Effects of the school environment on adolescent sexual behaviour: a mixed methods assessment of the theory of human functioning and school organisation

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I, Amy Peterson, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

Context Current school-based strategies to improve adolescent sexual health face logistical and political challenges and have limited long-term impact, possibly because they do not address upstream determinants. The theory of human functioning and school organisation proposes that schools can promote student health by increasing commitment to school through improving school processes and strengthening young people's engagement. While it has been assessed for other health behaviours, this thesis is the first to assess and refine the theory for application to adolescent sexual health.

Methods Three systematic reviews concerning sexual health outcomes were conducted, including a synthesis of qualitative studies of young women's accounts of school experiences, a synthesis of observational studies examining school-related factors, and a meta-analysis of evaluations of school environment and educational assets interventions. A multi-level, longitudinal analysis explored associations of school- and student-level engagement with the school environment and subsequent sexual behaviour.

Results Synthesis of qualitative studies revealed that young women's education and life trajectories were shaped by their commitment to school values, experiences with teachers and curriculum, and perceptions of how to achieve adulthood status. Synthesis of observational studies suggest that some school-related factors, such as enrolment, educational plans, and attitude to school, are associated with subsequent sexual health outcomes. Multi-level analysis indicates that higher levels of school- and student-level commitment to learning, sense of belonging and relationships with teachers are associated with reduced sexual risk behaviour. Meta-analysis provides evidence that school environment interventions may delay sexual debut, while narrative synthesis suggests that educational assets interventions may reduce risk of pregnancy and STIs.

Discussion Findings provide support for the theory as it relates to young people's sexual health. Proposed refinements consider parallel school-student value systems, greater emphasis on school leadership, the developmental context of school experiences and sexual behaviour, and application to varying social and economic settings.

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List of Acronyms

Add Health	National Longitudinal Study of Adolescent to Adult Health
CI	Confidence interval
DALY	Disability adjusted life year
FSM	Free school meals
GPA	Grade point average
HIV	Human immunodeficiency virus
HPS	Health Promoting School
HR	Hazard ratio
HSV-2	Herpes simplex virus-2
IDACI	Income deprivation affecting index
IUD	Intrauterine device
MD	Mean difference
MICE	Multiple imputation by chained equations
MVN	Multivariate normal imputation
OR	Odds ratio
PYD	Positive Youth Development
RCT	Randomised control trial
RR	Risk ratio
SD	Standard deviation
SE	Standard error
SRE	Sex and relationships education
STD	Sexually transmitted disease
STI	Sexually transmitted infection
VAE	Value-added education
WSCC	Whole School Whole Community Whole Child

Chapter 1

Young People's Sexual Health and School-Based Health Promotion

Introduction

Next to the home, young people spend most of their time interacting with peers, teachers and other adults at school. The school has been a primary setting for addressing adolescent pregnancy, sexually transmitted infections (STIs) and sexual risk behaviour globally (Patton et al., 2016). Yet, current school-based sexual health interventions face logistical and political challenges (Forman, Olin, Hoagwood, Crowe, & Saka, 2009; Landry, Darroch, Singh, & Higgins, 2003) and largely focus on modifying individual attitudes, knowledge and skills (Kirby, 2007), which may not be sufficient to sustain outcomes over time (Marseille et al., 2018). One reason is that these programs do not address upstream determinants of adolescent sexual health, such as those that relate to school and education (Viner et al., 2012).

While various models have theorised the link between school and health outcomes, these do not generally address the specific processes within schools that may work to influence health (Allensworth & Kolbe, 1987; Bonell, Dickson, et al., 2016; J. D. Hawkins & Weis, 1985; Langford et al., 2014). The theory of human functioning and school organisation poses that schools can promote student health by improving students' ability for practical reasoning and affiliation, as well as their commitment to learning and the school community (W. A. Markham & Aveyard, 2003). Student commitment can be achieved by strengthening relationships between staff and students, adopting teaching practices and content that is student-centred, and breaking down cultural boundaries between schools and the external communities to which the students belong. The theory has been assessed in the context of other adolescent health behaviours but not sexual health (Aveyard et al., 2004; Bisset, Markham, & Aveyard, 2007; Bonell et al., 2017; W. A. Markham et al., 2008; W. A. Markham, Young, Sweeting, West, & Aveyard, 2012; Tobler, Komro, Dabroski, Aveyard, & Markham, 2011).

The aim of this thesis is, for the first time, to assess the theory of human functioning and school organisation as it relates to young people's sexual health. Using a mixed methods approach, I explore to what extent the theory applies to students' sexual health behaviour and outcomes. The first chapter provides background on the current state of adolescent sexual health, the role of school-based interventions in promoting sexual health and an overview of common theories used to inform school-based interventions. I then review the theory of human functioning and school organisation as a potential alternative theory for addressing school-related determinants of health, followed by the aims of this thesis. Chapter 2 describes the methods used to achieve these aims, including an overview of my ontological and epistemological approach and summaries of the methods for three systematic reviews and a multi-level analysis of longitudinal data.

Findings are presented in Chapter 3-6. Chapter 3 describes results from a systematic review and synthesis of qualitative studies exploring the role of school experiences on young women's sexual health decisions. Chapter 4 reviews observational studies examining the associations of school- and individual-level school-related exposures and adolescent sexual health. Chapter 5 describes findings from a longitudinal analysis, using data from 20 English secondary schools enrolled in the control arm of a randomised control trial (RCT), that explores whether school- and student-level measures of engagement with the school environment are associated with subsequent sexual behaviour. Chapter 6 presents findings from a systematic review and meta-analysis on the effects of interventions addressing the school environment and educational assets on sexual health outcomes. Each chapter considers the implications of their findings for assessing the theory of human functioning and school organisation in relation to adolescent sexual health. Chapter 7 synthesises these findings by presenting a summary of results, considering the limitations of the studies, identifying refinements to theory of human functioning and school organisation for sexual health based on empirical findings and discussing implications for research, policy and practice.

Adolescent sexual health, pregnancy and sexually transmitted infections

Adolescence is a critical period for health. Young people experience biological, cognitive and social transitions that influence health behaviours and outcomes in adolescence and carry into adulthood (Patton et al., 2016; S. M. Sawyer et al., 2012). The world is currently experiencing the largest population of adolescents in history (UNFPA, 2014), suggesting that countries which devote resources to the health of their young people could experience a substantial return on their investment in reduced health care costs and increased economic productivity (Sheehan et al., 2017). To see this return, communities must re-orient their strategies to

address health issues that primarily impact young people, such as mental health, tobacco use, injuries, and sexual and reproductive health (Mokdad et al., 2016).

At the 1994 International Conference on Population and Development, the international community defined sexual and reproductive health as 'not merely the absence of disease' but 'a state of complete physical, mental and social well-being' related to sexual and reproductive functions and processes (United Nations, 2014, p. 59). Since then, research has advanced our understanding of sexual and reproductive health (World Health Organization, 2017). In particular, social determinants – such as education, child marriage and gender-based violence – are now recognised as critical factors for addressing adolescent sexual and reproductive health, and health and wellbeing generally (Patton et al., 2016). Building on this research and previous definitions, the Guttmacher-*Lancet* Commission on Sexual and Reproductive Health and Rights asserted that sexual and reproductive health cannot be disentangled from the realisation of sexual and reproductive rights, which include the freedom to decide whether and when to be sexually active, to choose sexual partners, and to decide whether, when and by what means to have children (Starrs et al., 2018). Further, the Commission extended their definition to include components of relationships, such as trust and communication, that are key to sexual and reproductive health. Due to the social and sexual transitions occurring during puberty, adolescence represents 'a window of opportunity' for learning about sexual relationships and behaviour (Suleiman 2017), and for establishing sexual health knowledge, skills and practices that young people will use to form and navigate relationships and health as adults (Suleiman, Galván, Harden, & Dahl, 2017). This thesis focuses on the measurable outcomes of adolescent sexual and reproductive health and their proximal, behavioural determinants, including pregnancy and parenthood, STI including HIV outcomes, age of sexual initiation, frequency of sexual intercourse (anal, oral or vaginal), contraception and condom use, and number of lifetime sexual partners. While holistic definition of sexual and reproductive health includes young people's knowledge of sexual health functions and processes, as healthy attitudes towards sexuality, as well as skills for sexual decision-making, measures of knowledge, attitudes and skills are not sufficient for determining whether interventions are effective at modifying sexual health and behavioural outcomes (Denford, Abraham, Campbell, & Busse, 2017; Kirby, 2007), and therefore are not included in the focus of this thesis.

Adolescent sexual health outcomes

Despite efforts to establish sexuality as normative and sexual health as positive, sexual health is typically measured in terms of risk, such as by rates of unintended pregnancy, STIs and HIV/AIDS. Unintended and teen pregnancy are associated with a range of health and social outcomes for women. Almost 4 million unsafe abortions occur each year among girls age 15-

19 years old (Darroch, Woog, Bankole, & Ashford, 2016). Girls under 20 are more likely than older women to use unregulated health providers and to die from abortion-related complications (Woog, V, Singh, Browne, & Philbin, 2015). Globally, complications from pregnancy and childbirth are a leading cause of death for girls age 15-19 years (World Health Organization, 2016).

In addition to health consequences, adolescent parenthood may disrupt educational trajectories, especially postsecondary attainment with possible economic repercussions. (Sonfield, Hasstedt, Kavanaugh, & Anderson, 2013). However, there is inconsistent evidence that adolescent childbearing affects workforce participation and while adolescent mothers are more likely to experience immediate and long term decreases in income, it is unclear whether these effects are the result of adolescent parenthood or prior social disadvantage (Ashcraft, Fernández-Val, & Lang, 2013; J. M. Fletcher & Wolfe, 2009). The educational and economic benefits of delaying parenthood may be highest among young women with economically advantaged backgrounds (Diaz & Fiel, 2016; Sonfield et al., 2013), though adolescent pregnancy and childbearing appears to impact completion of secondary school for all young women (Diaz & Fiel, 2016).

Unintended pregnancies are defined as pregnancies that occur when a woman either wanted a pregnancy in the future but not at the time she became pregnant (wanted later) or did not want to become pregnant then or at any time in the future (unwanted) (Kost, Maddow-Zimet, & Arpaia, 2017). About half (49%) of pregnancies among adolescent women ages 15-19 are unintended in developing regions, with half ending in abortion (Darroch et al., 2016). Birth rates in these regions tend to be much higher than in high-income countries (Sedgh, Finer, Bankole, Eilers, & Singh, 2015), with some reports indicating 1 in 5 women in low and middle income countries give birth before the age of 18 (Patton et al., 2016). Among countries with available data, countries in sub-Saharan Africa consistently reported birth rates of over 90 per 1000; next to this region, Mexico recorded the highest birth rate at 68 per 1000 (Sedgh et al., 2015).

In recent history, the United States and United Kingdom had two of the highest pregnancy and birth rates among high-income countries (Sedgh et al., 2015), though pregnancy and birth rates have steadily declined over the last 15 years. The U.S. adolescent pregnancy rate dropped from 68 in 2008 to 43 per 1000 in 2013, representing a 36% reduction and the lowest rate in 80 years (Kost et al., 2017). The birth rate followed a similar pattern with a drop from 41.5 in 2007 to 18.8 per 1000 women ages 15-19 in 2017, a 55% decline (Martin, JA, Hamilton, Osterman, M.J.K., Driscoll, & Drake, 2018). Similarly, the United Kingdom experienced declining pregnancy and birth rates. Among young women ages 15-19, there were 34.3 conceptions and 13.7 births per 1000 women in 2016, almost half of what there

were in 2006 (Office of National Statistics, 2018b; Office of National Statistics, 2018a). Despite improvements, the U.K. still has a higher national birth rate than the EU average of 5.6 births per 1000 women under 18 years old (Office of National Statistics, 2018b).

While pregnancy and birth rates have fallen across all racial groups in the U.S., there is little evidence for narrowing of disparities between groups. For example, black women were 2.6 times more likely than white women in 2013 to report a pregnancy between ages 15-19, compared to 2.7 in 1991 (Kost et al., 2017). Across settings, low socio-economic or educational status further increases the risk of teen births among all racial and ethnic groups (Penman-Aguilar, Carter, Snead, & Kourtis, 2013; Scott, Bajos, Slaymaker, Wellings, & Mercer, 2017). These disparities are amplified depending on the community or region where a young person resides (Kost et al., 2017; NHS National Services Scotland, 2018). Further, unintended pregnancy remains a concern. Among adolescents under 20, almost half (45.2%) of pregnancies in Britain (Wellings et al., 2013) and between 60-80% of pregnancies in the U.S. (Kost et al., 2017) were unplanned.

Maternal disorders are the fourth highest leading cause of death for females aged 15-19 years old, directly preceded by death resulting from HIV/AIDS (Mokdad et al., 2016). Though declining, approximately 250,000 adolescents are newly infected with HIV each year, two thirds of which are adolescent girls (UNAIDS, 2015). Most new adolescent infections come from eastern and southern Africa, followed by Asia and the Pacific, and western and central Africa. While only a fraction of new HIV cases are diagnosed among young people ages 15-24 in the U.K. (2.54%) (Nash et al., 2018), young people in the U.S. account for 21% of all new HIV diagnoses in 2016, disproportionately affecting black and Latinx males (Centers for Disease Control and Prevention, 2018a). The transmission or complications of HIV may be exacerbated by co-occurrence of other STIs. In 2008, WHO reported 489 million new diagnoses of curable STIs among adolescents and adults ages 15-49 (World Health Organization, 2012). Reports from the U.S. and the U.K indicate young people 15-24 account for half of all new cases of STIs (Satterwhite et al., 2013; *Sexually transmitted infections (STIs): Annual data tables*, 2018). After declining for several years, an increase was observed in rates of chlamydia, gonorrhoea and syphilis among American 15 to 19 year old adolescents (Centers for Disease Control and Prevention, 2018b). In the most recent study of sexual behaviour in the U.K., 5.6% of young men and 10.9% of young women ages 16-24 reported a STI diagnosis in the last 5 years (Khadr et al., 2016). When left untreated, STIs can lead to reproductive health problems, including infertility, pre-term labour and cancer, and can facilitate the transmission of other STIs, such as HIV infection (Gottlieb et al., 2014).

Adolescent sexual risk behaviour

Across the globe, sexual activity begins during adolescence, with the average age of first intercourse typically occurring between ages 15 and 19 (Wellings et al., 2006). Early sexual debut (typically, defined as prior to age 15) is associated with later sexual risk behaviours and outcomes, including increased number of sexual partners, adolescent pregnancy and STI diagnosis (Heywood, Patrick, Smith, & Pitts, 2015). Patterns of early sexual experience vary between countries. Among 15-24 year olds across countries in sub-Saharan Africa and Latin America defined as multi-burden (i.e., ≥ 2500 DALYs per 100,000 per year caused by infectious diseases, undernutrition, HIV and poor sexual health), between 10-20% reported having sex prior to the age of 15 (Patton et al., 2016). Another estimate among low- and middle income countries reported young women's rates of sexual debut before 15 years ranged regionally from 0.3% (West Asia) to 13.4% (sub-Saharan Africa) (Santhya & Jejeebhoy, 2015). In high-income countries, rates of early sexual intercourse (age 15 or prior) range from 5.7% (Slovenia) to 36% (Denmark) among young women and 10.8% (Slovenia) and 31.8% (Denmark) among young men (Madkour et al., 2014; Martinez & Abma, 2015; Rottermann, 2012). Disparities within countries exist as well. For example, people in the U.K. who identified as Black Caribbean were more than three times as likely to report having sex prior to the age of 16 than those who identified as White British (adjusted odds rate 3.60 [1.97, 6.91]) (Wayal et al., 2017). Similarly, the U.S. rate for sexual initiation prior to age 13 was almost four times higher among Indigenous (8.4%) and African American (7.5%) high school students than among white high school students (2.1%) (Centers for Disease Control and Prevention, 2017).

Unsafe sex is the second leading risk factor for health loss (i.e. incident DALYs) and twelfth leading risk factor for death among 15-19 year old adolescents (Mokdad et al., 2016). Approximately, 20 million girls aged 15-19 years in developing regions have an unmet need for modern contraception, ranging from 38% of young women in Latin American and the Caribbean to more than 60% in Africa and Asia (Darroch, Woog, Bankole, & Ashford, 2016). While condoms are reported as the most common contraceptive choice (38%), fewer adolescents use or have access to other forms of contraception, such as the pill (27%), injectables (19%), implants (8%) and IUDs (5%) (Darroch et al., 2016). These data also suggest that fewer than half of young people are benefiting from STI prevention provided by using condoms (Darroch et al., 2016), including in higher risk situations, such as having two or more partners in the past year (Patton et al., 2016).

Contraception use is generally higher in high-income countries. Across 23 European countries and Canada, more than 80% of sexually active teens used contraception the last time they had sex (Godeau et al., 2008). Condom use ranged from 39.3% (Belgium) to 85.7% (Greece) and dual use (use of condoms and another form of contraception) ranged from 3.5%

(Greece) to 31.1% (Netherlands) (Godeau et al., 2008). However, young people in high-income countries still engage in unsafe sexual behaviour. Almost half (46.2%) of U.S. high school students did not use a condom the last time they had sex (Centers for Disease Control and Prevention, 2017) and approximately 23% of young people ages 16-24 in the U.K. did not use a condom the first time they had sex with a new partner in the last year (Khadr et al., 2016). Further, rates of contraceptive use are lower among disadvantaged groups within high-income settings. In Britain and France, young people under 20 from disadvantaged socio-economic backgrounds are less likely to use contraception at first sex than their middle and higher socio-economic counterparts (Scott et al., 2017). While disparities in contraception use have narrowed in recent years, white students continue to report higher rates of using highly effective forms of birth control (e.g., birth control pill, implant, IUD, etc.) than African American high school students in the U.S. (Centers for Disease Control and Prevention, 2017).

Persistent disparities across countries and communities demonstrate the continued need for addressing sexual behaviours and health outcomes in adolescence. With more than 1.8 billion adolescents worldwide, investments and strategies must focus on reaching the greatest number of young people.

School-based responses to adolescent sexual health

Next to the home, young people spend most of their time in school (U.S. Bureau of Labor Statistics, 2018). More than 590 million adolescents are enrolled in secondary school globally (UNESCO Institute of Statistics, 2019). Due to compulsory education, most will remain in school until middle or late adolescence (European Commission, EACEA, & Eurydice, 2018; UNESCO, 2017), providing schools with opportunities to engage young people. Secondary school, and in some cases primary school, is also experienced at the point of developmental transitions in cognitive and social skills (Crone & Dahl, 2012) and the formation of personal identity outside the family of origin (Patton et al., 2016; Suleiman et al., 2017). These key transformational processes suggest that schools play a role in adolescent development beyond the scope of preparing students for future education and career. Schools serve as an important social context in which young people develop and practice social skills (such as emotional regulation) with their peers and teachers, preparing them for relationships in later adolescence and adulthood (Sawyer 2012). Further, adolescents will develop social affiliations with their peers, who may influence their attitudes about sex (van de Bongardt, Reitz, Sandfort, & Deković, 2015) or with whom they may engage in sexual activity (Suleiman & Brindis, 2014). For these reasons, schools are promising environments for supporting adolescent health.

Internationally, sexuality education has been prioritised as the key school-based strategy for sexual and reproductive health promotion among young people (Patton et al., 2016).

Sexuality education is a curriculum-based approach to teaching knowledge, attitudes and skills related to the 'cognitive, emotional, physical and social aspects of sexuality' (UNESCO, 2018, p. 16). Sexuality education is considered to be 'comprehensive' when it includes a breadth of topics (including all methods of pregnancy and STI prevention), encompasses a holistic understanding of sexuality beyond sexual behaviours, and is based on a human rights approach (UNESCO, 2018). Numerous systematic reviews exist on the effectiveness, cost-effectiveness and implementation of sexuality education programs focused on sexual health. These reviews systematically conclude from moderate quality evidence that comprehensive sexuality education programs have an effect on sexual behaviour, including delay of sexual initiation, reduced number of partners, and increase in contraceptive or condom use (Chin et al., 2012; Fonner, Armstrong, Kennedy, O'Reilly, & Sweat, 2014; Goesling, Colman, Trenholm, Terzian, & Moore, 2014; B. T. Johnson, Scott-Sheldon, Huedo-Medina, & Carey, 2011; Kirby, 2007). While programs are rarely evaluated in terms of effects on biological markers of STIs or HIV, moderate quality evidence suggests an effect on delay of pregnancy (Harden, Brunton, Fletcher, & Oakley, 2009; Oringanje et al., 2009). In addition to these effects, comprehensive sexuality education fulfils the statute for young people's human right to accurate information about their development and health (UNFPA, 2015).

However, there are challenges to implementing and sustaining curriculum-based health interventions in schools. As governments adopt formalised core subject standards and testing, time in school available for health education is further limited. Indeed, only 38.3% of a representative sample of schools across U.S. states reported teaching all 19 sexual health topics recommended by the Centers for Disease Control and Prevention in high schools (Brener et al., 2017). In a qualitative study examining program sustainability, a third of intervention developers cited time during the school (33%) and competing school priorities (29%), including the school's focus on academic testing as required by federal policy (29%), as barriers to implementing school-based health and social behaviour interventions (Forman et al., 2009). Recent developments in the field of sex education also point to the need for sexual health programs to address emerging concerns, such as young people's exposure to sexually explicit material during adolescence (Koletić, 2017) and accounts of sexual coercion and peer trafficking (Anderson, Coyle, Johnson, & Denner, 2014; Kann et al., 2018). These topics add to a growing a list of core content and skills health education and sexual health experts have identified as necessary for basic sex education (Future of Sex Education, 2011), indicating that an add-on approach to the teaching of sexual health topics in schools will remain an implementation challenge.

There are also political barriers. A third of developers in the Forman et al. study (2009) also cited the beliefs by school personnel about interventions as implementation obstacles. While parental support for sexuality education in some settings appears to be high regardless

of personal ideological orientation (Kantor & Levitz, 2017), curriculum-based interventions are particularly challenging to sustain in areas with conservative education policies or cultural norms (Guttmacher Institute, 2015; Power to Decide, 2013; Landry et al., 2003). Further, despite consistent evidence that abstinence-only programs do not impact most behavioural, or any pregnancy or STI outcomes (Chin et al., 2012; B. T. Johnson et al., 2011; Kirby, 2007; Santelli et al., 2017), countries and communities continue to devote funding to programs that promote fear-based messages and fail to cover critical information about accessing contraception, abortion and other sexual health services (Keogh et al., 2018; SIECUS, 2018; UNESCO, 2012). Funding for abstinence-only programs may even have a harmful effect in areas where policies are conservative and pregnancy and birth rates are already high (Fox, Himmelstein, Khalid, & Howell, 2019). The influence of political context is particularly felt by students who do not fit into 'traditional' gender norms or sexual orientations. Sex education has largely ignored or marginalized the experiences of lesbian, gay, bisexual, transgender, and queer and questioning (LGBTQ) youth (Schalet et al., 2014), exacerbated by contexts in which harmful messages about LGBTQ people are encouraged or mandated (Guttmacher Institute, 2019) and where bullying victimization has not been addressed (Human Rights Campaign, 2018). Yet, emerging research shows that the provision LGBTQ-inclusive sex education may reduce adverse mental health outcomes and bullying victimization among LGBTQ-identified youth (Proulx, Coulter, Egan, Matthews, & Mair, 2019).

