follow-up; and all significant and non-significant sexual health outcomes reported. AP and MD piloted the extraction tool and codes by inputting data from four studies then comparing inputs; where discrepancies occurred, guidance for the codes were discussed and modified. A standard contact form was used to request information from primary authors where detail was insufficient. Multiple reports of the same study were extracted separately then coded into a single entry. Risk of bias was assessed for randomized trials using the Cochrane Handbook for Systematic Reviews of Interventions risk of bias tool50 and for quasi-experimental studies using the adapted EPPI-Centre tool.51 Domains assessed included: random-sequence generation; allocation concealment; blinding of participants; personnel and outcome assessors; incomplete outcome data; selective reporting; and other sources of bias. Two reviewers (AP, MD) independently assessed studies and assigned scores (low, high or unclear risk) to domains within each study. Scores were then reconciled in EPPI-Reviewer 4 and reviewed by CB.

Randomized trials and quasi-experimental studies were synthesized narratively and, where appropriate, meta-analytically. Narrative summaries are reported by intervention type (e.g., school-level environment vs. student-level educational assets) then by outcome and follow-up time. Effect sizes were extracted into a Microsoft Excel spreadsheet and converted into uniform effect sizes (e.g., odds ratios) where required. Meta-analysis was conducted in EPPI-Reviewer 4’s meta-analysis function based on the Metafor package in R, using fixed-effects analysis. Meta-analysis was grouped by intervention type and outcome, and prioritized the most long-term follow-up reported. Heterogeneity is reported using I2 estimates. Where meta-analysis was precluded by insufficient data or heterogeneity, narrative summaries of effects are reported.

# Results

## Overview of included studies

The search yielded 28,810 unique references (Appendix Figure 3). Of these, 28,485 were excluded on title and abstract. Of the remaining 326 references, full reports were retrieved for all but five records which were unobtainable. Eleven outcome evaluations reported in seventeen study reports and published between 1999 and 2016 met eligibility criteria for inclusion (Table 1).52–68 Five of the 11 studies were from high-income countries (Australia and United States), four studies were from middle-income countries (South Africa and Kenya) and two were from low-income countries (Malawi and Zimbabwe). Five studies met the inclusion criteria for school-level environment interventions54,57,60–65,67 and six for student-level educational asset interventions.52,53,55,56,58,59,66,68. No study addressed both.

Nine studies used a randomized design with allocation at the level of school,54,56,57,59,64,65,67 region,52,53,55,58 or individual, 66 while two studies used a quasi-experimental design matching intervention and comparison schools non-randomly. 60–63,68 For most risk of bias domains, insufficient detail prevented complete assessment (Table 2), resulting in unclear risk of bias for all included studies. For example, only two randomized trials reported on the majority (but not all) relevant domains.52,53,64 The only domain reported on by most studies related to clustering. All but two cluster-allocated studies properly accounted for clustering. 52–54,56,57,59,61,64–67 Authors of one quasi-experimental study confirmed they did not adjust for school-level clustering because only two schools were included.68 Adjustment for household-level clustering was unclear for one RCT and could not be confirmed by authors.55,58

## School-level environment interventions

Of the five school-level environment interventions, three employed school-action teams to improve school policies or practices addressing school climate54,57,65,67 or safety and sexual violence prevention.64 Two interventions trained teachers in knowledge and skills related to either classroom management and interactive teaching60–63 or strategies to support actions identified through school action teams.65 All school-level environment interventions included other components, such as a social development or sexual health education curricula.

Only one meta-analysis for outcomes of school-environment studies was possible. Three randomized trials54,64,65 reported effects on sexual debut (i.e., ever having sex) and were included in the meta-analysis. The Gatehouse Project65 was a randomized trial of 25 secondary schools in Australia, reporting sexual debut outcomes from cross-sectional samples of 8th grade students in two year intervals. Positive Action54,67 was a randomized trial measuring sexual debut outcomes of 5th graders at 4 years post-baseline. PREPARE was the only school-level environment intervention based in a low- or middle-income country and reported sexual debut outcomes for vaginal and anal intercourse from a randomized trial at 6- and 12- months post-baseline. A pooled analysis included three effect sizes at the most long-term follow-up and found students in the intervention arm were less likely to report ever having sex (OR=0.5 95% CI 0.4, 0.7). This estimate, however, had substantial between-study statistical heterogeneity (I2=76.3%). Included studies were heterogeneous by location, follow-up times and age at intervention. A post hoc sensitivity analysis found that the pooled estimate remained significant when examining first follow-up (OR=0.6 95% CI 0.4, 0.9) and when only including studies of interventions from high-income countries (OR=0.5 95% CI 0.4, 0.6).

Two sexual debut outcomes were not included in the meta-analysis. In addition to sexual debut of vaginal and anal intercourse included in the above analysis, PREPARE64 also reported sexual debut for oral sex, with non-significant effects at both timepoints. Sexual debut outcomes from the Seattle Social Development Project (SSDP) were not included in the pooled analysis because SSDP used a quasi-experimental design.60 SSDP was a three-armed study where students received the ‘full’ intervention (from 1st to 6th grades) or ‘late’ intervention (in 5th and 6th grade only), or attended control schools. At 6-years post-intervention, 72% of students in the full intervention group versus 83% of control students reported ever having sex. Outcome differences were not significant between late intervention and control students.