Even when comprehensive sexuality education is adequately and responsibly implemented, curriculum-based approaches may not be sufficient to sustain sexual behaviour change over time (Kirby, 2007). Many behavioural effects from sexuality education diminish a year after the intervention ends (Marseille et al., 2018). Because the primary aim is to modify knowledge, attitudes and skills of individual students (UNESCO, 2018), these programs may not adequately target the broader social determinants of health required for sustainability of sexual health outcomes, such as access to health care, education, safe and supportive schools and families, and networks of peers with pro-social norms and attitudes (Viner et al., 2012). Indeed, the persistence of disparities in sexual behaviour and health outcomes between socio-economic and racial and ethnic groups (Kost et al., 2017) suggests that a curriculum-focused approach fails to address the inequities experienced by socially disadvantaged youth. Other school-based interventions have attempted to address more distal determinants of health, such as access to health care. School-based health centres aim to increase the provision of onsite or linked offsite health and social services to students, especially those who do not have access to care through private insurance (Mason-Jones et al., 2012). While considered a promising intervention (Patton et al., 2016), there is a lack of high quality evidence on the impacts of school-based health centres on contraception, pregnancy or STI outcomes (Shackleton et al.,

2016), despite reports that these centres overwhelmingly provide relevant sexual health services (School Based Health Alliance, 2015).

Like sexuality education, school-based health centres primarily focus on modifying proximal health risk behaviours, such as contraception use. Neither curriculum-focused nor school-based health centres, however, fully consider the role of school as an upstream determinant of sexual health. Given competing academic priorities and the ideological resistance to sexual health programs, there may be a key role for school-based interventions that, in addition to sexual health, also address other outcomes fundamental to school functioning (such as academic achievement) and require little if any curriculum time. Therefore, this thesis focuses on how the process and functioning of schools, as well as the assets or attributes that result from receiving formal education, influences young people's sexual health.

Theories on the role of school and education in sexual health

The basis for much of current work on the health potential of the school environment comes out of the WHO Ottawa Charter for Health Promotion of 1986, which called for a multi-component strategy for promoting health (*The Ottawa Charter for Health Promotion*, 1986). In addition to public policy and health services, the Charter recommends actions to create supportive environments that enable safe and satisfying living conditions, strengthen communities to advocate for and develop local opportunities for promoting health, and cultivate the knowledge and skills needed by individuals to make health-promoting choices. The values outlined in the Charter became the basis for the Health Promoting School (HPS) movement (Burgher, Barnekow Rasmussen, & Rivett, 1999). Though many variations have been recorded, the HPS framework typically describes a multi-level approach to health promotion in school settings, including a focus on the school curriculum, the school environment, and broader community engagement (Langford et al., 2014). Simultaneous efforts have produced similar models, such as the Coordinated School Health Program and Whole School, Whole Community, Whole Child (WSCC) models in the U.S., school- and community-based initiatives encompassing health education, health services and a healthy school environment (Allensworth & Kolbe, 1987; Lewallen, Hunt, Potts-Datema, Zaza, & Giles, 2015). Versions of HPS and WSCC outline how different levels of the school might impact health (IUHPE, 2009; Lewallen et al., 2015). Through health education and social and emotional learning, students learn the knowledge and skills to understand, negotiate and make healthy choices. The school's environment is addressed through policies and practices that ensure 1) students' physical safety from violence or environmental hazards; 2) opportunities to engage in physical activity and healthy eating; and 3) a positive social climate based on the quality of student and staff relationships (IUHPE, 2009; Lewallen et al., 2015). Schools must

also engage with the families of their students and the broader community by creating opportunities for input and participation in health-related activities. In the WSCC and some versions of HPS (IUHPE, 2009), school-based or -linked services address the physical and emotional health of students, their families and school staff.

Both HPS and the WSCC models have been adopted by national and international bodies (ASCD and CDC, 2014; WHO and UNESCO, 2018; Burgher et al., 1999), representing a global call to recognise the role of school environments, not just health education and services, on student health. However, because of the emphasis on broader student health, few have adopted these models as specific theoretical frameworks for promoting adolescent sexual health.

Positive Youth Development (PYD) has also been promoted as a promising approach for preventing or reducing risk behaviours in youth, including sexual risk behaviours (Centers for Disease Control and Prevention, 2010; Department for Education, 2010; Office of the Assistant Secretary for Health, 2015; Patton et al., 2016). While there are numerous descriptions in the literature, PYD can be generally described as offering opportunities for young people to accrue positive developmental assets, which enable them to make a contribution to their community, as well as protect them from negative health and social outcomes (Bonell, Dickson, et al., 2016). Specifically, positive assets allow young people to avoid or reduce the impact of risk behaviour, either through the accumulation of many assets or the development of a specific asset which addresses a particular risk behaviour (Bonell, Dickson, et al., 2016). Schools are considered a key environment in which assets can be built and utilised (Perkins, Borden, & Villarruel, 2001). Aspects of the school environment (school climate, relationships with caring adults, school boundaries, school activities, and high expectations and positive recognition from teachers) and personal disposition towards school (academic and intellectual achievement, belief in future education, caring about school and teachers, and involvement in activities) are considered positive assets that young people can build and use to resist risk behaviour, such as sexual activity (P. L. Benson, Scales, & Syvertsen, 2011; Catalano, Berglund, Ryan, Lonczak, & Hawkins, 2004). While extensive detail is provided on the positive assets needed by young people, the literature is not explicit or systematic about the ways assets cause young people to avoid or reduce risk behaviour (Bonell, Dickson, et al., 2016). Further, there are inconsistencies across descriptions of how PYD operates, making it difficult to implement as well as assess PYD theory in practice (Bonell, Dickson, et al., 2016).

The social development model (J. D. Hawkins & Weis, 1985) describes more specific pathways for how schools might contribute to young people's behavioural decision-making. The model posits that effective socialisation will strengthen young people's bonds to

conventional institutions which, in turn, will reinforce beliefs in the conventional order, leading to pro-social behaviours (J. D. Hawkins & Weis, 1985). Along with the family and peers, school is considered the most important context for socialisation. To be effectively socialised and bonded, young people must: perceive opportunities for pro-social behaviour; be involved in pro-social activities; possess the social, emotional and cognitive skills to engage with pro-social groups and increase chances of reward from that group; and perceive adequate recognition and reward from their behaviours (Cambron, Catalano, & Hawkins, 2019). Anti-social behaviour results from affiliation with anti-social groups or when bonding with pro-social groups is not sufficiently achieved (Cambron et al., 2019). While several studies have described the social development model as the theoretical basis for intervention addressing sexual health (Cho et al., 2011; J. D. Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999), the model seems primarily to apply to delinquency, substance use and violence, and is not explicit about what constitutes pro- or anti-social behaviours. In addition, the model may not adequately account for when conventional institutions, such as the school, perform actions perceived as pro-social but, in fact, cause harm to some students (Bonell, Fletcher, et al., 2013). This thesis explores the theory of human functioning and school organisation which, unlike PYD and the social development model, has not been previously studied in the context of adolescent sexual health.

Theory of human functioning and school organisation

While both PYD and the social development model consider school to be an important context and factor for health decisions, they do not explicitly describe the processes by which schools work to influence health. Drawing from Nussbaum's theory of human functioning (Nussbaum, 1990) and Bernstein's theory of cultural transmission (Bernstein, 1975), Markham and Aveyard proposed a new theory of health promoting schools that aims to provide explicit rationale for how school's institutional processes contribute to student health (W. A. Markham & Aveyard, 2003). To distinguish from previous frameworks of health promoting schools (i.e. WHO HPS framework, WSCC) which do not describe specific theoretical pathways (Langford et al., 2014), Markham and Aveyard's theory is known as the theory of human functioning and school organisation (Bonell, Fletcher, et al., 2013). The theory of human functioning and school organization (Figure 1.1) posits that the primary aim of schools in the promotion of health is to increase students' capacity for practical reasoning (i.e., the ability to critically reflect and engage in operational thinking) and affiliation (i.e., the ability to create mutually beneficial relationships and a socially-valued identity). These capacities are crucial for developing the self-esteem, support systems and skills needed to make pro-active and adaptive decisions about health and well-being. Students who are 'committed' have the most potential for realizing these capacities because they have a

commitment to learning (i.e., to the school's instructional order) and the school's community and values (i.e., the regulatory order). Students may be unable to fully realise these capacities if they do not share the values of the school (i.e., 'detached' students), are not interested in or capable of achieving instructional demands (i.e., 'estranged' students), or both (i.e., 'alienated' students). The theory suggests that development of these capacities during adolescence is key for future health and well-being.

Markham and Aveyard (2003) propose that schools must focus on their organisational systems and relationships within those systems in order to build both students' commitment to school and their capacities for practical reasoning and affiliation. Specifically, schools must 'weaken' classifications (i.e., boundaries) and framing (i.e., communication through pedagogy and curriculum) in four key areas in order to be health promoting:

- *School-community boundaries* – Students' commitment to the regulatory orders of the school can be increased by aligning the values of the school with those of the communities to which students belong. To do this, schools must weaken boundaries by involving families, community leaders and other stakeholders in school decisions and activities. Students who are detached or alienated will, thus, have a better chance for developing capacities for affiliation and practical reasoning.
- *Teacher (and other school staff)-student relationships* – Both practical reasoning and affiliation can be built by increasing students' participation in school decisions (such as through staff/student councils) because both students and teachers will gain greater understanding of each other's potentially differing priorities and values.
- *Student-student relationships* – Improved relationships between students can be achieved through reducing 'celebrated hierarchies' (e.g., school years), improving communication and providing opportunities for co-operation. This might include incorporating more discussions and interactive activities into pedagogy, which increase practical reasoning through self-reflection and affiliation through a greater understanding each other's perspectives.
- *Academic boundaries and student-centred practices* – Traditional boundaries in the curriculum can be weakened and increase practical reasoning abilities by introducing cross-curricular themes and encouraging students to explore how knowledge is socially constructed. Practical reasoning might also be cultivated by involving students in curriculum and pedagogical choices, enabling them to practice coping with challenges and mobilizing resources.

The theory suggests these mechanisms as actions which schools can use to alter their structure or practices to increase commitment to school, improve students' capacity for practical reasoning and affiliation, and affect young people's health behaviours and outcomes.

For example, schools may focus their efforts on involving students in school decision-making by introducing a school action team. Students on the team will learn more about how the school is run and their role within the school community and gain experience in providing realistic input and negotiating action; staff and teachers will learn more about students' perspectives on how the school should be run and be better able to meet their needs. Students will, in turn, feel a greater sense of school commitment because of their role in school decision-making and because actions are reflective of their needs or preferences. In addition, students will use the communication and perspective-taking skills they developed as part of the action team in developing future relationships, including expressing and negotiating their health needs, thus improving their quality of life and health. The effects of these capacities are potentially lifelong. Markham and Aveyard (2003) argue that students who are committed are more likely to go on to higher education (where their capacities will continue to be nurtured), have better incomes and higher social status, all of which contribute to health and well-being.

Markham (2015) later specified how classification and framing might manifest in adolescent health behaviours. He argued that schools which are strongly classified and strongly framed are more likely to invest the instructional order and, therefore, alienate students without the skills or desire to attain academically, thus, leading to more noncommitted students and increased rates of substance use. Weakly classified and weakly framed schools, however, are concerned with the social and personal development of students over their academic attainment, and thus create more opportunities for students to be valued within the school's pro-social system, producing lower rates of substance use. However, refinements to the theory based on quantitative and qualitative research from subsequent investigations suggest that some stronger boundaries may be worth maintaining when they promote practical reasoning, affiliation and autonomy, such as when a teacher uses their authority to manage classroom time to promote learning while providing students with

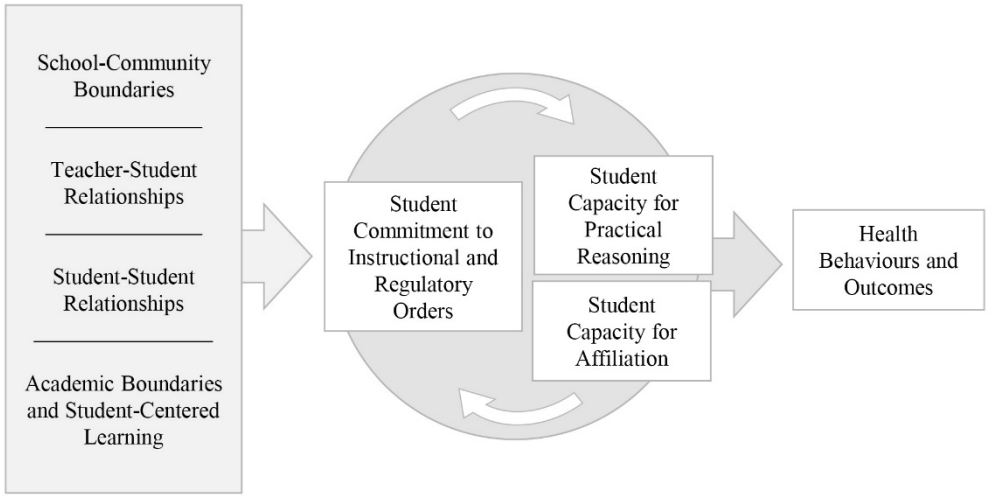

Figure 1.1: Theory of human functioning and school organisation

opportunities to direct their own learning (Bonell, Fletcher, Jamal, Aveyard, & Markham, 2016). These investigations also provide further insight into whether students may form their own parallel instructional and regulatory orders within school settings. It is theorized that when these parallel student orders are in opposition to the instructional and regulatory orders of the school, students may be motivated by the norms of their peers to learn and engage in health risk behaviours (Bonell, Fletcher, et al., 2016).

The theory of human functioning and school organisation differs from other school-related models on health in that the emphasis is on how schools can change to improve health. Both PYD and the social development model emphasise youth empowerment and the development of youth assets and skills. These models also make the assumption that school is already a pro-social environment. The theory of human functioning and organisation starts from the position that schools must alter their systems in order for students to realise essential abilities and skills for good health. As a result, they provide very specific mechanisms by which schools work to influence health. Further, while Markham and Aveyard (2003) acknowledge that some specific knowledge regarding health is important, they contend that a school does not need to adopt a health education curriculum in order to be considered health promoting, a key difference between this theory and the HPS and WSCC models. Where health information is included, they argue education should focus on the development of skills for 'collective action,' rather than skills to resist social pressure (a key feature of many school-based sex education curricula). This is in recognition of the potential effects of social disadvantage on students' health both during and after they leave school.

Previous studies have empirically assessed the theory of human functioning and school organisation in relation to smoking, drug use, drinking, and misbehaviour (Aveyard et al., 2004; Bisset et al., 2007; Bonell et al., 2017; W. A. Markham et al., 2008, 2012; Tobler et al., 2011) but sexual health has not been assessed. However, observational research suggests that school-related factors, such as those proposed by the theory, are associated with sexual health outcomes. Longitudinal analyses indicate a temporal relationship between youth who reported caring adult relationships at school (McNeely & Falci, 2004), higher levels of school attachment (McBride et al., 1995; Paul, Fitzjohn, Herbison, & Dickson, 2000; Rink, Tricker, & Harvey, 2007), more school involvement (Lauritsen, 1994), positive attitude to school (Bonell et al., 2005; Kogan et al., 2013), high educational expectations and aspirations (Henderson, Butcher, Wight, Williamson, & Raab, 2008; Lauritsen, 1994; Paul et al., 2000), higher academic achievement (House, Bates, Markham, & Lesesne, 2010) and lower rates of sexual risk behaviour. These collective findings suggest that it is at least plausible that the theory of human functioning and school organisation applies to young people's sexual health.

Thesis Aim

The aim of this thesis is to consider, assess and, ultimately, refine the theory of human functioning and school organisation for application to young people's sexual health. Given the logistical and political challenges communities currently face in delivering school-based programs such as comprehensive sexuality education, there is potential for schools to approach health promotion by addressing the upstream determinants of adolescent sexual health as a complement to current strategies. As well as potentially being more effective, upstream-focused interventions may have less reliance on space in school timetables, be politically less controversial and potentially meet other priorities of schools, such as promoting academic attainment. Other models have theorised the influential role of school on sexual health but fail to specify the organisational processes schools can modify to improve outcomes. The theory of human functioning and school organisation provides a clear framework and set of pathways that can be assessed and explored. This has been done for a range of risk behaviour outcomes, but not for sexual health. This thesis contributes to the overall assessment of the theory of human functioning and school organisation on student health, as well as to the broader discussion on the role of schools and education on young people's sexual health. To provide a comprehensive assessment of the thesis aim, the following research questions are answered:

1. *What do existing qualitative studies suggest about how school experiences and educational assets are implicated in young women's accounts of their attitudes and actions relating to sex, contraception, pregnancy and parenthood?*
2. *What do existing observational studies suggest about the associations between school-related factors at the individual- and school-levels and subsequent sexual health outcomes?*
3. *What are the multi-level associations between proxy and direct measures of student engagement in school (value-added education and student-reported academic commitment, sense of belonging, relationships with teachers, and participation in school) with adolescent sexual behaviour outcomes (sexual debut and contraception use)?*
4. *What do existing experimental and quasi-experimental studies indicate about the effects of interventions that aim to modify school environments and/or student educational assets on the sexual behaviour and sexual health outcomes of students ages 10-19?*

Each component of the thesis makes a unique contribution to assessing the theory in relation to adolescent sexual health. The rationale for these questions, and the methods used to answer them, are further explored in the next chapter after a discussion of the ontological and epistemological perspective of this thesis.

Chapter 2

Methods

Introduction

This chapter begins with a discussion of the ontological and epistemological assumptions underlying the research conducted in this thesis, including the use of mixed methods to assess the theory of human functioning and school organisation. I then review the methods used for achieving the thesis aims, including methods used for three systematic reviews and syntheses and a multi-level analysis of a longitudinal dataset.

Ontological and epistemological approach to mixed methods

While there has been extensive debate over the last century, it is now generally accepted that social phenomena cannot be studied in the same way as natural phenomena has been studied in the biological and physical sciences (Phoenix et al., 2013). This is because social phenomena are constructed and given meaning by human actors who possess some structurally-constrained agency (Giddens, 1986). The debate has sometimes been characterised as one between 'positivism' and 'interpretivism.' As described in social science literature, positivists assume there is a stable social reality, choose to focus on observable phenomenon, and strive for a unity of method between social and natural science as well as value-free inquiry (Green & Thorogood, 2013). Interpretivists, on the other hand, assume that there is no underlying social reality independent of the perceptions of individual social actors, choose to focus on understanding how the world is perceived by those social actors, and view the production of social scientific research as reflecting the active role of the researcher, including their personal values (Blaikie & Priest, 2017). Much of the debate has translated to discussion of the appropriate use of qualitative and quantitative methods (Phoenix et al., 2013).

My ontological perspective is most closely aligned with that of the cautious realist[*] (Blaikie, 2007; Blaikie & Priest, 2017). I share the belief with interpretivism that social scientific accounts, unlike natural scientific accounts, must engage with how reality is described by those engaged in producing it. For example, social scientific research on how schools influence adolescent sexual health should engage with how actors understand concepts such as 'school,' 'school engagement' and 'sexual risk.' This requires that qualitative research explores actors' perceptions and meanings of these terms and that quantitative research uses measures that have face validity, ideally informed by prior qualitative research. However, I also share the belief with positivism that an authoritative account of social reality is possible (Blaikie & Priest, 2017). Social science can produce authoritative findings by engaging with multiple accounts of social reality generated through qualitative and quantitative research. For example, researchers can identify disparities in rates of unintended pregnancy as well as the risk factors associated with these. These findings, because they are grounded in the experiences of individuals across time and space and assessed as accurately as possible, are not just one subjective account but represent a view of a social phenomenon approaching accuracy (Denzin, 2017). However, I also believe that all research provides only a partial and imperfect window on social reality. Degrees of biases exist in research production and interpretation (Phillips & Burbules, 2000) and all research is subject to the values and perceptions of individual researchers as well as the collective structures that determine how research is funded, conducted and published (Kuhn, 1962). My view is that it is the role of the researcher to approach objectivity through minimizing bias (Phoenix et al., 2013).

I also agree with post-positivists' epistemological assertions that studying social reality should occur through a process of critically assessing theories (Blaikie, 2007; Popper, 1959). Theory provides a language with which we can understand, analyse, categorise and make predictions about reality (Danermark, Ekstrom, Jakobsen, & Karlsson, 2002). However, because theories are estimations by researchers of what is both complex and unknown, theories are always fallible (Danermark et al., 2002). Through a deductive process, theories can be tested, rejected or refined, and re-tested as we compare theories' predictions about social phenomena with empirical data about those events (Blaikie, 2007; Popper, 1959). For

[*] According to Blaikie & Priest (2017), cautious realism is different than Critical Realism, although both share the assumption that social reality exists beyond the social actors observing it. Blaikie and Priest describe cautious realism as the ontological basis for the Neo-Positivist paradigm characterized by the belief that social reality can only be imperfectly observed, and, therefore, tests of theory to understand reality must be approached 'cautiously.' Blaikie and Priest define Critical Realism as a paradigm, adopting a 'depth realist' ontology, characterized by a stratified reality consisting of three levels (empirical, actual and real) with the purpose of research under Critical Realism as seeking to understand the underlying mechanisms of events by way of empirical observations. Neo-positivist/cautious realism uses inductive and deductive inquiries, where Critical Realism/depth realism uses inductive, abductive and retroductive inquiries.

example, while the theory of human functioning and school organisation has been assessed with other risk behaviours (e.g., substance use, misbehaviour), we cannot assume the theory would work in the same manner for sexual health, which is understood and acted on differently than other risk behaviours and within varying political and cultural contexts. However, while some post-positivists have proposed that qualitative research is a solely inductive strategy (Popper, 1959), I believe that social scientific research can use qualitative data to inform theory assessment and refinement. The focus of qualitative research, the phenomena it examines, and the way data is coded can all be, to some extent, determined by a combination of deductive and inductive processes to explore existing theory (Pope, Zibeland, & Mays, 2006). Qualitative data cannot aim to assess (as quantitative data does) whether patterns of association in empirical data are as predicted by theories. But it can contribute to theory refinement by exploring whether concepts or processes proposed in theory appear plausible in the accounts of actors' perceived experiences, without assuming that social phenomenon unfolds as any single actor describes it. For example, young people's accounts of their school experiences can inform whether accounts of their sexual decision-making confirm or contradict our expectations based on how we theorise the role of school on health. When our expectations are contradicted, qualitative research enables us to inductively explore how actors' accounts deviate from established theory, questions and codes (Pope et al., 2006). Qualitative research can thus offer a 'reality check' that can help refine existing theory.

Pragmatists argue for the combination of elements of qualitative and quantitative approaches to achieve both breadth and depth in examining a research area or theory (R. B. Johnson, Onwuegbuzie, & Turner, 2007; Teddlie & Tashakkori, 2006). Some have argued that mixing approaches does not account for the fundamental ontological differences in methods (Sim & Sharp, 1998). However, I agree with Blaikie's position that methods are in the service of ontological assumptions; therefore, it is inappropriate to assume any given research using qualitative or quantitative methods is associated with a particular paradigm (Blaikie & Priest, 2017). This thesis approaches mixed methods research from the perspective that both qualitative and quantitative methods bring strengths to the process of developing, testing and refining theories based on the ontological and epistemological assumptions I outlined above.

Mixing methods can improve both the utility and the generalizability of research in assessing a theory by various outcomes or contexts (Mayoh & Onwuegbuzie, 2015). Mixed methods, particularly those using syntheses, produce more powerful explanations by providing meaning and context to the relationships of potential determinants or interventions and outcomes (Harden et al., 2018). This may be especially true when the topic is complex, either because a theory or intervention is complex in execution or because they interface with a complex system (Petticrew et al., 2019). Further, the generalisability of findings may be

increased by exploring quantitative patterns of events identified through qualitative or quantitative exploration (Bryman, 1988), as well as by synthesizing primary qualitative studies conducted independently into cross-study and higher order themes (Dixon-Woods, Agarwal, Young, Jones, & Sutton, 2004). Mixed methods are, therefore, more useful for decision-making in policy because they provide the extent and limitations of empirical evidence needed to develop new or assess existing policy, and the context in which to implement policy effectively (Noyes et al., 2019).

While there are challenges to synthesizing data collected via different methods (R. B. Johnson & Onwuegbuzie, 2004; Mason, 2006), integration of mixed methods can occur in a number of ways, including: validation of data through triangulation; informing quantitative data collection or analysis through qualitative exploration (or the reverse, where quantitative informs sampling or setting selection of qualitative); describing structures versus processes; informing interpretation of associations or testing generalizability of a concept; and deductive theory testing through quantitative analysis and building or refining theory through qualitative and quantitative findings (Bryman, 1988). In the emerging field of integrating mixed methods or mixed studies reviews, several designs for integration have been identified. In their review of over 400 systematic reviews, Hong et al (2017) identified two main types of mixed methods synthesis design: 1) convergent synthesis where qualitative and quantitative research is collected and analysed in a parallel or complementary manner; and 2) sequential synthesis design where data collection and analysis of one type of evidence occurs prior to and informs the next phase of data collection analysis of another type of evidence. The authors also note that these designs may be described as segregated (where qualitative and quantitative syntheses are conducted separately then integrated in further synthesis), integrated (where qualitative and quantitative synthesis data are analysed using the same methods), or contingent (where syntheses inform and build on each other until all research questions are addressed) (Hong et al., 2017; Noyes et al., 2019).

Because this thesis is concerned with assessing and refining of theory, I conducted the components of my thesis using, what Hong et al (2017) may call, a segregated, results-based convergent design. Each chapter was conducted using the analysis and synthesis techniques appropriate for the type of research question and methods (i.e., meta-ethnography for qualitative, meta-analysis for quantitative) and considers how the empirical evidence explored in that chapter provides support for or diverges from the theory of human functioning and school organisation. Given the advantages of qualitative research in shedding light on complex processes and pathways for health-related decision-making, I started with the results of a qualitative systematic review exploring to what extent experiences described by young people resonate with the processes described in the theory of human functioning and school organisation. Further, I explore how setting or participant characteristics reveal patterns or

convergences from the theory and from each qualitative study. Qualitative work, however, is based on small samples of individuals often from a single context, which allows for greater exploration of meaning and processes, but cannot assess whether patterns of empirical events are as would be predicted by theories. Quantitative work, in contrast, does not aim to assess theory from a perspective of process but can examine the extent to which possible interventions or exposures (aligned in the theory of human functioning and school organisation) influence outcomes, either in experimental or observational contexts. Therefore, I use findings from a systematic review of observational studies to examine possible associations between school- and education-related variables that might align with the theory and sexual health outcomes. I then present findings from a new analysis of a longitudinal dataset to examine the association of variables that are intentionally aligned with the theory of human functioning and school organisation on subsequent sexual behaviour. And, in the final empirical chapter, I explore whether interventions concerning the school environment or student-level educational assets as theorised by Markham and Aveyard are associated with sexual health outcomes in a systematic review and meta-analysis of experimental studies.

The primary integration of these reviews and analyses occurs in my discussion chapter where I conduct further synthesis of my qualitative and quantitative reviews, as well as the longitudinal analysis to identify conceptual gaps in the theory and propose refinements to the theory as it relates to sexual health. Firstly, I re-present the analytical findings (Noyes et al., 2019) from each chapter; these are the integration of descriptive findings of primary research and theoretical findings from syntheses (which go beyond the included primary research) to assess to what extent the theory is empirically supported and applicable to sexual health. Findings from the observational and interview reviews and the longitudinal analysis present whether the patterns of statistical associations reported are as would be predicted in the theory of human functioning and school organisation. The review of qualitative studies identifies themes resulting from reciprocal translation that align or diverge from how the theory aims to explain the role of schools in sexual health. Secondly, I discuss the key gaps in the theory in addressing sexual health as evidenced by the collective synthesis of explanatory findings. In the final stage of integration, I produce a line of argument (Noblit & Hare, 1988; Noyes et al., 2019) by presenting a modified theory of human functioning and school organisation which extends Markham and Aveyard's concepts to include concepts supported or suggested by this thesis which may be assessed in future studies.

Though I did not use a sequential design in the manner in which Hong et al (2017) define it (i.e., a previous review driving the aims of the next), I did conduct the reviews in sequence and, thus, made continuous improvements to the design of subsequent reviews and analyses. For example, all of the review protocols were designed to study the same population (adolescent), setting (school) and outcomes (sexual health) and so the search and screening

processes were designed concurrently; however, I revised subsequent search and screening strategies to increase efficiency and add new relevant terms. Additionally, in conducting the systematic review of qualitative studies first, I essentially 'set the stage' (Mayoh & Onwuegbuzie, 2015, p. 100) for the additional studies, providing a means by which to contextualize the quantitative findings explored in future chapters. I also modified the question for my longitudinal analysis to include the variables of teacher relationships and school participation. This was based on findings from the qualitative and observational reviews indicating, in addition to being in alignment with theory, that teacher relationships were a critical potential determinant of sexual health and that school participation was understudied and had historically produced mixed results. These modifications improved the design and relevance of my thesis while also maintaining the integrity of my research aim to comprehensively assess and refine the theory of human functioning and school organisation as it relates to young people's sexual health.

Methods

To operationalize this aim, I considered parameters of each aspect of the theory to inform my methods. The theory of human functioning and school organisation is concerned with both the processes and functions of school as well as the skills and attributes which students cultivate as a result, aligned with two commonly explored concepts in the literature: the school environment and educational assets. In this thesis, I define the 'school environment' as aspects of the school that contribute to the school culture or climate, such as physical or psychological safety, availability of caring adults, opportunities for engagement with the school (such as school activities) and the appearance or layout of physical spaces (Bonell, Jamal et al, 2013). I also explore aspects of the students individual-level experiences in schools that relate to their own educational skills or attributes, known as 'assets' in the PYD literature (P. Benson, 2007), such as: academic goal setting, attendance, attainment, interest in school and school work, and involvement in school activities. My thesis focuses broadly on adolescents ages 10-19 globally without emphasis on any particular group, such as based on sexual identity or race/ethnicity, as all youth potentially have access to school and education. The exception to this is the systematic review and synthesis of qualitative studies (presented in Chapter 3) which highlights the experiences of young women. I initially targeted this population because of the policy and research focus on how young women's educational trajectories are disrupted by 'poor' sexual and reproductive health outcomes (Basch, 2011) and wanted to explore the reverse of this relationship informed by the theory of human functioning and school organisation. This was the first chapter of my thesis to be completed and, on the advice of my upgrade committee and supervisors, I expanded the remaining components of my thesis to encompass all adolescents. I explore the limitations of my findings as they apply to different

groups of adolescents, such as LGBTQ youth and youth from low-and middle-income countries, in the discussion. Finally, for the purposes of this thesis, I have defined sexual health as the measurable outcomes of adolescent sexual and reproductive health (e.g., pregnancy, parenthood, STIs, HIV) and their proximal, behavioural determinants (e.g., age of sexual initiation, frequency of sex, contraception and condom use, lifetime sexual partners). While other aspects of sexual health are important for sexual well-being (including the knowledge and skills to support sexual decision-making), these measures cannot accurately predict changes in sexual behaviour or outcomes.

To achieve the thesis aims, I conducted a systematic review and meta-ethnography of qualitative research, a systematic review and synthesis of observational studies, a secondary, multi-level analysis of longitudinal data from a randomised control trial, and a systematic review and meta-analysis of intervention evaluations. A summary of methods for each component is described below with full methods described in each study's corresponding chapter.

Systematic reviews and syntheses

Systematic reviews are comprehensive investigations of existing literature that use explicit and systematic methods to identify, appraise and synthesise studies (Gough, Oliver, & Thomas, 2012). Systematic reviews, as opposed to primary research, can produce more inclusive and robust findings on a research question by: 1) examining studies with differing but related scopes of inquiry and 2) accounting for the potential fallibility of any single study due to chance or bias in the design (Gough et al., 2012). In addition to a comprehensive summary of findings from existing research, reviews generate new findings that can only be derived from the *synthesis* of studies. Mixed-methods reviews retain many of the features of mixed-methods primary research, and thus their strengths, in examining potential relationships in context, enabling reviews to inform both theory and future research and practice (Adam Fletcher et al., 2016). As reviews are fundamentally forms of observational research (Shea et al., 2017), they are still subject to potential bias, such as: inconsistent inclusion of studies based on conscious or unconscious biases related to the population, intervention or exposure, context or outcome of the review (selection bias); using searching and screening methods that favour the inclusion of studies which have significant, beneficial findings (publication bias); disproportionate inclusion of studies in English or from English-speaking countries (language or location bias); and inaccuracies in or exclusion of data being extracted from included studies that may impact findings (extraction error) (Ganann, Ciliska, & Thomas, 2010; Shea et al., 2017). To minimise the occurrence of such bias, the reviews in this thesis follow explicit procedures for conducting and reporting findings (Moher, Liberati, Tetzlaff, Altman, & Group, 2009).

Systematic review and synthesis of qualitative studies

Qualitative health research explores the agency, processes and meaning underlying decisions leading to health outcomes through the perspectives of key stakeholders (Green & Thorogood, 2013) and can bring to light aspects of school and educational experiences implicated in young people's sexual decision-making. Building on previous syntheses, Chapter 4 uses qualitive synthesis to address the following question: *how are school experiences and educational assets implicated in young women's accounts of their attitudes and actions relating to sex, contraception, pregnancy and parenthood?*

This study follows PRISMA guidelines for conducting and reporting systematic reviews. To be included in the review, studies had to: 1) report on young women's accounts of school and education experiences (not including sexual health classes or programs) as they related to sex, contraception, pregnancy and parenthood during adolescence as a major theme; 2) have a majority sample of female participants; 3) employ qualitative data collection and analysis methods; and 4) be published in 1990 or later. Eight databases were searched on terms related to: school/education OR adolescent AND; sexual behaviour, pregnancy OR parenthood; AND qualitative research. Additional search methods were employed including reference checks of included studies, contacting subject matter experts, and Google web searches. Studies were screened for eligibility and data extracted using standardised, piloted tools. Included studies were assessed but not excluded on their methodological quality. A quality assessment tool was adapted from an existing tool (Rees et al., 2010; Shepherd, J et al., 2010) and studies were assessed on reliability and usefulness. Thematic synthesis with a meta-ethnographic approach was used to code, analyse and synthesise primary studies in three phases: 1) studies were read, re-read and coded in Nvivo 11 in order of reliability/usefulness and by date; 2) thematic codes were grouped into descriptive meta-themes and sub-themes, accounting for themes that conformed and extended across studies (i.e., reciprocal synthesis), built upon each other to create a logical argument (i.e., line-of-argument synthesis), or fundamentally conflicted (i.e., refutational synthesis) (Noblit & Hare, 1988); 3) analytical themes were developed as descriptive meta-themes and sub-themes were compared and applied to the theory of human functioning and school organisation. Using deductive analysis, the synthesis considers whether the processes outlined in the theory of human functioning and school organisation are supported by young women's accounts of the influences of school and education on their sexual decision-making. Inductive analysis is used to consider ways that theory may be refined or extended when young women's accounts diverge from what would be expected based on the theory's assumptions.

A full description of the methods are outlined in Chapter 3 and in the protocol for this review (PROSPERO Registration #CRD42016033545) (Appendix A.1). Findings are presented in Chapter 3 and the final paper was published in *Health & Place*.

Systematic review and synthesis of observational studies

Observational studies, which employ longitudinal study designs, can provide quantitative evidence about the temporal associations between aspects of students' school experiences and their subsequent health behaviours and outcomes. Further, school-level studies can suggest how the institutional and organisational features of school might influence student behaviour. Findings from Chapter 4 addresses the following question: *What do existing observational studies suggest about the associations between school-related factors at the individual- and school-levels and subsequent sexual health outcomes?*

This study follows PRISMA guidelines for conducting and reporting systematic reviews. To be included in the review, studies had to: 1) report on a sexual behaviour or sexual health outcome; 2) report on a school-related exposure; and 3) employ a longitudinal design if examining individual-level exposures or a longitudinal or cross-sectional design if examining school-level exposures. Three databases were searched on terms related to: school/education AND; sexual behaviour OR sexual health outcomes; AND observational study designs. Additional search methods were employed including reference checks of included studies and identified published reviews. Studies were screened for eligibility and data extracted using standardised tools. Included studies were assessed for methodological quality using a modified version of the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (NIH National Heart, Lung and Blood Institute, n.d.). Studies were given a rating of low-, medium- or high-quality. Effects were assessed for exposure and outcome combinations appropriate for meta-analysis. Findings are reported narratively by study type (e.g., individual- or multi-level), then by school-related exposure, population, and quality. The discussion considers whether findings from included school-level and longitudinal individual-level studies provide empirical support for the theory of human functioning and school organisation as a framework for understanding how school processes and experiences might influence young people's sexual health. Patterns of association between specific exposure and outcome variables are assessed for whether they align or contradict with what would be predicted by the theory. Full methods are outlined in Chapter 4 and in the review protocol (Peterson and Bonell, 2019) (Appendix B1.1). Findings are presented in Chapter 4.

Systematic review and synthesis of intervention studies

Experimental studies provide the most rigorous evidence for establishing causal relationships and testing theory. In the realm of adolescent sexual health, the most plausible and most ethical approach to experimentation consists of evaluations of interventions that aim to benefit adolescents and where there is equipoise concerning effectiveness. Synthesis of intervention studies explore the plausibility (through narrative synthesis) and the probability (through meta-analysis) that interventions addressing the school environment and educational assets

improve sexual health outcomes. Chapter 6 uses narrative and quantitative synthesis to address the following question: *What are the effects of interventions that aim to modify the environment of schools and/or increase educational assets on the sexual health outcomes of students ages 10-19?*

This study follows PRISMA guidelines for conducting and reporting systematic reviews. Studies were included in the review if they met the following criteria: 1) reported on outcome evaluations using randomised control trial or quasi-experimental designs; 2) interventions targeted adolescents ages 10-19; reported on school-based interventions that change aspects of the school environment (e.g., improving school climate, safety, policies, access to caring adults, etc.) or aim to improve educational assets (e.g., modifying individual academic goal setting, attendance, attainment, interest in school, etc.); 3) did not report on interventions aiming solely to improve knowledge, attitudes, skills or services related to sexual health; and 4) reported at least one sexual health outcome, such as pregnancy, STIs or HIV, and sexual behaviours associated with increased risk of pregnancy or STIs. Nine bibliographic databases were searched covering the following terms: school/education; sexual behaviour or sexual health outcomes; and intervention studies. Additional search methods were employed including reference checks of included studies, contacting subject matter experts, and Google web searches. Studies were screened by two reviewers using a piloted eligibility tool. Data was double extracted using a piloted tool to capture the following information: 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. Risk of bias was assessed for RCTs using the Cochrane Handbook for Systematic Reviews of Interventions (Higgins, JPT & Green, S, 2011) and for quasi-experimental studies using the adapted EPPI-Centre Tool (Shepherd, J et al., 2010). Two reviewers, including myself, independently assessed studies and assigned scores (low risk, high risk or unclear risk) to domains within each study. Final scores were reconciled and a third reviewer was consulted as a final check.

In accordance with Cochrane reporting guidelines, study information of all included studies is reported in a Summary of Findings table (Higgins and Green, 2011). Risk of bias is reported in a separate table. All outcomes are reported, regardless of significance of outcomes. RCT and quasi-experimental studies were synthesised narratively and, where appropriate, meta-analytically. Findings were synthesised narratively by intervention type (e.g., school-environment vs. educational assets) then by outcome, study type and follow-up time. Meta-analysis was conducted by intervention type and outcome, prioritizing longest follow-up time. In the discussion, school environment and educational assets interventions are assessed against the theory of human functioning and school organisation to determine whether interventions with components that align with theory constructs are effective at modifying

young people's sexual health outcomes. Findings are used to consider whether it is probable that the theory applies to sexual health, which constructs are supported empirically and what additional research is needed to confirm or refine the theory in relation to sexual health.

Full methods are described in Chapter 6 and in the registered review protocol (PROSPERO Record# CRD42017072169). Findings are presented in Chapter 6 and the full paper has been published in *Perspectives on Sexual and Reproductive Health*.

Multi-level Longitudinal Analysis

While the previous questions focus on how existing research can inform the theory of human functioning and school organisation in relation to adolescent sexual health, this question aims to add new research to our understanding of how school factors influence sexual health outcomes. Previous empirical studies have assessed the theory using 'value-added education' (VAE), a proxy measure of school-level aggregate student commitment and belonging. (Aveyard et al., 2004) VAE measures the degree to which schools achieve higher student attainment in public examinations and attendance than would be expected based on the socio-demographic characteristics of their students. However, this measure relies on administrative data rather than direct measures of student-reported engagement with the school environment, operating at the student or school level. Studies have explored the relationship of other health outcomes, such as smoking, substance use and misbehaviour, with VAE (Aveyard et al., 2004; Bisset et al., 2007; Bonell et al., 2019, 2017; W. A. Markham et al., 2008, 2012; Tobler et al., 2011) and with direct measures of the school environment (Bonell et al., 2019, 2017). To date, these exposures have not been examined with sexual health outcomes.

I have undertaken a multi-level analysis of a longitudinal dataset to explore the effects of the school environment on sexual health using measures that align with the theory of human functioning and school organisation. Multi-level modelling allows for measures to be nested within schools and the exploration of associations of school-level compositional features, as well as student-level assets on student health. Previous multi-level research frequently relies on cross-sectional data which cannot establish temporality between the exposure and outcome. This longitudinal analysis explores the effects of school- and student-level exposure at baseline with subsequent sexual behaviour at 24- and 36-month follow-ups. In addition, the data allows for the ability to explore potential mediators to further understand the processes by which school environments may work to influence outcomes.

This section outlines the methods to answer the following questions:

What are the associations of value-added education and student-reported engagement in the school environment (academic commitment, sense of belonging, relationships with

teachers, and participation in school) with adolescent sexual behaviour outcomes (sexual debut and contraception use)? Specifically:

1. *What is the association of a school-level measure of value-added education at baseline on student-level sexual behaviour outcomes at 24- and 36-month follow-up?*
2. *What is the association of school- and student-level academic commitment, sense of belonging, relationships with teachers, and participation in school at baseline with student-level sexual behaviour at 24- and 36-month follow-up?*
3. *Do student-level academic commitment, sense of belonging, relationships with teachers, and participation in school at 24-months mediate the relationship between the school-level measure VAE at baseline and student-level sexual behaviour outcomes at 36-month follow-up?*

Study Information

The data for this study comes from the 20 schools in the control arm of the INCLUSIVE cluster randomised trial conducted in south-east England. To avoid confounding from the intervention effects, the 20 schools allocated to the intervention arm were excluded from this analysis. The study population includes students who were enrolled in control schools at baseline and nearing the end of year 7 (age 11 to 12 years). Students completed follow-up surveys at 24- and 36 months post-baseline at ages 12-13 and 14-15, respectively. Students provided written informed consent to participate in data collection and parents had the option of withdrawing their children from surveys. Student survey data was collected by trained field workers who were blind to allocation. Surveys were administered in school exam settings dedicated to completing the surveys, where field workers were available to aid students with questions or with learning or language difficulties. Baseline data was collected before schools were allocated to a trial arm.

Exposure and Mediating Variables

Value-added education is a proxy measure of school-level student engagement derived from administrative data, developed by Aveyard and Markham and used in prior studies related to the theory of human functioning and school organisation (Aveyard et al., 2004; W. A. Markham et al., 2008, 2012; Tobler et al., 2011). VAE is the difference between the observed attainment and absence rates and the attainment and absence rates as would be expected based on the school's socio-demographic profile.

School-level and student-level environment scales. Direct measures of the school environment were assessed using multi-item scales from the Beyond Blue School Climate Questionnaire (M. G. Sawyer et al., 2010). Exposure variables were baseline school-level environment variables (school aggregates of student-level scores of commitment, belonging, relationships and participation scales) and baseline student-level commitment, belonging, relationships and

participation variables. Mediating variables were student-level commitment, belonging, relationships and participation variables measured at 24-month follow-up.

Outcome Variables

Questions used to assess sexual risk behaviours at 24- and 36-month follow-up were derived from existing surveys (Stephenson et al., 2004). The two dichotomous outcomes were *sexual debut* (i.e., ever had sex with man/boy or woman/girl) and *did not use contraception at first sex*, with an answer of 'yes' indicating risk.

Covariates and Effect Modifiers

Baseline covariates were pre-hypothesised as potential confounders or effect modifiers. School size, school-level income deprivation affecting index (IDACI) and proportion of students eligible for free school meals (FSM) were derived from data on government websites. Student-level factors were derived from baseline student surveys and included sex, ethnicity, family structure, levels of household employment and housing tenure.

Missing Data

At the start of analysis, the dataset was examined for missing data among the variables in question, which was present among multiple student-level exposure and outcome variables. To assess whether it could be reasonably assumed that data was not missing completely at random (i.e., missing data is independent of observations in the dataset), I ran a series of bivariate and multivariate models using logistic regression. Results indicated that missingness of multiple exposure and outcome variables were associated with covariates in unadjusted and adjusted models. For example, missingness of student-level commitment and belonging was associated with family structure in unadjusted and adjusted models, where student-level relationships and participation missingness was associated with parental unemployment after controlling for other covariates. Missingness of both follow-up variables of sexual debut were also associated with socio-economic variables (i.e., family structure, housing tenure, unemployment) and all student-level exposures in unadjusted and adjusted models. These findings indicate that it is reasonable to assume that missing data is associated with other observed data and can be ruled out as missing completely at random. In this case, it is critical that the analysis accounts for missing data.