The remaining outcomes for school-level environment interventions could not be synthesized meta-analytically due to insufficient number of studies or lack of information on effect sizes, and so are summarized narratively. Sexual behavior outcomes included recent and frequency of sexual intercourse; protected sexual intercourse; and sexual partners. The Aban Aya Project 57 was the only study to measure recent sexual intercourse. Aban Aya was a three-arm, randomized trial comparing a school/community intervention, a social development curriculum, and a no-intervention control; the school/community arm met our inclusion criteria. The trial reported that male students in the school/community arm were less likely than male controls to have recent sexual intercourse at three years post-baseline (GEE=0.7), with no effects for female students. PREPARE was the only study to measure frequency of vaginal or anal sex, reporting no significant effects at 6-months or 12-months post-baseline.64

Two randomized trials57,64 and one quasi-experimental study62,63 reported mixed results on protected sexual intercourse (e.g., used condom or contraception at last sex). Male students in the Aban Aya school/community arm reported proportionately more condom use as compared to controls (GEE=0.7) at three years post-baseline, but no effects were found for female students.57 Full intervention students in the SSDP study were more likely than comparison students to use condoms recently (odds ratio [OR]=1.9). Study reports did not indicate if effects on recent condom use were the result of increases in sexual behavior overall. Non-significant outcomes were reported for condom use at first sex (SSDP), condom use at last sex (PREPARE), and frequency of condom use (PREPARE and SSDP).62–64

One randomized trial64 and one quasi-experimental study60,63 reported on a measure of number of sexual partners. No difference in these was reported between PREPARE intervention and comparison groups at 6 months or 12 months post-baseline. 64 At 6 years post-intervention,60 50% of full-intervention SSDP students reported having more than one sexual partner by age 18 compared to 62% of control students, with no effect for the late-intervention group. When measured as a continuous variable (e.g., number of partners), effects did not appear to sustain at nine years post-intervention among the full-intervention students.63

The only study of a school-level environment intervention to report on pregnancy, birth or STD outcomes was the quasi-experimental study, SSDP.60–63 At six years post-intervention,60 17% of full-intervention students reported a pregnancy versus 27% of comparison students, with no significant difference between late-intervention and control students. No difference was reported in lifetime births between the control and full- or late-intervention groups. At nine years post-intervention,62,63 females in the full intervention group were less likely than control females to report a lifetime pregnancy (OR=0.5) or lifetime birth (OR=0.4). Male participants in the full-intervention group did not differ from control males in causing a pregnancy or fathering a child. At this same timepoint, no difference in self-reported lifetime STDs was reported between full-intervention and control groups. At 18 years post-intervention,61 full-intervention participants were less likely than controls to report an STD in the last three years (OR=0.3), with no difference between late-intervention and control students.

Three studies of school-level environment interventions reported on academic or school-related factors. In a separate report,69 the Gatehouse Project found intervention students were less likely to have low school attachment than controls but this was only significant in the final wave sample. Better academic behavior (i.e., working hard, setting goals, solving problems, etc.) was self-reported by students and their teachers in the Positive Action intervention as compared to control students.67 Additional analysis revealed the intervention effect on sexual debut was partially mediated by academic behavior. The quasi-experimental study, SSDP, measured a number of academic variables at 18 years old with mixed results.60 Full intervention students reported stronger school commitment, attachment and achievement than controls, with near significance for grade point average. Differences were not significant for dropping out of school or standardized test scores among intervention and control students, with no differences between late intervention and control students for any outcomes.

## Student-level educational assets interventions

Of the six studies examining student-level educational assets interventions, two were cash-transfer programs, where female students and their families received a monthly allowance either unconditionally53 or on condition that they attended 75-80% of school days in the previous month.52,53,66 This was hypothesized to reduce economic risk, and thus improve school attendance and sexual health outcomes. Four interventions subsidized expenses by paying school fees,52,53,55,58,59 providing uniforms,55,56,58,59 and additional supplies (e.g., pens, sanitary napkins).55,58,59 Three interventions provided support or case-management services to students, including access to adults who assisted students with absenteeism problems,55,58,59,68 and support of academic and career goal-setting.68

Meta-analysis of outcomes from educational assets interventions could not be conducted due to missing information and variability in reporting overall effect sizes. Results are synthesized narratively. All educational assets studies reported at least one sexual behavior outcome including sexual debut, protected sexual intercourse and sexual partners. Five randomized trials reported effects related to sexual debut 52,53,55,56,58,59,66 during intervention delivery,52,53,55,58,59 immediately post-intervention, 55,58,59,66 or at long-term follow-up.56 No studies found significant differences between intervention and control groups.

Three randomized trials reported on measures of protected and unprotected sex.53,56,66 Only a cash transfer program based in South Africa reported a small intervention effect at 24 months post-baseline on unprotected sex in the past three months (relative risk= 0.8).66 These trials also reported on partner-related variables, of which two found a significant intervention effect. Among a subgroup of girls attending school at baseline, cash-transfer intervention participants in Malawi were less likely to report having a sexual partner over the age of 25 years than control subgroup (OR=0.2).53 However, this effect was non-significant for girls who had dropped out of school at baseline compared with analogous controls. The South Africa cash-transfer program found cash-transfer recipients were less likely than controls to have any sex partner in the past 12 months but reported no significant effects for partner age or partner age difference.66 A large randomized trial on the effects of educational subsidies in Kenya found that age of oldest partner at 7 years post-intervention did not differ between intervention and comparison groups.56

Sexual health outcomes including pregnancy, parenthood and STDs were reported in four randomized trials 52,53,56,59,66 and one quasi-experimental study.68 The two cash-transfer programs reported non-significant effects on lifetime pregnancy at 12 months post-baseline, among educational subgroups in Malawi52,53 and in an overall analysis in South Africa.66 The Kenya-based education subsidy program reported fewer pregnancies among female participants at three (mean difference=0.03) and five (mean difference=-0.04) years post-intervention with effects disappearing at seven years.56 Differences between intervention and control males were non-significant. Only two pregnancies occurred during a 2-year Zimbabwe-based school support cluster randomized trial (both within the control group) so an effect size was not reported.59 In the only quasi-experimental educational-assets study, girls who were pregnant at baseline were less likely to have a repeat pregnancy at 24 months post-intervention (control pregnancy-free probability=0.7; intervention pregnancy-free probability=0.9), but no difference was found for girls parenting at baseline.68 These effects should be interpreted cautiously as the study included only one treatment and one comparison school, and an uneven distribution of enrolled participants.