Multiple imputation is a common strategy for handling missing data in statistical analyses, and a useful approach when multiple variables are missing values and there is concern that the sample size will be substantially reduced using a complete case approach. Multiple imputation assumes that the probability of missingness is dependent on observed data, known as data missing at random. Multiple imputation follows three phases: 1) Imputation – missing data are filled in M times to create M complete datasets; 2) Analysis – M complete datasets are analysed using chosen method of analysis (e.g. logistic regression); 3) Pooling – results from

M complete datasets are combined to create a single pooled, multiple imputation estimate (StataCorp, 2013). I conducted multiple imputation using Stata 15 (StataCorp, 2017).

Because this analysis is concerned with measures of school- and student-level engagement with the school environment at baseline, students who were not enrolled in control schools at baseline were excluded from the analysis. Multiple imputation was then performed on the remaining variables. The imputation model should reflect variables to be included in the analysis; thus, school- and student-level exposure variables (e.g., student-level belonging, commitment, etc.), outcomes and covariates (e.g., family structure, ethnicity, sex, parental unemployment) were included in the imputation model. Multiple imputation by chained equations (MICE), as opposed to multivariate normal imputation (MVN), was used because the present analysis includes both binary and continuous variables and MICE provides flexibility in allowing different types of variables into the model simultaneously by specifying the appropriate imputation method (i.e., regress for continuous and logit for dichotomous) (Azur, Stuart, Frangakis, & Leaf, 2011). I set the number of imputed datasets (*M*) at 25, given that the missing data averaged at 12.5% (Graham, Olchowski, & Gilreath, 2007; StataCorp, 2013). As all my outcomes were binary, I ran the meqrlogit command, a mixed-effects logistic regression command which allows multiple levels of clusters and is compatible with Stata's multiple imputation procedure. Additional details about adjusted and unadjusted models are described below.

Analysis

Analysis was conducted in several stages using Stata 15 (StataCorp, 2017). Descriptive analyses present the proportion and means of exposure variables and covariates. Using imputed data, multi-level logistic regression models were used to calculate unadjusted and adjusted associations fitted with random effects for school to account for clustering. Effects are reported as odds ratios for dichotomous outcomes and coefficients for continuous outcomes. Associations were assessed for interactions with potential confounders. Where interactions were present, adjusted analyses are reported by strata. To reduce the chance of a falsely positive interaction due to chance, associations were reported by strata when interactions were significant at $p \leq 0.01$. Adjusted models were run using multi-level logistic regression and controlled for school-level and individual-level socio demographic variables and interaction terms where appropriate.

To assess whether the association of VAE and sexual behaviour was mediated by student-level reports of belonging, commitment, relationships and participation, I followed Baron and Kenny's causal steps (Baron & Kenny, 1986). While structural equation modelling is commonly used to simultaneously assess multiple models for mediation, the hierarchical structure of this dataset, along with the use of binary outcomes, indicates that in this case there

is no particular advantage to using a structural equation modelling over fitting the models separately. Using multiple imputation, logistic regression adjusted for clustering and covariates was used to assess associations between VAE and 1) sexual health outcomes at 36-months and 2) potential mediating variables of student-level commitment, belonging, relationships and participation at 24-months. Additionally, potential mediating variables were assessed for associations with outcomes at 36-months using unadjusted and adjusted logistic regression with imputed data. Because VAE was not associated with any of the outcomes or the potential mediating variables, no further analysis for assessing mediation was done.

Results are used to assess school- and student-level associations between measures aligned with the theory of human functioning and school organisation and subsequent adolescent sexual risk behaviours. Findings are used to refine the theory by suggesting which exposures have the most potential impact on sexual decision-making.

Findings and additional details of methods are presented in Chapter 5. The paper has been prepared for submission to the *Journal of Adolescent Heal*

RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed <u>for each</u> research paper included within a thesis.

<u>SECTION A – Student Details</u>

Student ID Number	232033	**Title**	Ms
First Name(s)	Amy		
Surname/Family Name	Peterson		
Thesis Title	Effects of the school environment on adolescent sexual behavior: a mixed methods assessment of the theory of human functioning and school organisation		
Primary Supervisor	Chris Bonell		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

<u>SECTION B – Paper already published</u>

Where was the work published?	Health and Place		
When was the work published?	September 2018		
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*	**No**	Was the work subject to academic peer review?	**Yes**

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Where is the work intended to be published?	
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Stage of publication	Choose an item.

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I conceptualized the study and conducted all major aspects of the research, including searching, screening, extraction, quality assessment, synthesis and writing. Chris Bonell supervised the research and contributed to eligibility decisions, quality assessment and synthesis.

SECTION E

Student Signature	
Date	4 August 2019

Supervisor Signature	
Date	5 August 2019

Chapter 3

School experiences and young women's pregnancy and parenthood decisions: a systematic review and synthesis of qualitative research

The paper that forms this chapter is published as:

Peterson, A.J., Bonell, C. (2018). School experiences and young women's pregnancy and parenthood decisions: a systematic review and synthesis of qualitative research. *Health and Place,* 53: 52-61. doi: 10.1016/j.healthplace.2018.07.003

Supplemental findings are reported at the end of the chapter.

Evidence of copyright permission is in Appendix D.

School experiences and young women's pregnancy and parenthood decisions: a systematic review and synthesis of qualitative research

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Abstract

Schools are considered high-potential environments for promoting adolescent sexual and reproductive health outcomes among young women. Qualitative studies provide context and meaning to how school experiences and systems contribute to pregnancy and parenthood decisions from the perspectives of youth. This systematic review screened 24,711 references from 8 databases, yielding 28 qualitative studies. Included studies were assessed for quality and synthesised using meta-ethnographic approaches. Reciprocal translation revealed that young women's education and life trajectories were at least partially shaped by a commitment to school values and expectations for academic achievement, influenced by structural and relational factors within the school. These findings resonate with Markham and Aveyard's theory of human functioning and school organisation. Future policy and practices might seek to improve teacher-student interactions, leverage young women's developing autonomy, and ensure physically and psychologically safe spaces for students.

Keywords

Schools, adolescent health, sexual behaviour, systematic review, qualitative

Highlights

- Systematic review and synthesis of 28 qualitative studies revealed that young women's education and life trajectories were at least partially shaped by a commitment to school values and expectations for academic achievement.
- Young women's life and educational aspirations fit into their perceptions of how education or parenthood would help them achieve adulthood status.
- Young women indicated the ways that schools shaped their commitment to school and education, including whether school values were representative of their cultural identities and how teachers' explicit or implicit messages affected their expectations for future education or career.

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Introduction

In adolescence, young women experience biological, cognitive and social transitions that influence health behaviours and outcomes in adolescence and adulthood (Sawyer et al., 2012). While there is debate that becoming an adolescent parent affects workforce participation and income earnings (Ashcraft, Fernández-Val, & Lang, 2013; J. M. Fletcher & Wolfe, 2009), evidence suggests that adolescent parenthood disrupts girls' educational trajectories while highlighting the economic and mental health benefits of delaying parenthood into adulthood (Sonfield, Hasstedt, Kavanaugh, & Anderson, 2013). Pregnancy rates among 15-19 year-old girls in the U.S. are higher than any other country with available data (Sedgh, Finer, Bankole, Eilers, & Singh, 2015), and 75% of pregnancies are unintended (Finer & Zolna, 2016). Further, unintended pregnancy and sexual behaviours that lead to pregnancy disproportionately affect low-income, rural and minority youth (Centers for Disease Control and Prevention, 2015; Ng & Kaye, 2015; Penman-Aguilar, Carter, Snead, & Kourtis, 2013). Even with progress over the last 20 years (Martin, Hamilton, Osterman, Curtin, & Matthews, 2015), inequities in adolescent pregnancy and parenthood call for strategies that address upstream determinants of sexual and reproductive health.

Next to the home, young people spend most of their time interacting with peers and staff in school (Kaftarian et al., 2004). Therefore, schools are high-potential environments for supporting healthy development and fostering educational assets associated with health, such as academic success and optimism for future opportunities (Freudenberg & Ruglis, 2007; Muennig & Woolf, 2007; Viner et al., 2012). Access to education may be particularly important for promoting young women's sexual health (Patton et al., 2016). Current governmental strategies on adolescent pregnancy have prioritised the implementation of 'evidence-based programmes' in school settings, most of which focus on changing individual knowledge and attitudes (Koh, 2014). However, these interventions may not effectively influence upstream determinants (Rose, 1992; Viner et al., 2012), failing to address inequities in sexual risk behaviour experienced by socially-disadvantaged youth.

In their theory of human functioning and school organisation (Figure 3.1), Markham and Aveyard (2003) suggest that schools can increase health-promoting behaviours by improving students' commitment to schools' instructional (i.e., promoting knowledge and skills) and regulatory (i.e., promoting character and good conduct) orders and hence their capacity for practical reasoning and positive affiliations with other students. To improve student commitment, the authors propose schools should strengthen relationships among staff and students, adopt instructional and regulatory practices that are student-centred, and erode cultural boundaries between schools and local communities.

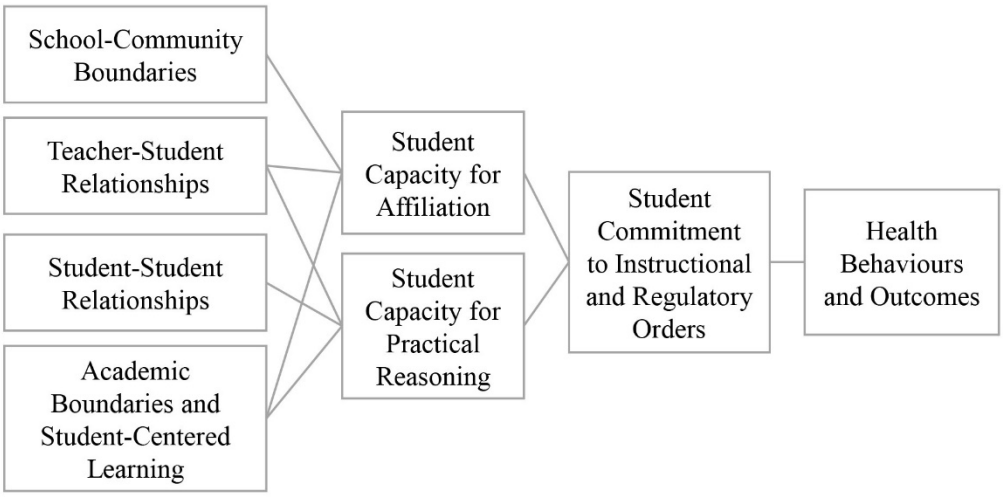


Figure 3.1 Theory of human functioning and school organisation (Markham and Aveyard 2003)

The health literature provides evidence that school influences adolescent health behaviour. Multiple studies indicate that school-based interventions influence sexual behaviours that lead to pregnancy by addressing school-level (Basen-Engquist et al., 2001; Flay et al., 2004; Patton et al., 2006) and individual-level (Allen, Philliber, Herrling, & Kuperminc, 1997; Flay et al., 2004; Patton et al., 2006; Philliber, Williams Kaye, Herrling, & West, 2002) determinants related to school environment and educational assets. Longitudinal studies report that attitude to school, school engagement, school connectedness and educational expectations or aspirations correlate with reduced adolescent pregnancy or birth, delayed sexual initiation and activity, and increased condom or contraceptive use (Bonell et al., 2005; Kogan et al., 2013; C. M. Markham et al., 2010; Rink, Tricker, & Harvey, 2007; White & Warner, 2015). Few multilevel model studies have examined whether school-level factors, such as attending school with high levels of school connectedness, impacts school-level reproductive outcomes and have produced mixed results (Henderson, Butcher, Wight, Williamson, & Raab, 2008; White & Warner, 2015).

Qualitative studies can make critical contributions to policy and practice by exploring the context and meaning of school experiences from young women's perspectives (Green & Thorogood, 2013). Previous reviews examined adolescent pregnancy and parenting but did not explicitly explore school or education themes (Spear & Lock, 2003), or did not address school experiences prior to pregnancy (Graham & McDermott, 2005). Harden et al. (2009) reviewed research with socially disadvantaged young parents, including attitude to school prior to pregnancy. This review was limited to U.K. studies and is now several years old. Jamal et al (2013) synthesised qualitative research as a part of a mixed-methods review on the school environment and student health outcomes, including two studies covering sexual

health. However, several important studies were missed and analysis did not focus on sexual health. The current review builds upon these reviews to address the research question *how are school and education experiences implicated in young women's accounts of their attitudes and actions relating to sex, contraception, pregnancy and parenthood?*

Methods

This study follows PRISMA guidelines for conducting and reporting systematic reviews. Modifications to the review protocol (Peterson & Bonell, 2016) are identified in Table 3.1. Additional details are provided in supplemental materials.

Table 3.1 Deviations from qualitative systematic review protocol

Inclusion Criteria	First inclusion criteria was modified during screening phase to exclude studies that reported on sexual health education but not broader school and education experiences. The timing did not impact the likelihood of missed studies during the screening phases.
Search Strategy	Three additional databases were added (ProQuest Dissertations and Theses Global, British Education Index (EBSCO), and Australian Education Index (ProQuest).
Data Extraction	Single extraction of data by first author due to time and resource constraints.
Quality Assessment	Single assessment of quality by first author due to time and resource constraints.
Synthesis	None.

Inclusion Criteria

To be included, studies had to: 1) report on accounts of school and education experiences as they related to sex, contraception, pregnancy and parenthood during adolescence (ages 10-19 years) as a major theme; 2) have a sample of at least 50% female participants; 3) employ qualitative data collection and analysis methods; and 4) be published in 1990 or later.

Search and Screening Strategy

Electronic databases (Medline, CINAHL Plus, PscyhINFO, ERIC, Web of Science Core Collection, ProQuest Dissertations and Theses Global, British and Australian Education Indexes) were searched in early 2016 using index and free-text terms. Search terms covered three concepts informed by previous reviews on school environment (Bonell et al., 2011) and qualitative research (Evans, 2002; Flemming & Briggs, 2007; Rees et al., 2010; Wong, Wilczynski, Haynes, & Hedges Team, 2004): 1) school/education OR adolescent AND 2) sexual behaviour, pregnancy OR parenthood AND 3) qualitative research. Several rounds of searches were piloted by the first author to assess precision and specificity. The final strategy was adapted (e.g., MeSH terms removed) and documented for each database. Additional studies were derived from web-based searches, reference checking of included studies and subject-matter expert contacts. The first author conducted all screening.

Data Extraction

Data were extracted on study aims, location, participant characteristics and study methods. Participant characteristics included: proportion female, age at time of data collection, race or ethnicity and socio-economic status as described in the study, and pregnant or parenting status. Methods included: study design, sampling (frame, selection, recruitment, and consent), data collection and analysis. The first author piloted the extraction tool on five studies, then extracted from remaining studies.

Quality Assessment

Critical appraisal was piloted and executed by the first author using the EPPI-Centre Tool (Rees et al., 2010; Shepherd, J et al., 2010). Each study was assigned two sets of scores (low, medium, or high) based on reliability and usefulness. Reliability is the extent to which researchers employed appropriate methods (e.g., study design, sampling, data collection, analysis) for their stated aims. Usefulness captures the relevance and conceptual richness that the study contributed to the review's research question, including breadth and depth of findings and the extent to which participant views were privileged.

Synthesis

Synthesis was conducted using meta-ethnographic approaches for translating findings across qualitative studies informed by Noblit and Hare (1988) and Thomas and Harden (2008). Synthesis was conducted in three phases. Phase 1 was conducted by the first author. Phases 2 and 3 were conducted initially by the first author, then extended and refined by the first and second authors.

Phase 1: Studies were ordered by their reliability and usefulness scores then placed in chronological order. Studies were read and re-read to identify themes and concepts inductively, and coded in NVivo 11. Reciprocal translation of studies occurred by identifying common themes which were applied across studies in a third read.

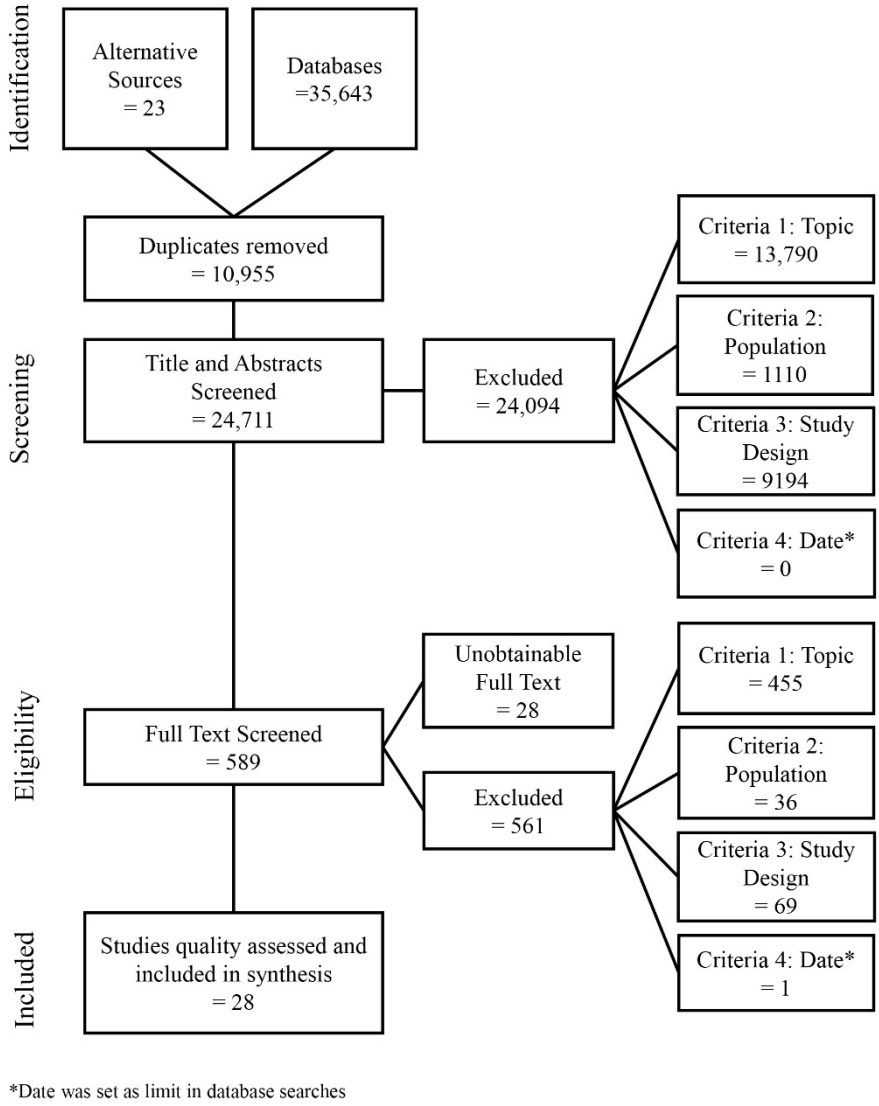
Phase 2: Descriptive themes and subthemes were developed by grouping thematic codes with direct quotes supporting the theme from the review studies. Synthesis of descriptive themes occurred by identifying and summarizing themes that: conformed and extended across studies (i.e., reciprocal synthesis); built upon each other to create a logical argument (i.e., line-of-argument synthesis); or conflicted (i.e., refutational synthesis) (Noblit & Hare, 1988). These descriptive themes and subthemes are presented in the results section.

Phase 3: The descriptive themes and subthemes were compared and applied to the theory of human functioning and school organisation and existing evidence on school-related determinants of adolescent pregnancy, resulting in analytical themes that address the review aim. These analytical themes are presented in the discussion.

Results

A total of 24,711 records were screened using EPPI-Reviewer 4 (Thomas, J, Brunton, J., & Graziosi S, 2010) on title and abstract and 589 studies on full text (Figure 3.2). Twenty-eight studies were included in the synthesis (Table 3.2). The majority were from the U.S. and U.K. Fifteen studies included pregnant or parenting teens, five included participants who were never pregnant as teens and nine studies did not explicitly include or exclude participants based on pregnancy or parenting status. Most studies targeted their sample based on socio-economic status, race or ethnicity.

Quality assessment resulted in six low-quality, eight medium-quality and twelve high-quality studies. Low-quality scores were primarily due to weaknesses in reporting methods. Studies rated most useful were high- or medium-quality. No study was excluded based on quality. In post-synthesis assessment, mostly high- and medium-quality studies contributed to



*Date was set as limit in database searches

Figure 3.2 Screening process and outcomes

theme development, though some detail would be lost if low-quality studies had been excluded. No theme was generated solely by a low-quality study.

Two major themes emerged in relation to adolescent sexual behaviour, pregnancy or parenthood, including young women's 1) views and attitudes on educational and life trajectories and; 2) experiences of school and education. Reciprocal translation revealed that few studies discussed sexual behaviour, while most emphasised the impact of school or education on pregnancy or parenthood decisions.

Theme 1: Young women's views and attitudes on educational and life trajectories

In the first theme, reciprocal translation revealed the role of education and life trajectories on sexual behaviour and pregnancy decisions as a central theme. Multiple authors framed this theme as a class issue, in which most middle-class, white adolescents favoured higher education pathways and financial independence prior to parenthood. The educational and life plans of low-income, youth of colour were more diverse (Elley, 2011; Vetter, Fairbanks, & Ariail, 2011), and included higher education, as well as young parenthood and earlier entrance into the workforce (Arai, 2003; Bettie, 2003; Biggs, Combellick, Arons, & Brindis, 2013; Coleman & Cater, 2006; Elley, 2011; Erdmans & Black, 2015; Smith & Roberts, 2011; Vetter et al., 2011; Walkerdine, Lucey, & Melody, 2001).

Subtheme 1a: For many educationally-committed teens, adolescent pregnancy meant the disruption to educational and financial achievement.

Many teens who were not pregnant or parenting cited educational goals as a reason for avoiding pregnancy (Algert, 2000; Bayer, Tsui, & Hindin, 2010; Childs, Knight, & White, 2015; Gilbert, 2011; Hoskins, 2001; Martyn & Hutchinson, 2001; Noone et al., 2014; Tabi, 1999; Walkerdine et al., 2001; Willemsen & DeJaeghere, 2015). Educational goals were achieved by what Elley (2011, p. 423) described as 'regulating their sexual identities with their aspirations' through avoiding sex (Bayer et al., 2010; Willemsen & DeJaeghere, 2015) or using contraception (Elley, 2011; Martyn & Hutchinson, 2001). Where these methods failed, unintended pregnancies were resolved through abortion to preserve educational trajectories and social status, especially if the teen was middle-class (Arai, 2003; Coleman & Cater, 2006; Gilbert, 2011; Martyn & Hutchinson, 2001; Smith & Roberts, 2011; Walkerdine et al., 2001).

Subtheme 1b: Educationally-committed teens framed their trajectories as pathways to responsible adulthood.

Higher education, career development and financial independence signalled the transition from adolescence to adulthood for educationally-committed teens (Bettie, 2003; Elley, 2011; Erdmans & Black, 2015; Walkerdine et al., 2001). Educational pathways were positioned as

'responsible' and teen pregnancy as 'immature,' these being viewed as incompatible. In a study on never-pregnant-or-parenting Puerto Rican teens, a 9th grade focus group participant described the incompatibility of adolescence and parenthood: ‘We are babies. We are not for having babies … you have to understand you have a baby you have to be responsible to it’ (Gilbert, 2011, p. 137). Responsibility included regulating reproduction because of its effects on education and career goals. In a 2001 study on African American adolescents who avoided pregnancy (Martyn & Hutchinson, 2001), participants were described as 'tough girls' who altered negative scripts about race, teen parenthood and education:

> Being responsible for their own destinies and relying on inner resolve and strength enabled the girls to follow their visions and adhere to their goals… Lisa explained, “There are choices, you can either have the baby, you can have it up for adoption, you can abort it, you can do whatever, but it completely falls on you...”(2001, p. 248).

Subtheme 1c: Pregnancy and childbirth do not disrupt life trajectories for teens who do not view education as a realistic or desirable option.

Reciprocal translation revealed that most pregnant and parenting teens had weak attachment to school prior to pregnancy (Algert, 2000; Arai, 2003; Biggs et al., 2013; Dawson & Hosie, 2005; Erdmans, 2012; Erdmans & Black, 2015; Kaplan, 1997; Minnis et al., 2013; Noone et al., 2014; Zachry, 2005). Adopting middle-class values of ‘going away to college’ (Bettie, 2003, p. 71) was generally undesirable because they disliked school (Arai, 2003; Coleman & Cater, 2006; Dawson & Hosie, 2005; Erdmans, 2012; Hoskins, 2001) and perceived limited career options (Agogbuo, 2006; Algert, 2000; Arai, 2003; Coleman & Cater, 2006; Kaplan, 1997; Minnis et al., 2013; Smith & Roberts, 2011). For some, higher education was viewed as impossible because they lacked the academic skills or grades (Elley, 2011; Walkerdine et al., 2001) and because of financial and immigration-related barriers (Biggs et al., 2013; Minnis et al., 2013). Authors suggested that alternatives to universities, such as community college and vocational school, were economically limiting in the same ways young parenthood might be (Bettie, 2003; Kaplan, 1997).

Fewer prospects for social mobility may have removed barriers from pursuing romantic relationships that included unprotected sex (Elley, 2011) or from fulfilling a desire for motherhood (Arai, 2003). This aligned with an apparent variability in contraceptive trust and use (Arai, 2003; Bettie, 2003; Walkerdine et al., 2001), possibly because contraception diminished spontaneity (Bettie, 2003; Kaplan, 1997) and signalled a premeditation to stigmatised sexual behaviour (Walkerdine et al., 2001). Some expressed anti-abortion sentiments (Bettie, 2003; Elley, 2011) that, as one author argued, may have protected them from revealing their true desires to be a young parent (Arai, 2003).

Table 3.2 Characteristics of studies included in the qualitative systematic review							
Author	Study Aim	Study Location	Sample Size	Age Range	Socio-economic Status	Race/Ethnicity	Pregnancy or Parenthood Status
(Agogbuo, 2006)	To explore the extent to which school-acquired skills in Africa influence their ability navigate health systems and health information.	USA Champaign-Urbana, IL	20	Over 18 years	Not stated	Not stated	Not stated
(Algert, 2000)	To explore the hypothesis that acculturated, low income Mexican-American teen mothers mirror the values and behaviours of their Anglo-American counterparts.	USA San Diego, CA	63	~16 years	Low-income	Mexican American and Anglo-American	Pregnant/ parenting and nonpregnant/ nonparenting
(Arai, 2003)	To explore how well policy explanations for early pregnancy match accounts of young mothers in diverse English communities.	UK London, Northumberland, and Manchester	12	Not stated	Working-class	Not stated	Parenting before 20 years old
(Bayer et al., 2010)	To uncover the role of global transitions in sexual behaviour of Peruvian adolescents.	Peru Pampas	20	12-17 years	Recruited from low-income area	Not stated	Not stated
(Bettie, 2003)	To study perceptions of social differences at school and possibilities of future by girls of different classes and race/ethnic locations.	USA Midwestern farming town	~60	High school age	Working- and middle-class	White and Mexican American	Not stated

Table 3.2 Characteristics of studies, cont.							
Author	Study Aim	Study Location	Sample Size	Age Range	Socio-economic Status	Race/Ethnicity	Pregnancy or Parenthood Status
(Biggs et al., 2013)	To explore how immigration may have influenced childbearing decisions within larger study of Latina teenage and adult childbearing.	USA Fresno and Los Angeles, CA	14	15-19 years	Recruited from programmes serving low-income clients	Latinx	Pregnant, in 2nd or 3rd trimester
(Charmaraman & McKamey, 2011)	To examine contexts and situations in which urban adolescents gather/explore information about relationships and sexuality.	USA Northeastern Region	23	6th grade	Not stated	Black, Latinx, Multiracial, and White	Not stated
(Childs et al., 2015)	To explore the social context in which never-pregnant African American adolescent girls, aged 12-14, form opinions about adolescent pregnancy.	USA Southeastern Metropolitan City	64	12-14 years	60% of participants received free or reduced lunch	African American	Not pregnant or parenting
(Coleman & Cater, 2006)	To explore decisions behind 'planned' teenage pregnancy.	UK E and W Sussex, Derbyshire, Yorkshire, Lancashire, Great Yarmouth and Cornwall	41	13-21 years	Most living in low-income areas	White-British	Pregnant or parenting a child under 1 year old
(Davidson, 2015)	To examine working-class Latina and middle-class white girls' narratives of aspiration and expressions of self-cultivation in Silicon Valley, USA.	USA San Jose and Palo Alto, CA	Not stated	High school age	Middle-class and working-class, low-income	White and Latinx	Not stated

Table 3.2 Characteristics of studies, cont.							
Author	Study Aim	Study Location	Sample Size	Age Range	Socio-economic Status	Race/Ethnicity	Pregnancy or Parenthood Status
(Dawson & Hosie, 2005)	To identify what factors determined both academic and broader success for pregnant young women and young mothers.	UK 10 Local Education Agencies in England	93	Not stated	Living in areas with varying levels of deprivation	White, Black-African, Black-Caribbean, Bangladeshi, Asian/White, Other	Pregnant or parenting
(Elley, 2011)	To study participants' views of sexual and relationships education, intimate relationships, educational aspirations and future plans.	UK Northeast England	12	15-21 years	Middle- and working- class	Not stated	Not stated
(Erdmans, 2012)	To examine why pregnant and mothering teens did or did not stay in high school and whether schools violated Title IX legislation.	USA Connecticut	62	~17.9 years	93% eligible for Medicaid	Puerto Rican, White, African American, Multiple races	Parenting
(Erdmans & Black, 2015)	To explore teen moms' life stories prior to pregnancy.	USA Connecticut	108	13-25 years	Currently receiving government assistance	White, Puerto Rican, Black, Other Latinx, Multiracial, Asian and West Indian	Parenting

Table 3.2 Characteristics of studies, cont.							
Author	Study Aim	Study Location	Sample Size	Age Range	Socio-economic Status	Race/Ethnicity	Pregnancy or Parenthood Status
(Gilbert, 2011)	To examine perceptions held by Puerto Rican teens living in Holyoke MA about teen pregnancy and births.	USA Holyoke, MA	39	14-19 years	89% of participants at or below poverty level	Puerto Rican	Not pregnant or parenting
(Hoskins, 2001)	To investigate how young people construct their sexual practices and use of safer sex.	UK London	25	16-18 years	Recruited near working-class schools	Indian-Asian, Asian-African, African, Irish-White and White	Not stated
(Jones & Norton, 2007)	To explore to what extent young women in Uganda are informed about sexual actions, experience sexual abuse and have ability to embrace sexuality.	Uganda Kyato Village	15	~17 years	Mostly low-income	Not stated	Not stated
(Kaplan, 1997)	To delve beneath the stereotypes of teenage motherhood and reveal motivations, concerns and strategies that make the lives of teen mothers comprehensible.	USA East Bay, CA	32	15-43 years	On welfare at time of interview	Black	Parenting before 19 years old

Table 3.2 Characteristics of studies, cont.							
Author	Study Aim	Study Location	Sample Size	Age Range	Socio-economic Status	Race/Ethnicity	Pregnancy or Parenthood Status
(Martyn & Hutchinson, 2001)	To generate a grounded theory that explains the social-psychological processes of low income African American women who avoided pregnancy.	USA Northcentral and south Georgia and large Midwest city	17	19-26 years	Low-income	African American	Not pregnant before 19 years old
(Minnis et al., 2013)	To explore how individual and family education and employment aspirations and expectations affected teen childbearing among young Latina women.	USA Fresno and Los Angeles, CA	65	15-19, 22-35 years	58% of participants received public assistance in last year	Latinx	Pregnant in 2nd or 3rd trimester
(Noone et al., 2014)	To explore Latino youth's views, experiences and concerns related to teen pregnancy in Jackson County OR using photovoice.	USA Jackson County, OR	9	15-20 years	Not stated	Latinx	Not stated
(Smith & Roberts, 2011)	To investigate young parents' understanding of the social gradient in young pregnancy.	UK London	21	17-40 years	Living in deprived area	White, Black, Multiple Race, Caribbean, Albanian, Indian	Pregnant or partner conceived under 18 years
(Tabi, 1999)	To improve understanding of educational-career programme effectiveness among African American youth.	USA Major Midwestern City	28	14-18 years	Recruited from low-income community	African American	Pregnant/ parenting and nonpregnant/ nonparenting

Table 3.2 Characteristics of studies, cont.							
Author	Study Aim	Study Location	Sample Size	Age Range	Socio-economic Status	Race/Ethnicity	Pregnancy or Parenthood Status
(Trusty-Smith, 2013)	To explore real-life experiences and narratives of African American, former teenager mothers who have earned a college degree.	USA Maryland, New York, Georgia, Alabama, and Florida	20	28-59 years	Working-class (as child)	African American	Parenting between 13-19 years old
(Vetter et al., 2011)	To explore how youth are subject to competing and conflicting discourses that have influenced their identities.	USA Large Southwest City	1	11th and 12th grade	Lives in a working-class neighbourhood	Latinx	Pregnant (near end of longitudinal study)
(Walkerdine et al., 2001)	To study the complex social, cultural, psychological dynamics of young women.	UK	30	16 and 21 years	Working- and middle-class	White, African-Caribbean, Multiple Race, Asian	Pregnant/ parenting and nonpregnant/ nonparenting
(Willemsen & DeJaeghere, 2015)	To study how school's curriculum and practices teach critical and transformative perspectives on relationships, sexuality and gendered futures.	Tanzania	6	Not stated	Recruited from school that serves 'vulnerable' girls	Not stated	Not stated
(Zachry, 2005)	To study to examine how motherhood may influence women's self-identity and perspective of education.	USA Boston, MA	9	18-20 years	Receiving welfare assistance	Latinx, Cape Verdean, African American, and Indian	Parenting

Subtheme 1d: For some young women who were academically skilful before they became pregnant, traditional education trajectories were fragile.

Authors of a longitudinal study of English girls (Walkerdine et al., 2001) posed that working-class teens disrupted their pursuit of traditional middle-class, educational pathways because of a 'transformation of self':

> The middle-class parents in the sample simply would not have tolerated the idea of anything, and certainly not pregnancy, getting in the way of educational success. This complicity between Sharon and her mother …suggests that as much as both she and her parents were proud of her ambition, they were secretly terrified of it …A baby was a much better known quantity. (2001, p. 208)

Similarly, in a longitudinal case study in the U.S. (Vetter et al., 2011), researchers interviewed an academically-motivated student who revealed she was pregnant in her last interview. The authors suggested that university conflicted with Jessica's desire to stay close to family, whereas her pregnancy allowed her 'to do what I want to…in education. I want to go to [community college] still, and I think me just having a baby makes me want it more' (2011, p. 202). Walkerdine (2001) argued the event of pregnancy helps resolve an internal conflict over the unknown (university) and the familiar (family), opening the possibility to pursue both parenthood and education, a combination that is largely unsupported by middle-class educational values. Adolescent parenthood is hence a 'problem' only in that it disrupts traditional, middle-class educational trajectories (Arai, 2003; Bettie, 2003; Coleman & Cater, 2006; Elley, 2011; Walkerdine et al., 2001) based on the assumption that parenthood and education are incompatible. However, as reported by studies that compared pre- and post-pregnancy education, schools are capable of supporting parenting and education simultaneously (Dawson & Hosie, 2005; Erdmans, 2012).

Subtheme 1e: For young mothers, becoming a parent validated a meaningful and legitimate pathway to adulthood.

Most parenting teens in the studies did not view young parenthood as 'irresponsible,' rather chose parenthood as a legitimate life pathway. Whether pregnancy was planned or the result of unintended pregnancy, participants framed young parenthood as a meaningful route to adult status (Arai, 2003; Bettie, 2003; Biggs et al., 2013; Coleman & Cater, 2006; Davidson, 2015; Erdmans & Black, 2015; Minnis et al., 2013; Smith & Roberts, 2011).

Several studies revealed that many young parents had already been forced to 'grow up quickly' by assuming adult responsibilities before pregnancy occurred, such as caring for relatives or taking on financial responsibilities (Arai, 2003; Coleman & Cater, 2006; Erdmans & Black, 2015; Minnis et al., 2013; Vetter et al., 2011). Arai (2003) argued some teens were thrust into early maturity because of traumatic childhood experiences. Parenthood was one

component in a set of trajectories that defined adulthood, where having a baby validated their maturity rather than marking the end of childhood (Coleman & Cater, 2006; Erdmans & Black, 2015). Young women pursued meaningful and socially beneficial trajectories in accordance with their views on development into adulthood.

Theme 2: Young women's experiences of school and education

In the second theme, reciprocal translation revealed that adoption and maintenance of young women's educational and life trajectories were shaped by structural and relational factors described through stories and examples of experiences of school and education.

Subtheme 2a: School values are not culturally representative of young women's identities.

Young women across studies expressed multiple identities based on their racial or ethnic background, country of origin, socio-economic status and social roles that shaped their attachment and response to school (Algert, 2000; Biggs et al., 2013; Erdmans, 2012; Erdmans & Black, 2015; Kaplan, 1997; Minnis et al., 2013; Noone et al., 2014; Vetter et al., 2011). Youth of colour reported social isolation and discrimination when attending schools primarily composed of white teachers and students (Algert, 2000; Erdmans & Black, 2015; Vetter et al., 2011). They indicated their identities were not reflected in school staffing or curriculum (Gilbert, 2011; Kaplan, 1997; Smith & Roberts, 2011; Vetter et al., 2011), and schools did not adequately highlight the successes of black or Latinx students (Bettie, 2003; Gilbert, 2011). In studies exploring pregnancy among immigrant teens, youth and their families valued education but considered it unattainable. Language barriers impacted their grades and caused them embarrassment (Biggs et al., 2013; Erdmans, 2012; Minnis et al., 2013), preventing participation in school activities (Biggs et al., 2013). For some, migration patterns between the U.S. and their parents' country of origin caused significant absences (Erdmans & Black, 2015), the academic effects of which were exacerbated by inconsistent teaching practices and a lack of support for English Language Learners (Erdmans, 2012).

Authors reported that broader development opportunities, such as sports and after-school programmes, might increase attachment to school and motivate young people to avoid pregnancy (Childs et al., 2015; Gilbert, 2011; Martyn & Hutchinson, 2001). However, young women reported financial and cultural barriers that prevented their participation, including academic or cost requirements (Gilbert, 2011). Some students perceived that certain clubs did not welcome youth of colour (Noone et al., 2014).

Subtheme 2b: School sanctions on students' autonomy marginalise adolescents sympathetic to young parenthood from school and education.

Reciprocal translation revealed the development of autonomy was important to young people across studies and pregnancy status. Adolescents with commitment to school expressed their autonomy in opposition to social stereotypes or identities that might jeopardise their educational aspirations (Elley, 2011; Martyn & Hutchinson, 2001; Vetter et al., 2011), such as declaring their educational and sexual independence from male dominance: 'for women, there needs to be self-esteem classes and "you don't need a man" classes, you can do for yourself' (Martyn & Hutchinson, 2001, p. 246).

For teens with weak attachment to school, educational systems or trajectories were not a source of autonomy, and detracted from established adult roles. Young mothers across several studies indicated that school prior to pregnancy conflicted with their desire for independence (Erdmans & Black, 2015; Tabi, 1999): 'Julie… fought against the structures of confining adolescence and asserted her independence from adults… "I don't like people telling me what I have to do… I want to do what I want to do, not what they want me to do"'(2015, p. 170). Several young mothers preferred post-pregnancy education because students 'were in control of their own choices' (Dawson & Hosie, 2005, p. 79) and the school allowed them to express their identities as adults and parents (Erdmans, 2012; Vetter et al., 2011).

When management of their education was constrained, young women asserted their independence by controlling their school and life experiences in ways they were able, such as truanting (Bettie, 2003; Vetter et al., 2011), dropping out (Biggs et al., 2013; Erdmans, 2012; Erdmans & Black, 2015) and becoming a parent (Coleman & Cater, 2006). Negative school responses to these assertions of autonomy further weakened fragile relationships with education. Because they viewed young parenthood as incompatible with school values (Bettie, 2003; Tabi, 1999), some schools sought to enforce 'appropriate' forms of autonomy (Bettie, 2003; Erdmans, 2012; Vetter et al., 2011) by putting young mothers '"back in their place"… to recenter attention on the success of students who could and did follow the institutional ideals' (Bettie, 2003, pp. 71–72).

Subtheme 2c: Teachers' explicit and implicit messages impact young people's expectations of future education and career.

Relationships with teachers featured prominently in young people's narratives (Agogbuo, 2006; Charmaraman & McKamey, 2011; Davidson, 2015; Dawson & Hosie, 2005; Erdmans, 2012; Erdmans & Black, 2015; Gilbert, 2011; Jones & Norton, 2007; Kaplan, 1997; Vetter et al., 2011; Willemsen & DeJaeghere, 2015; Zachry, 2005). Teens with poor attachment to school reported teachers were inaccessible (Dawson & Hosie, 2005; Erdmans, 2012; Erdmans & Black, 2015; Zachry, 2005) or perceived that teachers favoured white students or those

more likely to attend college (Erdmans & Black, 2015; Vetter et al., 2011). They were, therefore, less inclined to engage: ‘If you didn't show nothing to me or you didn't try to make any effort for me, I wouldn't make no effort for you’(Erdmans & Black, 2015, p. 144).

Lowered expectations of future education and career were reflected in teacher expectations (Davidson, 2015; Erdmans, 2012; Kaplan, 1997; Vetter et al., 2011), including explicit messages – 'why don't you just look for a job' (Erdmans & Black, 2015, p. 163), and indirect signals that their education was not important: 'my science teacher… let me skip' (2015, p. 164). Young people also received racialised messages that they were expected to ‘end up on welfare’ (Kaplan, 1997, p. 30) or were ‘not smart enough to get an education’ (Vetter et al., 2011, p. 194). In one study, authors highlighted a teen whose high aspirations were not sufficient to overcome lowered expectations:

> Even as she voiced these plans [to become a social worker], Juliana pointed out, more than once, that she was ‘a troublemaker’, observing that (white middle-class) teachers at Morton had described her this way… I asked her where she thought she would be in five years. ‘Probably pregnant!’ she said. ‘Everybody thinks I’m going to get pregnant.’ (Davidson, 2015, p. 398)

Several studies suggested positive connections to teachers but left these experiences largely unexplored (Algert, 2000; Charmaraman & McKamey, 2011; Gilbert, 2011). In one study, a teen who was not pregnant or parenting described how she assumed ‘only white people with money could go to college’ (Algert, 2000, p. 163) until she spoke with the school counsellor (who was also Latinx), prompting her to start 'doing all my school work and… getting all my credits' (2000, p. 157).

Subtheme 2d: Academic curriculum and support did not match student needs, perpetuating cycles of absences and academic failure.

Many pregnant and parenting teens described the school curriculum as boring and irrelevant (Coleman & Cater, 2006; Erdmans, 2012; Erdmans & Black, 2015; Kaplan, 1997; Trusty-Smith, 2013; Zachry, 2005). This was attributed to mundane classroom tasks; for example, one parenting teen in a special-education class was instructed to ‘copy off the books’ (Erdmans & Black, 2015, p. 162). The transition from lower to higher-level grades appeared to accelerate disconnection as academic challenges and school size increased (Dawson & Hosie, 2005; Erdmans, 2012; Erdmans & Black, 2015; Kaplan, 1997; Trusty-Smith, 2013; Zachry, 2005):

> “Until eighth grade I was smart, but once I hit high school and so much people around me, my head just got—I don’t know where it went." In smaller elementary school classes, ‘‘you could raise your hand and you could say, ‘Mister, could you help me with this?’ But you can’t really do that’’ in larger high schools. (Erdmans, 2012, p. 61)

Disconnection was often manifested through truancy, sometimes the result of problems outside of school, such as circular migration (Erdmans & Black, 2015), parental illness (Minnis et al., 2013) and mental-health problems stemming from family disputes and sexual abuse (Erdmans & Black, 2015; Kaplan, 1997). Others truanted to hang out with friends (Erdmans & Black, 2015; Kaplan, 1997; Zachry, 2005):

> "Sixth and seventh grade was hard but I was able to manage it. Then eighth grade is like when … I fell behind." She repeated eighth grade but she "skipped all the time and then started not wanting to go to school" because she could not do the work: "I tried my hardest and it seemed like the harder I tried, the less grade I got." (Erdmans & Black, 2015, pp. 166–167)

This example illustrates that attendance both reflected and compounded academic problems and perpetuated cycles of detachment from school. Multiple studies reported that young mothers were suspended as a punishment for truancy, increasing the time young people spent away from school (Erdmans, 2012; Erdmans & Black, 2015; Vetter et al., 2011).

Discussion

This review sought to advance understanding of how young women's experiences in education and school influence their sexual behaviours, pregnancy and parenting decisions. Synthesis of 28 qualitative studies revealed that young women's education and life trajectories were shaped by their commitment to school values and their expectations for academic achievement and higher education. These aspirations are informed by their experiences of school and education, and perceptions of how education or parenthood would help them achieve adulthood status. Young people indicated multiple ways in which schools shaped their commitment, including whether school values align with their broader environment and experiences, how students were treated and supported by teachers, and the extent to which the curriculum was relevant and engaging.

The finding that many young mothers have weak attachments to school prior to pregnancy challenges the assumption that adolescent pregnancy is the primary reason for school dropout (Basch, 2011) and supports research that suggests young people's limited educational and career opportunities are the result of social disadvantage, of which adolescent pregnancy is only one component (Harden et al., 2009; Kearney & Levine, 2012). It also highlights the importance of school as an upstream influence on adolescent sexual health, and not just a setting for sex and relationships education (SRE) (Viner et al., 2012).

The findings of this review support Markham and Aveyard's (2003) theory of human functioning and school organisation (described earlier) that students' commitment to schools' instructional and regulatory orders increase their capacity for practical reasoning and

affiliation, which influence their behaviour and future health. The theory provides a framework for examining the impact of school and education experiences on student health.