The two cash-transfer and Kenya education subsidy trials reported prevalence of STDs (including HIV, HSV-2 and syphilis) via biomarkers among either a random subsample53,66 or all participants.56 One significant outcome among an education subgroup, girls enrolled in school at baseline, was reported in one study. For the baseline schoolgirls subgroup in the Malawi cash transfer trial, intervention participants were less likely to receive a positive HIV or HSV-2 result than control participants at 18 months post-baseline (HIV: OR=0.4; HSV-2: OR=0.2).53 Effects were non-significant for both HIV and HSV-2 among baseline dropouts, and for syphilis in both subgroups. The South Africa cash-transfer program conducted HIV and HSV-2 testing at baseline and at 12, 24 and 36 months post-baseline or graduation (whichever came first); effects were non-significant for both outcomes.66 The Kenya education-subsidy trial collected biomarker data from participants at seven year post-intervention follow-up, with no differences found for HIV or HSV-2 among female and male subgroups.56

All six studies of student-level educational assets interventions reported on academic outcomes or school-related factors. Among randomized trials, intervention students were more likely to be enrolled,53 less likely to drop out of school,56,59 and more likely to reach the 8th grade.56 The exception was in the South Africa cash-transfer program, which did not find any significant effects for dropout or attendance.66 Attendance was also non-significant in the Kenya educational subsidy program,56 though all other academic outcomes were significant for this large study. Effects for absenteeism were mixed among two small randomized trials.58,59 The quasi-experimental study, Promise Place, reported differences between intervention and control students within those who were parenting at baseline, but not among those who were pregnant at baseline.68

# Discussion

## Summary of main findings

Eleven outcome evaluations were included in this systematic review. Five studies assessed school-level environment interventions, focusing on addressing school climate and culture through school action teams and teacher training. The remaining six studies evaluated interventions aiming to improve student-level educational assets, most of which provided financial incentives to increase school enrolment and attendance. While all but two studies were randomized trials, poor reporting made quality assessment difficult, and we appraised many domains across studies as having unclear risk of bias.

Findings from this review provide insights into whether the theory of human functioning and school organization might apply to sexual behaviors and sexual health outcomes. The theory (Appendix Figure 1) poses that health behaviors can be improved by increasing students’ commitment to school, specifically by breaking down boundaries between school and the surrounding community, strengthening teacher-student and peer relationships, and increasing student-centered learning.23

Findings from the meta-analysis of the effects of school-level environment interventions on sexual debut, along with the Aban Aya trial findings on recent sex and condom use, provide some support for the theory in that included interventions aimed to address school practices and relationships to increase student engagement. Included school-level environment interventions employed school action teams to improve school climate,57,64,65 engaged young people in school-wide strategies,57,64,65 and conducted teacher training to improve teacher-student relationships and strengthen student-centered learning.60–63,65 These practices are congruent with evidence from observational and evaluation studies that suggest that teacher and school support, academic support and mentoring, and school and class restructuring are important for students’ school performance70 and completion.71 This evidence aligns with and supports the theory’s contention that increasing commitment in students will encourage them to behave in ways which accord with the pro-social values of these institutions. Additionally, findings on educational outcomes from three included studies support the notion that intervention effects on attachment, commitment, academic behavior and achievement may serve a mediating or synergistic role for impacts on sexual health outcomes, further supporting the theory of human functioning and school organization.60,67,69 However, more data from rigorous evaluations is needed to assess the causal roadmap from school commitment to sexual health outcomes within school-level environment interventions, including whether these interventions improve educational outcomes and subsequent sexual health outcomes.

Evidence for the effectiveness of school-level environment interventions on other behavioral and health outcomes, including STDs and pregnancy, was mixed. This was partially due to the inconsistency in outcomes measured across studies which precluded further meta-analysis. PREPARE, a randomized trial, was the only school-level environment intervention to have no effects on sexual behavior.64 This intervention substantially differed from the other school-environment interventions both in setting and purpose. Based in South Africa, PREPARE sought to improve school policies and practices specifically related to sexual violence and school safety, which the authors suggest were not sufficient to overcome structural and economic barriers to sexual health. Findings from this study might call into question whether the theory of human functioning and school organization is mainly applicable to high-income countries, such as the U.S. and Australia, where educational and economic opportunities are more readily available and culturally acceptable.72,73 However, it is also possible that the PREPARE intervention did not sufficiently align with constructs within the theory to provide an adequate empirical test.

Evidence from studies of student-level educational-assets interventions provide less support for the theory of human functioning and school organization. Narrative synthesis suggests mixed evidence that these interventions, most of which provided financial support, can prevent pregnancies and STDs or reduce sexual risk behavior. For example, two large randomized trials found an effect either for pregnancy56 or STDs53 but not both. These studies also had significant impacts on dropout56 and enrolment,53 aligned with observational evidence that enrolment is important for sexual health outcomes.42,43 However, the remaining studies reported very few effects on pregnancy or STD outcomes or sexual behaviors. Across studies, our narrative synthesis found no clear pattern of how interventions did or did not impact educational and sexual behavior and health outcomes. This might in part be explained by limitations in studies, which are described below.

## Limitations

Some study and intervention limitations may have inhibited our ability to assess the theory of human functioning and school organization in the context of sexual health. In some cases, studies (particularly of student-level educational assets interventions) were hindered by sample sizes that were inadequate to detect effects55,58,59 or contextual factors that may have prevented significant differences between treatment groups, such as subsidies available to control students external to the study.58,66 Others may have been limited by a singular focus on increasing enrolment, and thus failing to address or overcome other factors important for sexual decision-making, such as cultural norms that devalue girls’ education and sexual autonomy, support early marriage and stigmatize access to sexual health information.74,75 Most student-level educational assets interventions did not address the role of other components of schooling on sexual health outcomes, such as education quality or school climate, limiting their relevance to empirically assessing many components of the theory of human functioning and school organization.

The usefulness of student-level intervention studies in assessing the theory was further limited by the fact that, while financial incentives and subsidies may improve school enrolment and attendance, they will also tend to improve the economic position of intervention participants and their families.76 Since pregnancy and other sexual health outcomes are associated with family- and community-level socio-economic status,3 it is challenging to untangle the role of school on sexual health outcomes from that of poverty alleviation in cash-transfer and education subsidy programs. For example, an increase in available income theoretically reduces the need for individuals to engage in transactional sex, possibly affecting the frequency of unprotected sex66 and number of sexual partners.53,66 However, as one included study concluded, cash transfers may not outweigh the social benefits of transactional sex.66 Interventions providing financial incentives for school enrolment and attendance may be strengthened by targeting additional social and educational assets in school-based settings.

Furthermore, the transferability of evidence across settings was difficult to determine given that all but one of the studies of school-level environment interventions were conducted in high-income countries and all but one of the studies of student-level educational assets interventions were conducted in middle- or low-income countries. Both economic and cultural differences may have impacted the intervention components addressing school-related factors and how they were received by intervention participants. Given that allocation concealment was poorly reported, these differences could potentially be further compounded by selection bias, a possible risk in trials where blinding is not possible.77 Further, although educational assets interventions did not include additional curriculum components, the majority of school-environment interventions did, so that the effects of school-environment and curriculum components could not be disaggregated. However, results from the Aban Aya three-armed trial, with one arm focused on a curriculum intervention and one on an intervention with curriculum and environment components, suggest that changes to the school environment had independent effects on sexual risk behaviors.57

In terms of limitations in review methods, there were no deviations from the established protocol, although it was modified at the start of full-text screening to clarify the interventions to be included. As the criteria for including studies on intervention type was broad during screening of titles and abstracts, modifications to the protocol did not impact prior screening. Some potentially relevant studies may have been excluded during screening of full reports because interventions were insufficiently described. The review sought to minimize location and language bias by searching multiple databases without language restrictions. It is possible that relevant studies were missed due to exclusion of studies published prior to 1990; however, given that all studies were published since 1999 and most within the last 10 years, we feel this cut-off was generous and reasonable. We were unable to assess publication bias due to the small number of studies.

Given the variability in reporting data which is common in social interventions,78 analysis required transformation of data into standardized effects for school-level environment studies. Several studies did not provide adequate information to transform effect sizes or only provided effects for subgroups, preventing us from undertaking meta-analyses on any educational assets outcomes and most school-level environment outcomes. In most cases, emails to authors for missing data were not answered. As a result, few meta-analyses were possible and we could not conduct meta-regression to explore heterogeneity of effects.

This review focused on school-level environment and student-level educational assets interventions since both were hoped to potentially illuminate the theory of human functioning and school organization.23 However, we were interested and disappointed to find no studies that addressed both the school- and student-levels simultaneously.

## Implications for policy and research

Findings from the meta-analysis of the effects of school-level environment interventions on sexual debut, as well as results of the Aban Aya trial on recent and protected sex, provide some support for the theory of human functioning and school organization. Educational outcomes from these studies suggest that student attachment, commitment and academic behavior and achievement might, as theorized, mediate health outcomes, further supporting the theory. Evidence from intervention studies addressing student-level educational-assets interventions were limited in their ability to assess the theory because they did not clearly address factors such as education quality and because financial incentives and subsidies may have improved sexual health via other non-school pathways.

Our findings are generally consistent with other reviews examining school-level environment interventions which concluded there is limited evidence to assess the probability that these programs impact sexual health.45,46 Unlike past reviews, we were able to conduct a single meta-analysis which suggests that interventions modifying aspects of the school environment, such as school climate or access to caring adults, have the potential to delay sexual debut. Through narrative synthesis, we revealed it is plausible that interventions aiming to improve student-level assets can be effective at reducing pregnancy and STDs, supported by other reviews examining broader impacts of sexual health interventions in low- and middle-income countries.74,79,80 Further analysis of the effects on pregnancy and STDs in relation to sexual behaviors and educational outcomes fails to reveal a clear pathway for exactly how these interventions work to impact sexual health outcomes. Since subsidy and cash transfer programs are expensive to implement,79 there is ample opportunity for new research to explore these pathways and the careful combination of these programs with other interventions elements.