School Commitment and Pregnancy Outcomes

Findings on students with strong educational trajectories align with Markham and Aveyard's definition of 'committed' students devoted to achieving higher education. Many students who became young parents lacked commitment to school prior to pregnancy. They may be 'detached', rejecting the rigidity of school values on non-educational trajectories, or 'estranged', because their academic abilities cannot support their desire for educational achievement. In some cases, deficits in support and cycles of disengagement 'alienated' young people because they lacked both the skill and desire to succeed in school. Detached, estranged or alienated youth might actively choose early parenthood. Others were ambivalent about planning or preventing pregnancy, for example prioritising relationship satisfaction over risk of pregnancy, and becoming pregnant via inconsistent contraceptive use. It is difficult to distinguish between these latter groups as adolescent parenthood is often stigmatised within school culture and youth may not reveal their true intentions to researchers. Young parents in these studies, however, did not demonstrate deficits in practical reasoning or affiliation as Markham and Aveyard would posit. Instead, they chose or adapted to their role as parents, because of benefits to their status as adults and limited costs to future education or career.

School Community Boundaries

Markham and Aveyard (2003) suggest that schools can increase student commitment by developing shared values with the broader community. Restorative practices, which the U.S. and U.K. have increasingly adopted, might be used to re-engage detached and alienated students who experience social disadvantage by focusing on nurturing relationships in response to undesirable behaviour, such as truancy (Fronius, Persson, Guckenberg, Hurley, & Petrosino, 2016). School-based wellness centres are promising interventions for addressing various health issues affecting school engagement and learning (Knopf et al., 2016).

Students in the studies reviewed reported racial discrimination through school policies and teaching practices. A mixed-methods study on the effects of teacher race on pregnancy outcomes has found that an increased proportion of black teachers was negatively associated with pregnancy among black students. The greater presence of black teachers may strengthen teacher-student relationships and improve the school's ability to address the needs of black students (Atkins & Wilkins, 2013). This resonates with findings in our review that young people reported their identities were not represented positively in schools where young parenthood was common.

Studies reported messages from school on acceptable forms of adulthood and autonomy, which ignored or discouraged adolescent parenthood. Young people created their own social spaces based on socio-economic status and ethnicity within middle-class schools that validated young parenthood as a legitimate pathway to adult status and independence (Bettie, 2003). This resonates with Willis's work on how working-class boys in 1970s British schools responded to the middle-class school culture by asserting their own working-class culture (Willis, 1977). Pound et al's (2016) recent review on young people's views on SRE suggests that schools' inability to accept adolescent sexual activity, of which teen pregnancy is the visible proof, affects the relevance and salience of SRE.

Teacher-Student Relationships

Markham and Aveyard (2003) suggest that strengthening teacher-student relationships facilitates capacity for practical reasoning and affiliation. Our studies offer several explanations for teacher influence on students' sexual health. Teachers' expectations based on socio-economic status, race, ethnicity or gender may contribute to young people's own lowered self-expectations. This aligns with evidence that students with higher educational expectations and aspirations report lower rates of sexual-risk behaviour (Henderson et al., 2008; Lauritsen, 1994; Paul, Fitzjohn, Herbison, & Dickson, 2000; South & Baumer, 2000; White & Warner, 2015). Young parents also reported that they preferred teachers and school staff to treat them as adults, especially when they had already adopted adult responsibilities at home. In a qualitative case study on adolescent substance use, Fletcher et al (2009) similarly reported that female students perceived schools did not recognise their experiences with adult responsibilities, causing them to resent the school and teachers.

In our review, students reported that they did not receive adequate teacher support. A recent review of state policy studies reported that higher expenditure and lower teacher-to-student ratios were associated with lower rates of child bearing (Beltz, Sacks, Moore, & Terzian, 2015). Teachers may focus their limited time on high-achieving students more likely to attend college. Other qualitative studies support similar findings that schools focused on academic attainment may discriminate against students unlikely to increase school attainment scores, leading young people to 'disinvest' from education and adopt risk behaviours (Bonell, Fletcher, Sorhaindo, Wells, & McKee, 2012).

Academic boundaries

In accordance with studies reporting an association between attitude towards school and sexual behaviour (Bonell et al., 2005; Kogan et al., 2013), many young parents in this review disliked school and found it irrelevant to their lives. Markham and Aveyard (2003) theorise that schools can improve student commitment by integrating learning across subjects and

involving students in development of teaching practices. Schools might encourage students to reflect on their overlapping identities within and outside of school as a part of assignments and provide more opportunity for student input and choice in curriculum content.

Limitations

The studies in this synthesis heavily represent low-income young women in high-income countries, primarily the U.S. and U.K.; only four studies interviewed middle-class teens and only three were from low- or middle-income (LMIC) countries. Subsequently, LMIC studies did not contribute greatly towards themes reported in this review. Further, most studies interviewed young parents after pregnancy and it could be difficult to distinguish experiences leading up to and after pregnancy. This review focused on school experiences prior to pregnancy and might therefore have excluded studies about experiences after parenthood or external to the school environment that may have contributed to the research question. The synthesis for this review drew mainly on interview data that might over-represent teens who chose a parenthood trajectory and might under-emphasise the extent to which poor information and random chance influence sexual health outcomes. Likewise, it is not possible to know whether factors for avoiding pregnancy identified by nonpregnant, nonparenting teens during early or middle adolescence were successful in helping them avoid pregnancy later.

Methodological limitations include a lack of screening and quality assessment by multiple reviewers, which was attempted but ultimately not possible due to resource and time constraints. Bias was minimised by piloting the eligibility criteria and quality-assessment tool, results of which were discussed between the two authors. Twenty-eight studies were unobtainable for full-text screening, primarily because author contact was unavailable or there was no response to requests for full text. Most were theses and may have been captured in title and abstract screening as published versions. This review focused on the experiences of youth identified as female. Future reviews might explore gender differences in the role of education and school in sexual and pregnancy decision-making.

Implications

This synthesis identifies several factors in the school environment that can be examined in future studies. First, multi-level studies might further examine the impact of teacher characteristics on commitment to school and health outcomes, specifically racial composition of school staff and shared values between staff, students and their families. Second, new qualitative studies might further explore how school policies and practices alienate students who are sympathetic to young parenthood. Lastly, new interventions might seek to modify student sexual health outcomes by: improving teacher-student relationships through staff

training to reduce cultural bias and improve communication with students; promoting adolescent take-up of adult roles and identities by gradually increasing flexibility and choice in learning activities; and ensuring physically and psychologically safe spaces through school policies and hiring practices that reflect the needs and values of students' communities. These interventions may target students during particularly vulnerable periods, such as the transition from middle to high school, to ensure students are supported socially and academically. Interventions should account for differences in school and student culture by involving youth in the development and implementation of programmes.

Conclusion

This is the most comprehensive synthesis exploring young women's views on school and education as they relate to sexual behaviour and pregnancy decisions. Aligned with Markham and Aveyard's theory that schools play a role in young people's health, findings suggest that adolescents' educational trajectories and sexual decisions are interrelated, and shaped by school experiences and relationships. Schools may support student health-promoting sexual behaviours by implementing policies and practices that improve teacher-student interactions, enabling young women's developing autonomy, and ensuring physically and psychologically safe spaces for students.

Supplemental findings on young women's experiences of school and education

The following section provides additional findings from the qualitative review that were not included in the final paper due to word limits. While some content was worked into the published version, I present the full details from these results here to add further context to the application of the theory of human functioning and school organisation. These supplement results were written as additional subthemes under Theme 2: Experiences of school and education.

Results

Subtheme 2e: Physical and Psychological Safety

Several studies described school environments that were disorganised or unsafe for students (Jones & Norton, 2007; Kaplan, 1997; Zachry, 2005). Students described chaotic environments where teachers were unable to manage the behaviour of students in their classrooms (Zachry, 2005), constant noise emanated from the students and teachers (Kaplan, 1997), and security policies created a 'prison-like atmosphere' (Kaplan, 1997, p. 31). A number of studies described young mothers across the academic spectrum who engaged in physical altercations with other students (Algert, 2000; Erdmans, 2012; Erdmans & Black, 2015; Vetter et al., 2011; Zachry, 2005) or had been bullied in school (Coleman & Cater, 2006; Dawson & Hosie, 2005; Minnis et al., 2013; Walkerdine et al., 2001).

A low quality, longitudinal study of Ugandan schoolgirls reported school officials as a source of physical harm, where male teachers pressured their female students into sexual relationships in order to receive high grades or avoid mistreatment during class (Jones & Norton, 2007). This was a part of larger issue described by female students in low and middle income countries where young women were engaging in transactional sex in order to pay for school-related fees or basic necessities (Jones & Norton, 2007) or to acquire 'luxury' goods, such as cell phones and clothing (Willemsen & DeJaeghere, 2015). Transactional sex put them at risk for unintended pregnancy, which for many girls, ended their formal education (Willemsen & DeJaeghere, 2015).

In a medium-quality case study of a girls' school in Tanzania, the students identified sexual relationships, including transactional ones, as a risk of attending a mixed-gender school (Willemsen & DeJaeghere, 2015). In contrast, the physical boundaries of their all-girls school, which were protected by security guards, along with policies that restricted communication with males ensured 'a space to study free from the temptation to enter sexual relationships' (Willemsen & DeJaeghere, 2015, p. 192) and protected them from unintended pregnancy.

Subtheme 2f: Relevance of formal curriculum

Weak attachment to school was evident in the ways that many pregnant and parenting teens described the school curriculum, indicating that it was boring and irrelevant to them (Coleman & Cater, 2006; Erdmans, 2012; Erdmans & Black, 2015; Kaplan, 1997; Trusty-Smith, 2013; Zachry, 2005). This was attributed to mundane classroom tasks. For example, one parenting teen was in a special education class 'for kids that couldn't read or write,' where the students were instructed to 'copy off the books' (Erdmans & Black, 2015, p. 162). This student tried to quit school but was legally forced to return. A number of other girls characterised school as lacking relevance to their lives (Coleman & Cater, 2006; Kaplan, 1997; Zachry, 2005):

> When asked if she was interested in her academic studies when she was in high school, Holly responded, "[I] didn't think they were very important … I didn't think I would use them in the real world. I didn't think that they had nothing to do with what was going on right now.'' (Zachry, 2005, p. 2578)

Bettie (2003) argued that working-class Latinas in one Midwestern school, having been tracked to vocational classes, cultivated a response to the boredom and aspects of school that were irrelevant to their lives, showing 'little interest in the formal curriculum… and employed rituals of girl culture as an alternative to and refusal of official school activities.'(Bettie, 2003, p. 60) 'Girl culture' involved the discussion of and interest in babies and motherhood and the rejection of the educational values embraced by middle-class students and the school faculty.

Subtheme 2g: Broader development

Nonpregnant and nonparenting teens identified involvement in school and after-school activities as one method for avoiding pregnancy (Childs et al., 2015; Gilbert, 2011; Martyn & Hutchinson, 2001). In addition to occupying time they would have spent with a romantic partner (Gilbert, 2011; Martyn & Hutchinson, 2001), belonging to a team or group increased their investment in maintaining their membership to that group. Becoming a young parent would be 'embarrassing' and would jeopardize their ability to participate and be successful in sports or other activities (Childs et al., 2015; Martyn & Hutchinson, 2001; Noone et al., 2014). Young people, however, identified financial and cultural barriers that prevented them from participating in activities. Students may be unable to meet the minimum grade requirements or cannot afford the cost of participating in sports teams (Gilbert, 2011), a missed opportunity for academically or socially alienated students. Costs for community activities, such as art or dance, and not meeting income thresholds for participating in subsidized programs, like Upward Bound, were listed as barriers to participation in community program (Gilbert, 2011). Further, some students perceived that certain clubs did not welcome youth based on their racial or ethnic background and suggested programs actively recruit young people from these groups to ensure they feel welcome in programs (Noone et al., 2014).

Broader development opportunities might also include expanded students' world views through community events (Tabi, 1999) or volunteering opportunities (Noone et al., 2014), where young people learn to ‘be an example for others’ (Noone et al., 2014, p. 68). A high quality and a low quality study indicated that serving as a role model for others helped nonpregnant-nonparenting teens maintain their educational course (Algert, 2000; Martyn & Hutchinson, 2001):

> Sometimes I’m so frustrated I don’t want to come to school, I just feel like dropping out, but I know better…What I think about is that I’m the first girl to finish high school that will be going on to college…I’m expected to do better. It’s not pressure, it’s pride. I never had anyone to guide me. So, I look at my little brother and sister, they’re little and I love them so much, and I want to set a good example for them. My brother and sister look up to me by me setting a good example. [Angelica – nonpregnant/nonparenting] (Algert, 2000, p. 159)

Synthesis with findings described in Health and Place paper

These supplemental findings extend the findings presented in the *Health and Place* in supporting components of theory of human functioning and school organisation, as well as provide insights into areas where the theory requires refinement or further development.

Firstly, additional findings suggest that school environments could be sources of psychological and physical harm. Overcrowded schools, failure of teachers to manage classrooms and the presence of security contributed to chaotic environments making it difficult for students to learn. Studies from low income countries also reported school environments that enable sexual abuse by teachers and transactional sex as a means to pay for school fees and supplies. Markham and Aveyard do not explicitly address the role of schools as a source of harm. The theory requires additional development concerning the role of school in establishing practices which protect students from internal sources of psychological or physical harm. Further, it may be critical for schools to strengthen, rather than weaken, boundaries between the school and community when the community is physically dangerous, as was the case with Willemsen and Dejaeghere’s (2015) Tanzania study in which boundaries were required in order to create a safe space for young women to learn.

Secondly, additional findings extend the contention that that young people’s accounts aligned with the theory’s academic boundaries and framing, in which Markham and Aveyard theorise that schools can improve students' commitment to school by implementing 'education in breadth' and by including students in the development of pedagogic and communication practices used in school (W. A. Markham & Aveyard, 2003). The qualitative studies in this review provide insight into how these can be achieved.

Schools might encourage students to bridge academic worlds with social worlds by making space for young people to explore their overlapping identities as students, teenagers,

caregivers, and members of different cultural groups within their classroom assignments. For example, schools might explore with students the role of intersectional stigma on adolescent pregnancy and motherhood (Chambers & Erausquin, 2015). Schools might also integrate current issues from the local community into their curriculum, including opportunities for involvement in community and after-school activities. Service learning – the combination of meaningful service contribution in the community and reflection on service – may also have an impact on sexual behaviour, though programs focused on vocational education did not (Kirby, 2007). This makes sense in the context of studies included in this review which suggested that vocational education and young parenthood were not incompatible. Schools might also involve students in the development and decision-making around teaching practices and communication. Young parents in this study made clear distinctions between the trust and respect they received at alternative schools intended for pregnant and parenting teens versus the mainstream high schools they attended prior to pregnancy. Autonomy was a concept expressed across youth populations in the review studies, and was echoed in preferences for how sex educators deliver sexual health education in Pound et al's 2016 qualitative synthesis (Pound et al., 2016). As a result, schools may consider how to gradually integrate more choice and flexibility in curriculum, schedule and teachers, especially for students in higher grades.

Chapter 3 References

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Chapter 4

Systematic review of observational studies examining school-related influences on adolescent sexual health outcomes

Introduction

The theory of human functioning and school organisation proposes that the school environment – above and beyond health education – can promote young people's health (W. A. Markham & Aveyard, 2003). Markham and Aveyard have suggested how various school processes may improve young people's commitment to school and their capacity for practical reasoning and affiliation which in turn, would promote healthier behaviours. While Markham and Aveyard did not specify adolescent sexual health in their theory, observational literature can provide insight into whether the school-related factors – such as those suggested by the theory of human functioning and school organisation – are associated with young people's sexual health outcomes. This chapter presents a systematic review of observational literature exploring school-related factors associated with sexual behaviour and sexual health outcomes.

Several reviews have sought to identify observational research on school-related influences on sexual health. Two reviews from 2010 examined associations between student competence and connectedness derived from the PYD literature (which included education- and school-related factors) and outcomes relating to sexual behaviour or health outcomes (House, Bates, Markham, & Lesesne, 2010; C. M. Markham et al., 2010). However, these reviews limited included studies to those published in peer-reviewed journals in English from the United States, Europe, New Zealand and Australia. In addition, while they assessed and interpreted studies based on study design (i.e. longitudinal versus cross-sectional), they did not appear to systematically consider other aspects of study quality, such as accounting for plausible confounders, response rates or sample sizes. Two additional reviews have examined observational studies of school-related influences on sexual health in LMIC settings. Chung et al (2018) examined risk and protective factors for adolescent pregnancy in LMIC countries at

different levels of Bronfenbrenner's (1994) socio-ecological model, which included school and education; but this review did not account for quality of studies in its synthesis. Another recent review examined determinants of adolescent pregnancy in Africa, and considered quality in its synthesis; however, exposures explored were limited to school enrolment and attendance (Kassa, Arowojolu, Odukogbe, & Yalew, 2018). None of these reviews considered the role of school-level studies in describing relevant risk or protective factors of the school.

This review builds on existing reviews by including a comprehensive range of individual- and school-level studies exploring the associations of school- or education-related factors with sexual behaviour or sexual health outcome across high-, middle- and low-income countries. Individual-level longitudinal studies examine the temporal associations between students' experience with school or education and their subsequent health behaviours and outcomes. School-level studies can examine how aspects of the institutional and organisational features of school may influence student behaviour, either concurrently or over time. Specifically, the school may influence health through the compositional characteristics of the student body (such as the socio-demographic make-up or collective attitudes towards school) or through contextual factors made up by the physical or social environment (such as policies and formal or informal practices of teachers or staff) (Macintyre, Ellaway, & Cummins, 2002). By systematically synthesizing individual- and school-level observational literature, this review will seek to assess whether existing observational studies support the theory of human functioning and school organisation in theorising how school influences sexual decision-making in young people.

Methods

This review follows PRISMA guidelines for conducting and reporting systematic reviews. The protocol for this review is provided in Appendix B.1 and is available online (A.J. Peterson & Bonell, 2019).

Eligibility Criteria

Population

Studies were included if the target population were adolescents, defined as ages 10-19 (World Health Organization, 2014).

Exposure

Studies were included if the study included a school-related exposure variable, such as school enrolment, truancy or attendance, academic performance, expectations or plans for future education, and attitudes or connectedness towards school. Measures could be self-reported, assessed by a parent or teacher, reported via administrative data or collected via researcher

observation. Exposure variables were included in the synthesis if they were hypothesized to be a predictor of a sexual health outcome, and not just as a potential confounder.

Outcome

Studies were included if they reported at least one sexual health outcome, such as adolescent pregnancy, STIs or HIV, or sexual behaviour, such as age of sexual initiation, frequency of sex, use of condoms or contraception, or number of sexual partners.

Study type

Studies were included if they were longitudinal designs measuring individual-level and/or school-level exposure variables at a time point prior to measured sexual health outcomes. Because school-level variables are less likely to reasonably be affected by reverse causality, cross-sectional studies examining school-level exposure variables were also included.

Language and date

Studies were not excluded based on language or date.

Search Strategy and Selection

Three bibliographic databases were searched March-May 2019: CINAHL Plus (EBSCO), PubMed and Social Sciences Citation Index (Web of Science). In addition to database searching, the reference lists of studies meeting inclusion criteria and of identified published reviews were checked for potentially relevant studies.

Search terms linked three concepts: 1) school or education; 2) sexual health and behaviour outcomes; and 3) observational studies. School/education terms were informed by Bonell et al. (2011) and Peterson et al. (2019). Several rounds of free text and subject heading searches were pilot tested to determine a balanced level of precision and specificity. Search terms and Boolean operators for one database were developed and then adapted for remaining databases. A sample search string is shown in Table 4.1 (remaining search records are listed in Appendix B.2).

All searches were managed in EPPI-Reviewer 4 (Thomas, J, Brunton, J., & Graziosi S, 2010). After duplicates were removed, studies were screened on title and abstract, then by full text where title/abstract could not explicitly include or exclude studies. Eligibility criteria outlined above were imported into EPPI Reviewer 4 (Appendix B.3) and used to assess studies for inclusion. Each excluded study was coded with an exclusion justification code.

Data extraction and Quality Assessment

Study data from included studies were extracted into a standardised Excel file. Information extracted from studies included: study location, study design (e.g. longitudinal, cross-sectional), study population, sample size, response rates, approach to analysis (e.g. multi-level

Table 4.1 Sample Search String		
Database: PubMed		
Date: 26 March 2019		
#	*Search String*	*Results*
S1	Educat* OR school	727,627
S2	Goal* OR likelihood OR probability OR intention* OR aspiration* OR engagement OR involvement OR commitment OR interest OR contribution OR dislike OR attainment OR asset* OR failure OR attendance OR success* OR system*	6,216,845
S3	S1 AND S2	226,315
S4	wide OR ethos OR climate OR environment OR culture OR manag* OR organisation OR aggregat* OR governance OR context OR effects OR difference* or inequalit* OR variation OR influence* OR factor*	10,335,877
S5	S1 AND S4	385,609
S6	S3 OR S5	467,088
S7	pregnancy OR pregnancies OR conception OR abortion OR "family planning" OR "safe sex" OR "safer sex" OR "protected sex" OR "unsafe sex" OR "unprotected sex" OR "sexual behavior" OR "sexual behaviour" OR "sexual risk" OR "sexual risk-taking" OR "sexual intercourse" OR "sexually active" OR sexuality OR "sexual initiation" OR "sexual activity" OR "sexual debut" OR condom OR STI OR STD OR "sexually transmitted infection" OR "sexually transmitted disease" OR chlamydia OR gonorrhea OR contraception OR contraceptive OR contraceptives OR "birth control" OR abstinence OR"long-acting reversible contraception" OR "long-acting reversible contraceptive" OR LARC OR condom	150,724
S8	S6 AND S7	13,329
S9	observational OR longitudinal OR analysis OR "cross-sectional" OR "multi-level" OR "school-level"	4,211,869
S10	S8 AND S9	4331

analysis, adjustment for clustering), measures for exposure and outcome variables, covariates or confounding variables, and effect sizes, standard errors or confidence intervals, and/or p-values.

Studies were assessed for quality using an adapted version of the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (NIH National Heart, Lung and Blood Institute, n.d.). The following criteria from the NIH tool were included: clear study aim and definition of study population, response rates, sampling design, sample size justification, measurement of exposure and outcome variables, and adjustment for key potential confounding variables. Two items were added to the tool specifically to assess quality of multi-level studies including adjustment for clustering and over-adjustment of factors that are potential mediators of school-level variables and outcomes (Aveyard, Markham, & Cheng, 2004). Based on these domains, each study was given a score of high, medium or low. To be scored as high quality, studies must have reported on the majority of domains, adjusted for all key confounders (including clustering for school-level studies), clearly described measures and sampling design, and reported on and achieved attrition equal to or less than 20%. To be scored as medium quality, studies must have reported at least four of the domains, adjusted for most key confounders, and clearly described measures and sampling design. Studies were

scored as low if they did not meet high or medium criteria. Context of the studies were considered in assessing quality, including whether the study was longitudinal or cross-sectional in design. In addition, if a study was a secondary analysis of data, some domains that are not commonly reported in secondary analyses (such as sample size justification) were considered but did not significantly affect the quality rating. To ensure consistent assessment, appraisal of 10% of included studies (n=6) were confirmed by a second reviewer.

Synthesis

Findings of included studies were synthesised narratively. Study information and outcomes, including all significant and nonsignificant associations, are reported in 'Summary of Findings' tables. (Higgins, JPT & Green, S, 2011) Quality of evidence by study are reported in a separate table. Findings of included studies were synthesised narratively by study type (e.g. individual- or multi-level), then by school-related exposure (e.g. academic performance, school enrolment), outcome (e.g. sexual debut, adolescent pregnancy), population, and quality (e.g. high and medium quality then low quality). Meta-analysis was considered and would have been reported by exposure/outcome combinations (i.e. attitude of school and early sexual debut) in line with the narrative synthesis. A common summary estimate for pooled effect sizes would be determined based on best fit for reported outcomes (e.g., odds ratios for dichotomous measures) and calculated using EPPI-Reviewer 4's meta-analysis function. It was determined that meta-analysis was not possible due to inconsistency in exposure/outcome groupings, subgroup reporting or insufficient data (described below), therefore, narrative summaries of effects are reported.

Results

Searches yielded 16,411 citations after 2385 duplicates were removed. After 139 full text items were reviewed, 53 studies met the inclusion criteria (Figure 4.1). As outlined in Table 4.2, fifteen studies were assessed as high quality, twenty-one studies were assessed as medium quality, and seventeen were assessed as low quality. Medium quality scores were primarily due to low response rates and lack of reporting on measurement, where poor quality scores were primarily due to lack of reporting on measurement, low participation and response rates, and failure to adjust for key confounding variables.

The majority of studies (36) were conducted using data from the United States. Additional high-income country studies included six studies from the United Kingdom and one from New Zealand. One study covered ten high- and middle- income European countries, including Austria, Estonia, France, Germany, Hungary, Ireland, Italy, Slovenia, Romania, and Spain. The remaining studies were based in low- or middle- income African countries, including four from South Africa, three from Kenya, and two from Malawi. A number of the studies

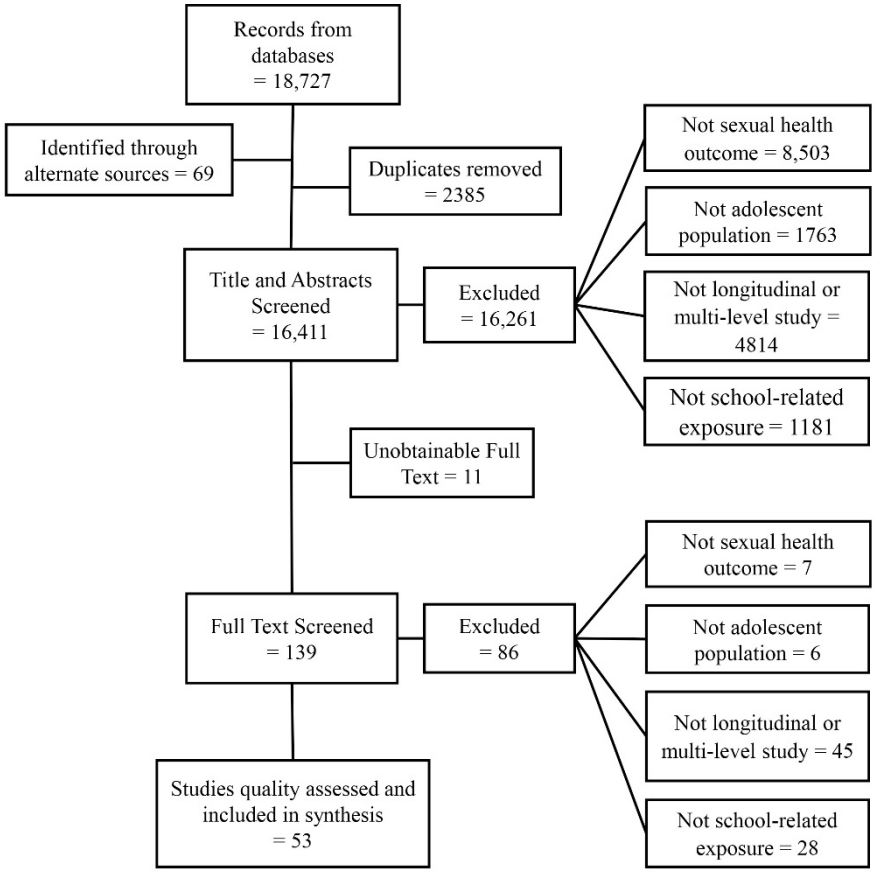

Figure 4.1: PRISMA diagram

conducted analyses on the same data set. Thirteen studies analysed data from the National Longitudinal Study of Adolescent to Adult Health study (Add Health) based in the United States (Chen, Thompson, & Morrison-Beedy, 2010; Cubbin, Brindis, Jain, Santelli, & Braveman, 2010; Ford et al., 2005; Greene, Eitle, & Eitle, 2018; Koon-Magnin, Kreager, & Ruback, 2010; McNeely & Falci, 2004; Mollborn, Domingue, & Boardman, 2014; Resnick et al., 1997; Rink, Tricker, & Harvey, 2007; Shneyderman & Schwartz, 2013; S. J. South, Haynie, & Bose, 2005; Steiner, Michael, Hall, Barrios, & Robin, 2014; White & Warner, 2015). Two reports each used data from the following data sets: National Survey of Family Growth (Kim, 2015; Manning, Longmore, & Giordano, 2000), the RIPPLE randomised control trial (Allen et al., 2007; Bonell et al., 2005), the Rochester Youth Development Study (Smith, 1996; Thornberry, Smith, & Howard, 1997), and the Transitions to Adulthood Study (Beguy, Mumah, & Gottschalk, 2014; Marston, Beguy, Kabiru, & Cleland, 2013). Each of these reports are treated as separate studies given that the analyses vary in their methods, including the exposures and outcomes measured.

Table 4.2 Assessment of study quality										
Study	Study Type	Score	*Participation >50%*	*Prespecified /uniformly selected participants*	*Sample size and/or power justified*	*Measurement defined, valid, and reliable*	*Assessors blinded to exposure*	*Attrition < 20%*	*Did not over-adjust for mediators*[1]	*Adjustment for key confounders*[2]
Allen 2007	Longitudinal	Medium	Y	Y	Y	Unclear	Unclear	N	-	Socio-economic status, family background and relationships, expectations of future, school and drinking behaviours, and sexual health knowledge, clustering
Anderson 2007	Longitudinal	Low	Y	Y	Y	Y	N	Y	-	None reported
Beguy 2014	Longitudinal	Low	Y	Y	N	Y	N	N	-	None reported
Bonell 2005	Longitudinal	Medium	Y	Y	N	Y	Unclear	Unclear	-	Socio-economic disadvantage (living conditions, parental employment)
Chen 2010	Longitudinal	Medium	Y	Y	N	Y	Unclear	Y	-	Age, race, gender, parental education, sexual knowledge and attitudes, substance use and school behaviours, mental health, parental monitoring and disapproval.
Costa 1995	Longitudinal	High	Y	Y	N	Y	Unclear	Y	-	Gender, grade in school, socio-economic status, family composition
Cubbin 2010	Longitudinal	High	Y	Y	N	Y	Unclear	Y	-	Race/ethnicity, family structure, poverty status, parental education, neighbourhood poverty
Ford 2005	Longitudinal	High	Y	Y	N	Y	Unclear	N	Y	Gender, age, race/ethnicity, family structure, maternal education, clustering
Forste 2002	Longitudinal	Low	Unclear	Unclear	N	Y	Unclear	Y	-	None reported
Gambadauro 2018	Longitudinal	Low	Unclear	Y	Y	Y	Unclear	Unclear	-	None reported
Glynn 2018	Longitudinal	Low	Unclear	Unclear	N	Unclear	Unclear	Unclear	-	Parental education and health, living arrangements, gender of head of household, socio-economic status

Table 4.2 Assessment of study quality, cont.										
Study	Study Type	Score	*Participation >50%*	*Prespecified /uniformly selected participants*	*Sample size and/or power justified*	*Measurement defined, valid, and reliable*	*Assessors blinded to exposure*	*Attrition < 20%*	*Did not over-adjust for mediators*[1]	*Adjustment for key confounders*[2]
Greene 2018	Longitudinal	High	Y	Y	Y	Y	Unclear	Y	-	Physical development, age, gender, race, parental education, family structure
Hanson 1987	Longitudinal	Low	Unclear	Unclear	N	Y	Unclear	Unclear	-	Family structure, maternal employment and education, school region, family income, school type
Henderson 2008	Longitudinal	Medium	Y	Y	N	Y	Unclear	N	N	Family structure, parental monitoring, parental education and class, housing tenure, ethnic group, religious belief, spending money, peer and self-aspirational values, clustering
Hoskins 2015	Longitudinal	Medium	Y	Y	Y	Y	Unclear	Unclear	-	Family income
Kim 2015	Longitudinal	High	Y	Y	Y	Y	Unclear	Yes	N	Gender, age, ethnicity, math performance, socio-economic status, parental education and occupation, average school class size, school rurality and type, school-level satisfaction with school, grade retention and study behaviours, clustering
Kneale 2012	Longitudinal	Low	Unclear	Unclear	N	N	Unclear	N	-	None reported
Koon-Magnin 2010	Longitudinal	High	Y	Y	N	Y	Unclear	Y	-	Age, race, parental education and occupation, drinking behaviours, physical development, religiosity, parental closeness, family structure, college aspirations, sexual partners, and marital status
Laflin 2008	Longitudinal	Low	Unclear	Unclear	N	Y	Unclear	Unclear	-	Boys: self-efficacy, peer self-esteem, prayer frequency Girls: grade, peer self-esteem, family structure

Table 4.2 Assessment of study quality, cont.										
Study	Study Type	Score	*Participation >50%*	*Prespecified /uniformly selected participants*	*Sample size and/or power justified*	*Measurement defined, valid, and reliable*	*Assessors blinded to exposure*	*Attrition < 20%*	*Did not over-adjust for mediators*[1]	*Adjustment for key confounders*[2]
Lauritsen 1994	Longitudinal	Medium	Y	Y	N	Unclear	Unclear	Y	-	Race, age, family structure and income, neighbourhood disorder, family attachment, peer involvement, attitudes about marriage/children, education
Lou 2014	Longitudinal	Low	Unclear	Unclear	N	Unclear	Unclear	Unclear	-	Family structure and income, parental education, race, religiosity, and state unemployment, abortion policies, benefits
Manning 2000	Longitudinal	Low	Unclear	Unclear	N	Unclear	Unclear	Unclear	-	Age at first intercourse, race/ ethnicity, family structure, parental education, rurality, religiosity, relationship type
Marston 2013	Longitudinal	Medium	Unclear	Y	N	Y	Unclear	N	-	Age, sex, settlement, religion, family structure and supervision, delinquent behaviour, religiosity, sibling risk, family dysfunction, self-esteem, social participation, peer influence
Maticka-Tyndale 2010	Cross-Sectional	High	Unclear	Y	N	Y	Unclear	-	Y	Age, ethnicity, religion, socio-economic status, risk perception, abstinence attitudes, supportive social networks
McBride 1995	Cross-Sectional	Low	Unclear	Y	N	Y	No	-	N	None reported, did not adjust for clustering
McGrath 2008	Longitudinal	Medium	Unclear	Y	N	Y	Unclear	Unclear	-	Geographical location, education, family structure, living parents, drinking alcohol, smoking, HIV attitudes and knowledge

Table 4.2 Assessment of study quality, cont.										
Study	Study Type	Score	*Participation >50%*	*Prespecified /uniformly selected participants*	*Sample size and/or power justified*	*Measurement defined, valid, and reliable*	*Assessors blinded to exposure*	*Attrition < 20%*	*Did not over-adjust for mediators*[1]	*Adjustment for key confounders*[2]
McNeely 2004	Longitudinal	High	Y	Y	N	Y	Unclear	Y	-	Parental connectedness, family structure and income, depressed mood, age, gender, race
Mersky 2006	Longitudinal	Medium	Unclear	Y	N	Unclear	Unclear	Y	-	Race, maternal education and employment, family structure, maternal employment, welfare history, neighbourhood poverty, and low birth weight
Molborn 2014	Cross-Sectional	Low	Y	Y	N	Y	Unclear	N	N	School-level racial composition, maternal education, religiosity
Moore 1998	Longitudinal	Medium	Unclear	Y	N	Unclear	Unclear	Y	Y	Race, family structure, family income and parental education, clustering
Ohannessian 1993	Longitudinal	Low	Y	Y	N	Unclear	Unclear	N	-	Parental education and age
Oman 2012	Longitudinal	High	Unclear	Y	N	Y	Y	Y	-	Age, gender, race/ethnicity, parental income and education, family structure, and neighbourhood deprivation
Oshima 2013	Longitudinal	Medium	Unclear	Y	N	Y	Unclear	Y	NA	Prior pregnancy, birth control use, leaving foster care before age 19, substance use disorder, arrest history
Parkes 2013	Longitudinal	Medium	Y	Y	N	Y	NA	N	-	Gender, age, puberty, family structure and relationships, maternal education, paternal monitoring, religiosity, romantic and 'problem' behaviours
Paul 2000	Longitudinal	Medium	Y	Unclear	N	Y	Unclear	Y	-	Socio-economic status, paternal education, maternal employment family structure, religiosity, age at menarche, smoking and drinking behaviour

Table 4.2 Assessment of study quality, cont.										
Study	Study Type	Score	*Participation >50%*	*Prespecified /uniformly selected participants*	*Sample size and/or power justified*	*Measurement defined, valid, and reliable*	*Assessors blinded to exposure*	*Attrition < 20%*	*Did not over-adjust for mediators*[1]	*Adjustment for key confounders*[2]
Pearson 2012	Longitudinal	Low	Y	Y	N	Y	Unclear	Y	-	None reported
Resnick 1997	Longitudinal	High	Y	Y	Y	Y	Unclear	N	Y	Gender, race/ethnicity, family structure, poverty status, clustering
Rink 2007	Longitudinal	Low	Y	Y	N	Y	Unclear	N	-	None reported
Rosenberg 2015	Longitudinal	High	Unclear	Y	N	Y	Unclear	Y	-	Age, family structure, parental education and employment, socio-economic status, household size
Scaramella 1998	Longitudinal	Medium	Y	Y	N	Y	Unclear	Y	-	Parental education and deviant behaviours
Schofield 2008	Longitudinal	Low	Unclear	Y	N	Y	Unclear	Unclear	-	Unclear
Shneyderman 2013	Longitudinal	Medium	Y	Y	N	Y	Unclear	N	-	Age, gender, and mother's educational attainment
Smith 1996	Longitudinal	Medium	Y	Y	N	Y	Unclear	Unclear	-	Race, welfare assistance, family structure and parent education
South 2000	Longitudinal	Low	Unclear	Y	N	Unclear	Unclear	Y	-	Race, family income, parental education, family disruption, number of siblings
South 2005	Longitudinal	Medium	Y	Y	N	Y	Unclear	Y	-	Age, gender, race, parental education, public assistance, family structure and disruption
Steiner 2013	Longitudinal	High	Y	Y	N	Y	Unclear	Y	-	Age, biological sex, race, ethnicity, parental education, parent marriage status
Stoner 2017	Longitudinal	High	Y	Y	Y	Y	Unclear	Y	-	Age, orphan status, alcohol use, depression, anxiety, pregnancy, socio-economic status
Stouhamer 1998	Longitudinal	Low	Y	Y	N	Y	Unclear	Y	-	None reported

Table 4.2 Assessment of study quality, cont.										
Study	Study Type	Score	*Participation >50%*	*Prespecified /uniformly selected participants*	*Sample size and/or power justified*	*Measurement defined, valid, and reliable*	*Assessors blinded to exposure*	*Attrition < 20%*	*Did not over-adjust for mediators*[1]	*Adjustment for key confounders*[2]
Teitler 2000	Cross-Sectional	Medium	Y	Y	Y	N	Unclear	-	Y	Age, gender, race, clustering
Thornberry 1997	Longitudinal	Low	Unclear	Y	N	Y	Unclear	Y	-	Race/ethnicity, poverty, neighbourhood disorganisation, parental education, family social support, parent's college expectations
Whitbeck 1999	Longitudinal	Medium	Y	Y	N	N	Unclear	Y	-	Family structure, pubertal development, gender
White 2014	Longitudinal	High	Y	Y	N	Y	Unclear	Y	Y	School type and size, school-level racial composition, race, age, attitude toward sex, parental education, physical development, GPA, alcohol use, delinquency, household structure, childhood abuse, parental monitoring, clustering
Zhou 2015	Longitudinal	High	Y	Y	N	Y	N	Y	-	Ethnicity, educational intentions, socio-economic status, family structure

1 Applicable to school-level studies.
2 Not all effect sizes reported are adjusted for described factors. Adjusted and unadjusted effects are indicated in Summary of Findings tables.

Of the 53 included studies, forty-five longitudinal studies reported on individual-level school-related exposures (Table 4.4). School-level exposures were reported in six longitudinal studies (five of which also reported eligible individual-level outcomes) and four cross-sectional studies (Table 4.5). The possibility of meta-analysis was examined across exposure variables and outcomes. Outcomes varied substantially across exposures measured in studies. Where multiple studies reported on the same outcome and exposures, other factors created variation in outcome/exposure combinations. Firstly, studies varied in reporting overall outcomes versus outcomes by subgroup (e.g. male or female, by race/ethnicity). This substantially reduced the number of possible outcome/exposure combinations. Further, differences in reporting dichotomous and categorical exposure variables created difficulty in identifying conceptual (e.g. importance to go to college vs. very likely to attend college) or equivalent (e.g. binary response items vs. 5-item likelihood scale) matches for outcomes across studies' exposure categories. As a result, any possible pooled effect sizes among specific exposure/outcome/category combinations would be challenging to synthesise with the remaining outcomes reported in narrative analysis. Finally, missing standard errors, p-values or confidence intervals excluded some studies from analysis. For these reasons, meta-analysis was not undertaken. Findings are synthesised narratively by study type, exposure category, outcome, subgroup and study quality.

Individual-level studies

School enrolment

Eight individual-level, longitudinal reported on associations between school enrolment and sexual behaviours and pregnancy (Anderson, Beutel, & Maughan-Brown, 2007; Beguy et al., 2014; Glynn et al., 2018; Koon-Magnin et al., 2010; Marston et al., 2013; McGrath, Nyirenda, Hosegood, & Newell, 2009; Rosenberg et al., 2015; Stoner et al., 2017). Enrolment was measured either as being registered in school or having dropped out of school. In comparison with other school-related factors synthesised here, enrolment was the only factor where more studies were from low- or middle-income than high income countries. The only high-income country study, from the U.S., measured partner's enrolment in school (Koon-Magnin et al., 2010).

Table 4.3 Rows 1-2 show findings of associations between school enrolment and sexual health outcomes. Overall, there is sufficient evidence from high- and medium-quality studies to suggest an association of enrolment status with sexual debut and number of sexual partners. However, evidence of associations between enrolment status and pregnancy was mixed.

After adjusting for socio-economic and -demographic variables, dropping out or not being in school for both female and male populations was associated with an increased risk of early

sexual debut in two medium-quality studies from Kenya and South Africa (Marston et al., 2013; McGrath et al., 2009) as well as a low-quality study from Malawi (Anderson et al., 2007; Glynn et al., 2018). A medium- and a low-quality study, both from South Africa, reported that being enrolled in school or completing secondary school was associated with a reduced risk of sexual debut (Anderson et al., 2007; McGrath et al., 2009); while another low-quality study from Malawi reported a null association (Glynn et al., 2018). In addition, a high-quality study found that young women in South Africa who had dropped out of school had a greater number of sexual partners in the last 12 months than those still enrolled, after adjusting for socio-economic status and related risk-behaviours (Stoner et al., 2017).

The influence of school enrolment on pregnancy outcomes was mixed. A high-quality study found no association after adjusting for socio-economic status and household structure in South Africa (Rosenberg et al., 2015), while a low-quality study in Kenya, which did not adjust for potential confounders, found protective associations for female respondents after accounting for previous pregnancy status (Beguy et al., 2014).

While no studies from high-income countries examined the influence of a young person's own enrolment on their sexual health, one high-quality U.S. study found that young women were more likely to have sex if their partner had left school, as compared with dating someone who attended the same school (Koon-Magnin et al., 2010). Partner's enrolment status also appeared to also be more influential than partner's age, another previously established risk factor for sexual behaviour.

School behaviour

Ten individual-level longitudinal studies reported on school behaviours, including four high-quality (Ford et al., 2005; Resnick et al., 1997; Stoner et al., 2017; Zhou, Puradiredja, & Abel, 2016), one medium-quality (Allen et al., 2007) and five low-quality studies (Gambadauro et al., 2018; Hanson, Myers, & Ginsburg, 1987; Manning et al., 2000; Schofield, Bierman, Heinrichs, & Nix, 2008; Stouthamer-Loeber & Wei, 1998). Several studies examined attendance (Ford et al., 2005; Resnick et al., 1997; Stoner et al., 2017) or truancy (intention to skip or number of classes/days skipped) (Allen et al., 2007; Gambadauro et al., 2018; Stouthamer-Loeber & Wei, 1998; Zhou et al., 2016) while others examined teacher-rated conduct (Hanson et al., 1987; Schofield et al., 2008; Stouthamer-Loeber & Wei, 1998) and expulsion or suspension (Manning et al., 2000; Stouthamer-Loeber & Wei, 1998).

Table 4.3 Row 3 shows the associations reported between school behaviour and sexual health outcomes. There is mixed evidence of the associations between school behaviour and pregnancy, while only single studies reported on the relationship of school behaviour with sexual debut, contraception use, sexual partners and adolescent birth.

Among studies which examined pregnancy, two high-quality studies examined truancy and pregnancy among adolescents in the U.K. and found mixed associations. Truancy was associated with an increased risk for pregnancy among female participants in one study (Zhou et al., 2016) but no association in an overall population when measured at baseline or first follow-up (Allen et al., 2007). A low-quality study by Hanson et al (1987) reported that skipping class, perceiving oneself as a troublemaker and being in trouble with the law were associated with an increased risk for pregnancy among female adolescents in the U.S., after adjusting for parental factors, family structure and socio-economic status. Stouthamer-Loeber and Wei (1998) reported that truancy, teacher-rated poor conduct and suspension from school were all associated with becoming a father before age 19, but did not adjust for potential confounders.

Additional low-quality studies examined other sexual risk behaviours. A single high-quality study from South Africa reported between girls' attendance and number of partners after adjusting for age, socio-demographic factors, mental health and pregnancy status (Stoner et al., 2017). A low-quality study reporting on truancy data across ten European countries, along with a low-quality U.S. study measuring maladjustment in school, found school behaviour was associated with an increased risk of early sexual debut in high- and middle-income countries (Gambadauro et al., 2018; Schofield et al., 2008). However, neither study adjusted for key confounders. A single low-quality study reported no association between being expelled and contraception use among female adolescents (Manning et al., 2000).