More rigorous evaluation is needed to determine the effects of school-environment interventions on long-term sexual health outcomes, including pregnancy and STDs. Both school environment and educational-assets interventions should more clearly theorize the school- and education-related mechanisms of change, and assess these outcomes in relation to sexual behavior and health. The theory of human functioning and school organization provides a useful starting point for identifying processes by which school-based and educational interventions may work to influence sexual behavior. Cash-transfer and educational subsidy programs may consider how commitment to school prior to receiving financial support influence long term outcomes, and whether these programs may have synergistic effects if combined with elements of school-environment interventions, such as those that address school climate or teacher-student relationships. As other reviews have concluded,46 studies should compare these interventions with and without curriculum components. Specifically, future research might collect more detailed information on the components of such complex interventions, and their implementation, to support greater understanding of how each contributes or works interdependently to improve outcomes. Future reviews would greatly benefit from improved reporting on risk of bias domains.

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| Table 1: Characteristics and Outcomes of Included Studies | | | | | |
| Intervention | Location | Intervention description | Study design | Participant characteristics | Outcomes and Effects |
| *School Environment Studies* | | | | | |
| Aban Aya Project (Flay 2004) | U.S. | Based on theory of triadic influence, Aban Aya consisted of a social development curriculum and a school/community intervention (SCI) that aimed to reduce high risk behaviors by targeting risk and protective factors and skills, including enhance sense of self, cognitive-behavioral skills and strengthening family and community ties. SCI was intended to impact all social domains of influence on children, including family, school climate and community by providing parental support, increasing youth support programs in school, and forging linkages among parents, schools and local businesses through a local school task force. | Randomized Control Trial  Unit of randomization: School  *Baseline Sample*  Intervention: 4 schools, 366 students  Comparison: 4 schools, 372 students  *Follow-up*  3 years post-baseline  Attrition:  20% turnover each year, 51% of original sample at final follow-up | Age: ~10.8 years (5th grade)  Gender: 51% female; 49% male  Race/ethnicity: Schools were 91% African-American, <10% Latino  Socio-economic status: 77% received federally subsidized school meals | **3 years post-baseline**  *Self-report*  Recent sexual intercourse  Male:GEE 0.7 (p=.02)  Female: GEE not reported (p=0.1)  Condom use  Male: GEE 0.7 (p=.05)  Female: GEE not reported (p=.08) |
| Gatehouse Project (Patton 2006) | Australia | Gatehouse’s goal was to promote social inclusion and commitment to education to reduce health risk behaviors and improve emotional well-being. The intervention consisted of four components: (1) student survey about security, communication with teachers, and school life; (2) school action team with a focus on school policies and teacher practices; (3) consultation and training on intervention strategies; and (4) a ten-week social-emotional curriculum. Strategies between schools varied but always addressed school policy, social-emotional curriculum, and inclusive relationships within the classroom. Study used three cross-sectional samples. | Randomized Control Trial  Unit of randomization: School  *Cross-Sectional Samples*  Intervention: 12 schools; 1343 students (1997), 1158 students (1999), 966 students (2001)  Comparison: 14 schools; 1342 students (1997), 1428 students (1999), 1497 students (2001)  *Follow-ups*  2- and 4-years post baseline  *Response Rates*  1999  Intervention: 75%  Control: 66%  *2001*  Intervention: 66%  Control: 69% | Age: 13-14 years (8th grade)  Gender:  *1997*  Intervention: 52% female Control: 54% female *1999*  Intervention 55% female  Control: 55% female  *2001*  Intervention: 53% female  Control: 54% female  Race/ethnicity: Not stated  Socio-economic status: Not stated | **2 years post-baseline**  *Self-report*  Sexual debut  OR 0.8 (0.6, 1.2)  **4 years post-baseline**  *Self-report*  Sexual debut  OR 0.6 (0.4, 0.8) |
| Positive Action (Beets 2009, Snyder 2013) | U.S. | Based on the theory of self-concept, Positive Action is a multicomponent school-based social and character development program designed to improve student behaviors by strengthening school climate, relationships and engagement in learning. Principals at each participating school received a school-climate kit providing directions for a schoolwide climate program, including an intervention committee, to promote the core elements of the classroom curriculum and to encourage and reinforce positive actions throughout the entire school. The full program also included a classroom curricula and family and community involvement components. | Randomized Control Trial  Unit of randomization: School  *Sample*  Intervention: 10 schools, 976 students  Comparison: 10 schools, 738 students  *Follow-up*  5 years post-baseline  *Attrition*  Baseline sample size and attrition not reported | Age: 10-11 years old (5th grade)  Gender: 50% female; 50% male  Race/ethnicity:  26% Hawaiian; 24% Multiple ethnic backgrounds; 21% Other Asian; 9% NonHispanic White; 5% Other Pacific Islander; 5% Japanese; 2% American Indian; 2% African American; 5%; 5% Japanese; 8% Other; 2% Unknown  Socio-economic status: Not stated | **5 years post-baseline**  *Self-report*  Sexual debut  OR 0.2 (0.1, 0.7) |
| PREPARE (Mathews 2016) | South Africa | PREPARE was a multi-component intervention hypothesized to reduce sexual risk behaviors and intimate partner violence synergistically through increasing social support and changing norms. The intervention comprised of a 21-session educational program, a school health service delivered by a nurse, and a school safety program. The school safety program comprised of two components. School teams (consisting of principals, teachers, school safety officers, parent representatives and local police officers) attended a two-day training on laws regarding sexual violence and action planning for school safety audit. Randomly selected students participated in a photovoice project (a qualitative method using photography, storytelling and discussion) to identify unsafe situations and places within the school. | Randomized Control Trial  Unit of randomization: School  *Baseline Sample*  Intervention: 20 schools, 1748 students  Comparison: 22 schools, 1703 students  *Follow-up*  6- and 12-months post-baseline  Attrition:  *6 months*  Overall: 6%  *12 months*  Overall: 12% | Age: ~13.7 years  Gender:  Intervention: 42% male  Control: 38% male  Race/ethnicity: Not stated  Socio-economic status: 6.0 (SD 1.7) (IG) and 6.0 (SD 1.7) (CG) means of an undefined socio-economic index | **6 months post-baseline**  *Self-report*  Sexual debut  OR 1.0 (0.8, 1.5)  Sexual debut (including oral sex)  OR 1.2 (1.0, 1.5)  Vaginal sex frequency  β= 0.12 (-0.03, 0.3)  Anal sex frequency  β= 0.02 (-0.1, 0.1)  Condom use at last sex  OR 0.7 (0.4, 1.4)  Condom use frequency  β= 0.1 (-0.2, 0.4)  Contraception use, excluding condoms  OR 1.2 (0.7, 2.3)  Number of partners  β= 0.4 (-0.4, 1.0)  **12 months post-baseline**  *Self-report*  Sexual debut  OR 1.1 (0.8, 1.4)  Sexual debut (including oral sex)  OR 1.1 (0.8, 1.4)  Vaginal sex frequency  β= 0.08 (-0.1, 0.3)  Anal sex frequency  β= 0.1 (-0.02, 0.3)  Condom use at last sex  OR 0.6 (0.3, 1.3)  Condom use frequency  β= -0.1 (-0.4, 0.3)  Contraception use (excluding condoms)  OR 1.2 (0.7, 2.1)  Number of partners  β= -0.03 (-0.7, 0.6) |
| Seattle Social Development Project (SSDP) (Hawkins 1999, Lonczak 2000, Lonczak 2002, Hill 2014) | U.S. | Based on the social development model, SSDP was theorized to increase student bonding to school via teacher training, parent education and social competence training, thereby reducing risk behaviors. Teachers in intervention classrooms received in-service training on 3 instructional methods: proactive classroom engagement, interactive teaching and cooperative learning. First grade teachers delivered a cognitive and social skills training curriculum. ‘Full’ intervention group consisted of students who were assigned to intervention classrooms 1st grade and remained in intervention schools through 6th grade. ‘Late’ intervention group consisted of students assigned to intervention schools in 5th and 6th grades. | Quasi-experimental study  *Baseline Sample*  Intervention: 12 schools, 156 students (Full) and 267 students (Late)  Comparison: 5 schools, 220 students  *Follow-up*  6-, 9- and 18-years post-intervention  Attrition:  *6 years*  Overall: 7%  *9 years*  Overall: 7%  *18 years*  Overall: 6% | Age: ~11.3 years (5th grade) at first survey  Gender:  Full intervention: 51% male  Late intervention: 49% male  Control: 54% male  Race/ethnicity: 47% Caucasian American; 26% African American; 21% Asian American; 7% Other  Socio-economic status (enrolled in National School Lunch/School Breakfast Program):  Full Intervention: 56% Late Intervention: 59% Control: 57% | **6 years post-baseline**  *Self-report*  *Prevalence or mean differences*  Sexual debut  Full Intervention vs. Control: -10.9 (-19.2, -1.4)  Late Intervention vs. Control: -6.9 (-14.0, 1.0)  Multiple partners  Full: -11.8 (-21.7, -0.7)  Late: -2.4 (-11.1, 7.2)  Ever pregnant  Full: -9.3 (-17.3, 0.0)  Late: 1.0 (-7.8, 8.9)  Ever gave birth  Full: -7.3 (-15.4, 2.0)  Late: 1.9 (-6.8, 9.1)  **9 years post-baseline**  *Self-report*  *Full intervention vs. Control*  Sexual debut  Not reported  Age of sexual debut  Mean Difference (MD)  -0.6 (1.1, -0.1)  Condom use frequency  MD -0.2 (-0.6, 0.2)  Recent condom use  OR 1.9 (1.1, 3.2)  Condom use at first sex  OR 1.4 (0.9, 2.3)  Number of partners  MD 0.6 (0.1, 1.0)  Ever pregnant  Female: OR 0.5 (0.3, 0.9)  Male: OR 1.0 (0.5, 1.8)  Ever gave birth  Female: OR 0.4 (0.2, 0.8)  Male: OR 1.2 (0.6, 2.5)  STD  OR 0.7 (0.4-1.3)  **18 years post-baseline**  *Self-report*  Age of sexual debut  Not reported  STD  Full Intervention vs Control: OR 0.3 (p=0.005)  Late Intervention vs Control: OR 0.8 (p=0.3) |
| Educational Assets Studies | | | | | |
| Kenya School Support Program (Cho 2011, Hallfors 2012) | Kenya | Citing the social development model, the Kenya School Support Program provided young orphan adolescents with financial and counselling support to improve school retention, increase attachment to school and thus reduce HIV risk factors. Intervention participants received school uniforms, school fees, sanitary pads and underpants, and monitoring and assistance from a community visitor. Intervention students could attend high school on partial scholarships. All study households, regardless of condition, were given twice monthly food supplements (and mosquito nets and blankets). | Randomized Control Trial  Unit of randomization: Individual  *Baseline Sample*  Intervention: 53 participants  Comparison: 52 participants  *Follow-up*  12- and 24-months post-baseline  Attrition:  *12 months*  Intervention: 2%  Control: 2%  *24 months*  Intervention: 2%  Control: 6% | Age: 12-14 years (~12.9 years)  Gender: 59% female; 41% male  Race/ethnicity: 100% Luo  Socio-economic status: Not stated | **12 months post-baseline**  *Self-report*  Sexual debut  GEE -1.5 (p=0.1)  **24 months post-baseline**  *Self-report*  Sexual debut  GEE -0.1 (p=0.7) |
| Kenya Education Subsidy Program (Duflo 2015) | Kenya | The Kenya Education Subsidy intervention aimed to reduce adolescent girls’ dropout, pregnancy and marriage rates by subsidizing the cost of education for upper primary school students and thereby reducing economic risk factors. Free school uniforms were distributed to boys and girls enrolled in grade 6 at the onset of the school year and a second uniform was delivered a year later if still enrolled in same school regardless of grade. The total education subsidy, delivered over two years, equaled around $12 per student. | Randomized Control Trial  Unit of randomization: School  *Baseline Sample*  Intervention 82 schools  Comparison: 82 schools  19,289 students across arms  *Follow-up*  3-, 5- and 7-years post-intervention  Attrition:  *3 years*  4% female and 4% male  *5 years*  15% female and 9% male  *7 years*  40% female and 33% male | Age: ~13 years  Gender: 49% female; 51% male  Race/ethnicity: Not stated  Socio-economic status: Not stated | **3 years post-intervention**  *Self-report and report by teachers/peers*  Ever pregnant  Female: MD −0.03, SE=0.01  Male: MD −0.002, SE=0.003  **5 years post-intervention**  *Self-report and report by teachers/peers*  Ever pregnant  Female: MD −0.04, SE=0.02  Male: MD 0.005, SE=0.005  **3 years post-intervention**  *Self-report and report by teachers/ peers*  Ever pregnant  Female: MD −0.03, SE=0.02  Male: MD −0.002, SE=0.02  *Biomarker*  HIV positive  Female: MD 0.004, SE=0.01  Male: MD 0.001, SE=0.002  HSV-2 positive  Female: MD 0.01, SE=0.01  Male: MD 0.01, SE=0.01 |
| Promise Place Program (Tolma 2014) | U.S. | Promise Place was a school-based case management intervention to reduce repeat teen pregnancy. Within 3 weeks of enrolment, Family Advocates met with intervention participants to complete an intake assessment and to identify family, personal, and graduation goals. Advocates helped student set up future goals, prioritize needs, and identify needed resource. Advocates spent a minimum of 2 hours/month with students, including home visits (for those on maternity leave or with failing attendance) and individual counselling. When a student graduated, dropped out, or returned to their home-school, they were considered to be in after-care treatment, including support to the students for accessing community resources and promoted continuity of care. | Quasi-experimental study  Unit of randomization: School  *Baseline Sample*  Intervention: 1 school, 64 pregnant students and 76 parenting students  Comparison: 1 school, 47 pregnant students and 16 parenting students  *Follow-up*  24 months post-baseline  Attrition:  Intervention: 44%  Control: 46% | Age:  *13 years*  Intervention: 4%  Control: 0  *14 years*  Intervention: 7%  Control: 5%  *15 years*  Intervention: 13% Control: 16%  *16 years*  Intervention: 17%  Control: 29%  *17 years*  Intervention: 38% Control: 37%  *18 years*  Intervention: 16%  Control: 11%  *19 years or older*  Intervention: 4%  Control: 3%  Gender: 100% female  Race/ethnicity:  *Hispanic*  Intervention: 46%  Control: 70%  *Black*  Intervention: 34%  Control: 13%  *White*  Intervention: 8%  Control: 8%  *American Indian/Alaska Native*  Intervention: 1%  Control: 2%  *Other*  Intervention: 11%  Control: 8%  Socio-economic status (enrolment in Medicaid):  Intervention: 64%  Control: 65% | **24 months post-baseline**  *Self-report*  Currently pregnant  Pregnant at baseline: Control pregnancy-free probability 0.7 (0.4, 0.8)  Intervention pregnancy-free probability 0.9 (0.7, 1.0)  Difference p=0.002  Parenting at baseline: Control pregnancy-free probability  Intervention pregnancy-free probability 0.9 (0.8, 1.0)  Difference p=0.9 |
| South Africa Cash Transfer Program (Pettifor 2016) | South Africa | This intervention was conditional cash transfer program to reduce HIV incidence among young women by increasing school enrolment. Intervention participants received 100 Rands (R), and their parent or guardian received R200 every month, conditional on attending 80% of school days per month. Young women were eligible to receive the cash each month in which they met the attendance criteria as long as they were eligible to attend school and up to a maximum of 3 years. The funds were deposited directly into bank accounts for the young woman and parent or guardian separately. | Randomized Control Trial  Unit of randomization: Individual  *Baseline Sample*  Intervention: 1225 participants  Comparison: 1223 participants  *Follow-up*  12- and 36-months post-baseline  Attrition:  Intervention: 5%  Control: 13% | Age:  *Grade 8*  Intervention: 26%  Control: 25%  *Grade 9*  Intervention: 26%  Control: 28%  *Grade 10*  Intervention: 28%  Control: 27%  *Grade 11*  Intervention: 21%  Control: 20%  Gender: 100% female  Race/ethnicity: Not stated  Socio-economic status (percent with food insecurity):  Intervention: 33%  Control: 35% | **12 months post-baseline**  *Self-report*  Pregnancy  Relative Risk (RR) 0.9 (0.8, 1.2)  Sexual debut  Hazard Ratio per person year (HR) 0.9 (0.8, 1.1)  Condom use  RR 0.8 (0.7, 1.0)  Multiple partners  RR 0.9 (0.7, 1.1)  Partner age (≥25)  RR 0.9 (0.6, 1.1)  **36 months post-baseline**  *Biomarker*  HIV positive  HR 1.2 (0.9, 1.7)  HSV-2 positive  HR 0.9 (0.7, 1.2) |
| Zimbabwe School Support Program (Hallfors 2011) | Zimbabwe | Based on the social development model, the Zimbabwe School Support Program provided support to keep orphan girls in school (therefore, increasing their attachment to school and educational aspirations) to reduce HIV risk. Intervention students received school support, including fees, exercise books, uniforms, and other school supplies (e.g., pens, soap, underpants, and sanitary napkins). Helpers (female teachers) were trained to monitor participants’ school attendance and to assist with absenteeism problems but were not to provide special HIV or life skills training. When girls matriculated to high school, new helpers were selected and trained in the new schools. | Randomized Control Trial  Unit of randomization: School  *Baseline Sample*  Intervention: 13 schools, 184 students  Comparison: 12 schools, 145 students  *Follow-up*  12- and 24-months post-baseline  Attrition:  *12 months*  Intervention: 3%  Control: 4%  *24 months*  Intervention: 7%  Control: 18% | Age: ~12 years  Gender: 100% female  Race/ethnicity: Not stated  Socio-economic status (average number of assets in home, scale of 0-12):  Intervention: 3.2  Control: 3.3 | **12 months post-baseline**  *Self-report*  Sexual debut  Not reported  **24 months post-baseline**  *Self-report*  Sexual debut  GEE -0.3 (non-significant)  *Report from teachers/ peers*  Pregnancy status  Not reported |
| Zomba Cash Transfer Program (Baird 2010, Baird 2012) | Malawi | Theorized to reduce economic risk factors and increase enrolment, the Zomba Cash Transfer Program provided monthly cash transfers to participants and their guardians to reduce risk of sexually transmitted infections. Participants received cash transfers either unconditionally or on the condition that the girl attended school for 80% of the days that school was in session during the previous month. Cash was split between guardian and participant and varied randomly by enumeration area and by individual. School fees were paid directly to school for recipients eligible to attend secondary school. | Randomized Control Trial  Unit of randomization: Enumeration Area  *Baseline Sample*  Intervention: 88 enumeration areas, 727 participants  Comparison: 88 enumeration areas, 1050 participants  *Follow-Up*  12- and 18-months post-baseline  Attrition:  *12 months*  Baseline schoolgirls: 7% Baseline dropouts: 10% (control not reported)  *24 months*  Overall: 4% | Age: 12-22 years (~15.6 years)  Gender: 100% female  Race/ethnicity: Not stated  Socio-economic status: Not stated | **12 months post-baseline**  *Self-report*  Sexual debut  Schoolgirls at baseline:  OR 0.7 (0.4, 1.1)  Dropouts at baseline:  OR 0.7 (0.3, 1.5)  Condom Use  Schoolgirls at baseline: OR 1.1 (0.7, 1.8)  Dropouts at baseline:  OR 0.7 (0.4, 1.2)  Frequency of sex  Schoolgirls at baseline: OR 0.5 (0.3, 0.8)  Dropouts at baseline: OR 0.5 (0.3, 0.9)  Older partner  Schoolgirls at baseline: OR 0.2 (0.1, 0.6)  Dropouts at baseline: OR 0.8 (0.4, 1.5)  Currently pregnant  Schoolgirls at baseline: OR 0.7 (0.4, 1.4)  Dropouts at baseline: OR 0.6 (0.3, 1.1)  **18 months post-baseline**  *Biomarker*  HIV positive  Schoolgirls at baseline: OR 0.4 (0.1, 0.9)  Dropouts at baseline: OR 1.4 (0.7, 2.6)  HSV-2 positive  Schoolgirls at baseline: OR 0.2 (0.1, 0.7)  Dropouts at baseline: OR 1.0 (0.5, 2.2)  Syphilis positive  Schoolgirls at baseline: OR 0.9 (0.1, 6.9)  Dropouts at baseline: OR 1.6 (0.3, 10.0) |

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| Table 2. Risk of Bias Judgments | | | | | | | |
| *Intervention Name* | *Random generation of allocation sequence* | *Allocation concealment* | *Blinding* | *Complete Outcome Data* | *Selective outcome reporting* | *Accounted for clustering* | *Other forms of bias* |
| Aban Aya Project | NC | NC | NC | NC | NC | Yes | Yes |
| Gatehouse Project | NC | NC | NC | NC | NC | Yes | No |
| Kenya Education Subsidy Program | Yes | NC | NC | No | NC | Yes | Yes |
| Kenya School Support Program | Yes | NC | NC | Yes | NC | NC | Yes |
| Positive Action | NC | NC | NC | NC | NC | Yes | No |
| PREPARE | Yes | Yes | No | NC | NC | Yes | Yes |
| Promise Place Program | NA | NA | NC | No | NC | No | Yes |
| Seattle Social Development Project | NA | NA | NC | NC | NC | Yes | No |
| South Africa Cash Transfer Program | NC | Yes | NC | NC | No | NA | Yes |
| Zimbabwe School Support Program | NC | NC | NC | NC | NC | Yes | Yes |
| Zomba Cash Transfer Program | Yes | NC | NC | Yes | No | Yes | No |
| NC = Not clear; NA = Not applicable (because quasi-experimental study) | | | | | | | |