Academic Performance

Twenty-one individual-level longitudinal studies reported on exposures related to academic performance or attainment (Chen et al., 2010; Costa, Jessor, Donovan, & Fortenberry, 1995; Ford et al., 2005; Forste & Haas, 2002; Hanson et al., 1987; Kneale, Fletcher, Wiggins, & Bonell, 2013; Laflin, Wang, & Barry, 2008; Lou & Thomas, 2015; Manning et al., 2000; Mersky & Reynolds, 2007; Moore, Manlove, Glei, & Morrison, 1998; Ohannessian & Crockett, 1993; Parkes et al., 2014; Paul, Fitzjohn, Herbison, & Dickson, 2000; Pearson, Kholodkov, Henson, & Impett, 2012; Resnick et al., 1997; Scaramella, Conger, Simons, & Whitbeck, 1998; Smith, 1996; S. J. South et al., 2005; Stouthamer-Loeber & Wei, 1998; Thornberry et al., 1997). Five of these studies used data from Add Health (Chen et al., 2010; Costa et al., 1995; Ford et al., 2005; Resnick et al., 1997; S. J. South et al., 2005). All studies were from high-income countries, including the U.S., U.K. and New Zealand.

Table 4.3. Evidence map of individual-level studies addressing school-related exposures by sexual health outcome								
	Exposure (direction)	Ever Had Sex/ Early Sexual Debut	Contraception Use	Sexual partners	Sexual Risk Index	Adolescent pregnancy	Adolescent birth	STI Diagnosis
	Parentheses indicate quality of study. ↓ = Lower risk ↑ = Higher risk • = Null association							
1	Enrolment (enrolled or completed school)	↓ McGrath et al 2009 (medium) ↓ Anderson et al 2017 (low) • Glynn et al 2018 (low)				• Rosenberg et al 2015 (high) ↓ Glynn et al 2018 (low)		
2	Enrolment (dropped out or not in school)	↑ Marston et al 2013 (medium) ↑ Koon-Magnin et al 2010 (high) ↑ McGrath et al 2009 (medium) ↑ Glynn et al 2018 (low)		↑ Stoner et al 2017 (high)		↑ Glynn et al 2018 (low)		
3	School behaviour (poor)	↑ Schofield et al 2008 (low) ↑ Gambadauro et al 2018 (low)	• Manning et al 2000 (low)	• Stoner et al 2017 (high)		↑ Zhou et al 2016 (high) • Allen et al 2007 (medium) ↑ Hanson et al 1987 (low)	↑ Stouthamer and Wei 1998 (low)	
4	Academic Performance (higher)	↓ Resnick et al 1997 (high) ↓ Paul et al 2000 (medium) • Pearson et al 2012 (medium) ↓ South et al 2005 (medium) ↓ Forste and Haas 2002 (low) ↓ Laflin et al 2008 (low) ↓ Ohannessian and Crocket 1993 (low)			↓ Chen et al 2010 (medium)	• Resnick et al 1997 (high) ↓ Scaramella et al 1989 (medium) • Hanson et al 1987 (low) ↓ Smith 1996 (medium)	• Mersky and Reynolds 2007 (medium) ↓ Moore et al 1998 (medium) ↓ Kneale et al 2013 (low) ↓ Thornberry et al 1997 (low)	

Table 4.3 Evidence map of individual-level studies addressing school-related exposures by sexual health outcome, cont.								
	Exposure (direction)	Ever Had Sex/ Early Sexual Debut	Contraception Use	Sexual partners	Sexual Risk Index	Adolescent pregnancy	Adolescent birth	STI Diagnosis
	Parentheses indicate quality of study. ↓ = Lower risk ↑ = Higher risk • = Null association							
5	Academic performance (lower)	↑ Costa et al 1995 (high) • Parkes et al 2014 (medium)	↑ Manning et al 2000 (low) (did not use contraception)			• Oshima et al 2013 (medium)	• Moore et al 1998 (medium) • Lou and Thomas 2015 (low) ↑ Stouthamer and Wei 1998 (low)	↑ Ford et al 2005 (high)
6	School plans and expectations (higher)	↓ Koon-Magnin et al 2010 (high) • Oman et al 2013 (high) • Cubbin et al 2010 (high) ↓ Lauritsen 1994 (medium) ↓ Pearson et al 2012 (low) ↓ Laflin et al 2008 (low) • Ohannessian and Crocket 1993 (low) ↓ Henderson et al 2008 (medium) ↓ Moore et al 1998 (medium)	↓ Oman et al 2013 (high)			↓ Oman et al 2013 (high) ↓ Smith 1996 (medium) ↓ South and Baumer 2000 (low) ↓ Hanson et al 1987 (low)	• Thornberry et al 1997 (low)	
7	School plans and expectations (lower)	↑ Marston et al 2013 (medium) ↑ Paul et al 2000 (medium) ↑ Lauritsen 1994 (medium)	↑ Bonell et al 2005 (medium)			↑ Zhou et al 2016 (high) ↑ Bonell et al 2005 (medium) • Allen et al 2007 (medium)		
8	Attitude to school (positive)	↓ Whitbeck et al 1999 (medium) • Paul et al 2000 (medium)			↓ Hoskins and Simons 2015 (medium)	• Hoskins and Simons 2015 (medium)	↓ Kneale et al 2013 (low)	

Table 4.3 Evidence map of individual-level studies addressing school-related exposures by sexual health outcome, cont.								
	Exposure (direction)	Ever Had Sex/ Early Sexual Debut	Contraception Use	Sexual partners	Sexual Risk Index	Adolescent pregnancy	Adolescent birth	STI Diagnosis
	Parentheses indicate quality of study. ↓ = Lower risk ↑ = Higher risk • = Null association							
9	Attitude to school (poor)	↑ Parkes et al 2014 (medium) ↑ Henderson et al 2008 (medium)	↑ Bonell et al 2005 (medium)			• Bonell et al 2005 (medium) • South and Baumer 2000 (low)	↑ Stouthamer and Lou 1998 (low)	
10	Involvement in school-related activities	• South et al 2005 (medium) ↓ Whitbeck et al 1999 (medium) ↓ Lauritsen 1994 (medium) • Ohanessian and Crocket 1993 (low)				• Oshima et al 2013 (medium)		
11	Connectedness to school (higher)	↓ Greene et al 2018 (high) ↓ Oman et al 2013 (high) ↓ Resnick et al 1997 (high) ↓ Paul et al 2000 (medium) ↓ Rink et al 2007 (low) • Shneyderman and Schwartz 2013 (medium)	• Oman et al 2013 (high) • Shneyderman and Schwartz 2013 (medium) • Greene et al 2018 (high) ↓ McNeely and Falci 2004 (high)	• Chen et al 2010 (medium) ↓ Greene et al 2018 (high)	• Chen et al 2010 (medium)	↓ Oman et al 2013 (high) • Resnick et al 1997 (high)	• Thornberry et al 1994 (low)	↓ Steiner et al 2014 (high) • Ford et al 2005 (high) • Shneyderman and Schwartz 2013 (medium)

Table 4.3 Rows 4-5 show the associations reported between academic performance and sexual health outcomes. Overall, higher academic performance appears to be associated with a reduced risk of early adolescent sexual debut, adolescent pregnancy and adolescent birth based on studies with high-, medium- and low-quality; however some caveats are indicated below. Only single studies examined associations of academic performance with a sexual risk index, contraception use and STI diagnosis.

Several high- and medium-quality U.S. and New Zealand studies indicated that higher academic performance (as measured by reading, writing and/or math scores or grade point average) was associated with reduced risk of early sexual debut after adjusting for social disadvantage (Costa et al., 1995; Paul et al., 2000; Resnick et al., 1997; S. J. South et al., 2005). However, some of these associations were limited to subgroups, including male but not female students in New Zealand (Paul et al., 2000) and white but not Latinx or African American populations in the U.S. (Costa et al., 1995). Four low-quality U.S. studies also reported associations between academic performance (as measured by grades and standardized test scores) and sexual debut among female (Laflin et al., 2008; Lou & Thomas, 2015; Ohannessian & Crockett, 1993) and male respondents (Forste & Haas, 2002; Laflin et al., 2008). One medium-quality U.K. study (Parkes et al., 2014) and one low-quality U.S. study (Pearson et al., 2012) found no associations between academic performance and sexual debut. After adjusting for socio-demographic characteristics, peers' low grade point average (GPA) also appeared to be associated with earlier sexual debut (S. J. South et al., 2005) as was academic engagement among Latinx students (but not among white or African-American students) (Costa et al., 1995). Forste and Haas (2002) found that U.S adolescent males who repeated a grade were less likely than those who had not to have ever had sex. Other sexual risk behaviours were examined in two U.S.-based studies. Chen et al. (2010) examined in their medium-quality study the association of GPA with a cumulative risk index for sexual behaviour (including sexual debut, transactional sex, non-romantic sex and lack of contraception use) as well as number of non-romantic partners; both relationships were significant, suggesting higher GPA leads to lower risk across multiple behaviours. Higher grades were also associated with contraceptive use at first sex among young women after adjusting for socio-demographic background characteristics in a low-quality study by Manning et al (2000).

Academic performance (as measured by teacher-rated ability, parent- and student-reported average grades, and/or test scores) was associated with increased risk of adolescent pregnancy or birth in multiple high- and medium-quality U.S. studies after adjusting for social disadvantage (Moore et al., 1998; Scaramella et al., 1998; Smith, 1996) and in three low-quality studies from the U.S. (Stouthamer-Loeber & Wei, 1998; Thornberry et al., 1997) and U.K. (Kneale et al., 2013). Additionally, Oshima et al (2013) found that failing grades were

associated with increased risk of involvement in pregnancy among male foster youth (but not among female foster youth) after adjusting for prior sexual behaviour, substance use disorders and prison history. Several studies found no association of academic performance with birth (Mersky & Reynolds, 2007) or pregnancy (Hanson et al., 1987; Resnick et al., 1997), though these were of mixed quality. One high-quality U.S. study found a low GPA to be a risk factor for STI diagnosis after adjusting for socio-demographic and family factors (Ford et al., 2005).

School plans and expectations

Twenty individual-level longitudinal studies examined associations between the presence or lack of educational aspirations, plans or expectations and sexual health outcomes, including sexual debut, sexual debut with contraception, frequency of sex, pregnancy and birth (Allen et al., 2007; Bonell et al., 2005; Cubbin et al., 2010; Hanson et al., 1987; Henderson, Butcher, Wight, Williamson, & Raab, 2008; Kneale et al., 2013; Koon-Magnin et al., 2010; Lauritsen, 1994; Marston et al., 2013; Moore et al., 1998; Ohannessian & Crockett, 1993; Oman et al., 2013; Paul et al., 2000; Pearson et al., 2012; Smith, 1996; S. South & Baumer, 2000; Thornberry et al., 1997; Whitbeck, Yoder, Hoyt, & Conger, 1999; White & Warner, 2015; Zhou et al., 2016). All but one study studied populations from high-income countries, covering the U.S., U.K. and New Zealand. A single study examined educational aspirations of Kenyan youth (Marston et al., 2013).

Findings for associations between school plans and expectations and sexual health outcomes are shown in Table 4.3 Rows 6-7. Evidence from high-, medium- and low-quality studies indicate that school plans and expectations are associated with adolescent pregnancy. There is also evidence that plans and expectations are associated with sexual debut, though this is mixed. Evidence for associations with other behaviours, including contraception use and frequency of sex, was limited.

High aspirations or expectations for future education or training (e.g. desire to attend college, expect to go on to higher education) were associated with reduced risk of early sexual debut among female adolescents after adjusting for social disadvantage in two high- and medium-quality studies (Koon-Magnin et al., 2010; Lauritsen, 1994), as well as a low quality study that did not adjust for potential confounders (Pearson et al., 2012). In addition, two medium-quality studies reported that lower aspirations and expectations for attending higher education were associated with an increased risk for early sex among female (Henderson et al., 2008; Marston et al., 2013) and male students (Henderson et al., 2008). Paul et al (2000) reported that, after adjusting for SES, family and behavioural factors, students who did not know whether they would continue in school were less likely to engage in early sex compared to students who expected to leave school in the next four years. Additionally, female students in a medium-quality study whose aspirations exceeded their expectations for future education

reported increased risk of early sexual debut (Lauritsen, 1994). Several medium- and high-quality studies did not find any associations between desire or expectation to continue to school (or lack thereof) and sexual activity for male (Cubbin et al., 2010; Lauritsen, 1994; Marston et al., 2013) or female adolescents (Cubbin et al., 2010), and in overall samples. (Oman et al., 2013; Whitbeck et al., 1999) An additional low-quality study also found no associations between aspirations and sexual debut for male or female adolescents (Ohannessian & Crockett, 1993) .

Only two studies examined contraception use in relation to expectations or aspirations of higher education. Bonell et al (2005) reported that, after adjusting for socio-economic factors in an overall sample, lower expectations were associated with increased risk for failure to use contraception at last sex but found no association for use of protection at first sex. Oman et al (2013) reported that higher aspirations were associated with greater likelihood of using contraception at last sex in an overall sample after adjusting for individual socio-demographic, family and neighbourhood factors.

After adjusting for social disadvantage, three high- and medium-quality studies reported that high aspirations or expectations for future education and training were associated with reduced risk for pregnancy or birth for female (Moore et al., 1998) or overall samples (Oman et al., 2013; Smith, 1996). Three low-quality studies also found reduced risk for adolescent pregnancy or birth among females with higher aspirations or expectations (Hanson et al., 1987; Kneale et al., 2013; S. South & Baumer, 2000). Lower expectations were associated with increased risk of pregnancy among female participants (Allen et al., 2007; Zhou et al., 2016) and in overall samples (Bonell et al., 2005) after adjusting for socio-economic and family variables. For one of these studies, (Allen et al., 2007) lower expectations when measured at first follow-up (but not when measured at baseline) were associated with increased risk for pregnancy. No studies found an association between involvement in pregnancy or fatherhood and expectations or aspirations among male subgroups (Allen et al., 2007; Thornberry et al., 1997), though these were not adjusted for known factors associated with pregnancy or birth.

Attitude to school

Eight individual-level studies reported on associations between student attitude to school and sexual debut, contraception use and parenthood (Bonell et al., 2005; Henderson et al., 2008; Kim, 2015; Kneale et al., 2013; Parkes et al., 2014; Paul et al., 2000; Stouthamer-Loeber & Wei, 1998; Whitbeck et al., 1999). Four studies derived from the United Kingdom (Bonell et al., 2005; Henderson et al., 2008; Kneale et al., 2013; Parkes et al., 2014), two from the U.S. (Stouthamer-Loeber & Wei, 1998; Whitbeck et al., 1999), one from New Zealand (Paul et al., 2000) and one from Malawi (Kim, 2015).

Table 4.3 Rows 8-9 shows associations of attitude to school with sexual health outcomes. There is sufficient evidence from medium-quality studies to suggest that attitude to school is associated with sexual debut. Additionally, low quality evidence point to an association with adolescent birth; however, no studies which measured pregnancy reported an association. Single studies medium quality reported associations with contraception use and a sexual risk index.

After adjusting for social disadvantage, two medium quality studies reported that poor attitude to school was associated with increased risk of early sexual debut among overall (Parkes et al., 2014), female and male populations in the U.K. (Henderson et al., 2008). However, Parkes et al (2014) reported a difference in timing of attitude where dislike of school at age 10-11 was significantly associated with early debut but not when dislike was reported at age 6-8. An additional U.S. study reported a reduced risk of early sexual debut with positive attitude to school in an overall population (Whitbeck et al., 1999), though a second medium quality study reported null associations for both male and female groups in New Zealand (Paul et al., 2000). In another English sample, students who reported they disliked school at baseline were more likely to engage in protected or unprotected sex at first and second follow-ups as well as failure to use contraception at last sex measured at second follow-up, after adjusting for socio-economic status (Bonell et al., 2005). In the same medium quality study, ambivalence towards school was associated with a greater risk for unprotected first sex at first follow-up, but not with any other outcome. Hoskins and Simons (2015) also reported that positive attitude to school was associated with increased risk of aggregated sexual risk behaviour including sexual debut, number pf partners and frequency of sex and condom use in the last three months.

After adjusting for social disadvantage, three studies reported null associations with ever having or being involved in a pregnancy, including a medium quality study measuring poor attitudes to school among an overall population in the U.K. (Bonell et al., 2005), a medium quality study measuring positive attitudes among an African American group in the U.S. (Hoskins & Simons, 2015), and a low quality study measuring poor attitudes among a female population in the U.S. (S. South & Baumer, 2000). However, two additional studies reported associations between attitude to school and parenthood, though neither adjusted for key confounders. A U.S. study of adolescent males reported an increased risk for fatherhood prior to age 19 among young men with a negative attitude toward school (Stouthamer-Loeber & Wei, 1998). A U.K. analysis, which examined three separate longitudinal data sets of adolescent women and did not adjust for key confounders, found mixed results, where one data set found no association while the other two reported that students who liked or strongly liked school were less likely to become mothers by age 20 (Kneale et al., 2013).

Involvement in school

Five individual-level studies looked at involvement in school activities (measured as some level of engagement in school-related activities) and early sexual debut and pregnancy, with mixed results (Table 4.3 Row 10) (Lauritsen, 1994; Ohannessian & Crockett, 1993; Oshima et al., 2013; S. J. South et al., 2005; Whitbeck et al., 1999). All examined U.S. samples and adjusted for at least some socio-economic and demographic factors. Two medium-quality (Lauritsen, 1994; Whitbeck et al., 1999) and one low-quality study (Ohannessian & Crockett, 1993) measured time spent doing conventional school activities, such as homework, school projects or reading books. While Whitbeck et al (1999) reported involvement in school activities was associated with a reduced risk of having had sex in the past year among an overall sample, Lauritsen (1994) found a reduced risk in early sexual debut for male students only, and Ohannessian and Crocket (1993) reported no associations for early sexual debut among either female or male subgroups. Two medium-quality studies measured involvement in extra-curricular activities, such as sports or school clubs. South et al (2005) reported no association with early sexual debut. Likewise, Oshima et al (2013) reported no association with pregnancy involvement, in either male or female subgroups.

Connectedness to school

Eleven studies examined individual-level associations between connectedness to school and sexual debut, current sexual activity, contraception use, STI diagnosis, pregnancy and parenthood (Chen et al., 2010; Ford et al., 2005; Greene et al., 2018; Hoskins & Simons, 2015; McNeely & Falci, 2004; Oman et al., 2013; Paul et al., 2000; Rink et al., 2007; Shneyderman & Schwartz, 2013; Steiner et al., 2014; Thornberry et al., 1997). All but two studies used the U.S. Add Health longitudinal sample; the remaining studies came from the U.S. (Thornberry et al., 1997) and New Zealand (Paul et al., 2000). In all but one study (McNeely & Falci, 2004), connectedness to school was measured using a scale including items such as attitude to school, interest in school, sense of belonging and attachment to teachers. McNeely and Falci (2004) reported on attachment to teachers and social belonging at school separately.

Table 4.3 Row 11 shows associations of attitude to school with sexual health outcomes. There is sufficient evidence from high- and medium-quality studies, supported by additional low-quality studies, to suggest that higher connectedness to school is associated with reduced risk of early sexual debut. However, there is mixed evidence for the remaining reported outcomes.

Four high- and medium-quality studies reported that feeling connected to school was associated with a reduced risk of early sexual debut after adjusting for socio-economic status, family and demographic factors (Greene et al., 2018; Oman et al., 2013; Paul et al., 2000;

Resnick et al., 1997). McNeely and Falci (2004) specifically measured attachment to teachers as a dimension of school connectedness, which was associated with delayed sexual debut with or without condoms after adjusting for social disadvantage. However, they reported no association between social belonging at school and the same outcomes. One medium-quality study reported no association between connectedness to school and early sexual debut after adjusting for social disadvantage (Shneyderman & Schwartz, 2013). A low-quality study reported mixed results at different timepoints: responding neutral or agreeing with the connectedness scale was associated with early sexual debut at follow-up 1 but was not significantly associated with this outcome at follow-up 2, though neither of these were adjusted for potential confounders (Rink et al., 2007).

With the exception of McNeely and Falci (2004), no other study reported significant associations of connectedness with contraception or condom use after adjusting for social disadvantage, including one medium- (Shneyderman & Schwartz, 2013) and two high-quality studies (Greene et al., 2018; Oman et al., 2013). Greene et al (2018), a high-quality Add Health study, examined an American Indian sample and reported connectedness was associated with fewer lifetime sexual partners after adjusting for age, parental factors and socio economic status. Another Add Health study of an overall sample found no association between connectedness and number of non-romantic partners after adjusting for demographic and family variables, but not for socio-economic status (Chen et al., 2010). This study also combined multiple sexual risk behaviours (e.g. sexual debut, sex under the influence, contraception use) to create a sexual risk index and reported no association.

Three studies examined associations between school connectedness and STI diagnoses. No associations were found in a high- (Ford et al., 2005) and a medium-quality (Shneyderman & Schwartz, 2013) analysis of Add Health data, after adjusting for demographic factors and maternal education. However, a high-quality analysis of Add Health data reported a slight reduction in risk of STIs after adjusting for demographic and parental factors (Steiner et al., 2014). Similar mixed results were reported for pregnancy reported by two high-quality U.S. studies (Oman et al., 2013; Resnick et al., 1997). Only Oman et al (2013) found that a stronger sense of connectedness to school was associated with a reduced risk in pregnancy before the age of 20 after adjusting for both individual- and neighbourhood-level social disadvantage. One low-quality studies reported no associations between attachment to school and birth among a male sample (Thornberry et al., 1997).

Table 4.4. Longitudinal studies assessing individual-level school-related factors and sexual health outcomes							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Allen 2007	England, UK	Students in co-educational secondary schools enrolled in a randomised trial	13-14	Baseline: 8766 (99.2%) Follow-up 1 (1 year post-baseline): 7770 (81.7%) Follow-up 2 (2 years post-baseline): 6656 (70%)	School plans and expectations	Lack of expectation of being in education or training by age 20 at baseline (self-report)	*Ever pregnant at follow-up 2 (female)* Adjusted Odds Ratio (AOR) Unsure: 0.68 (0.20, 2.30) AOR Yes: 0.50 (0.12, 2.04) *Involved in pregnancy (male)* UOR Unsure: 0.62 (0.27, 1.43) UOR Yes: 1.24 (0.23, 6.77)
						Lack of expectation of being in education or training by age 20 at follow-up 1 (self-report)	*Ever pregnant at follow-up 2 (female)* AOR Unsure: 1.71 (0.68, 4.34) AOR Yes: 8.36 (1.23, 56.73) *Involved in pregnancy at follow-up 2 (male)* Unadjusted OR (UOR) Unsure: 1.22 (0.71, 2.10) UOR Yes: 2.06 (0.68, 6.21)
					Truancy	Intent to skip school at baseline (self-report)	*Ever pregnant at follow-up 2 (female)* AOR Ambivalent: 1.19 (0.55, 2.61) AOR Likely 2.05 (0.64, 6.61) *Involved in pregnancy at follow-up 2 (male)* AOR Ambivalent: 1.77 (0.48, 6.47) AOR Likely: 2.93 (0.94, 9.15)
						Intent to skip school at follow up 1 (self-report)	*Ever pregnant at follow-up 2 (female)* AOR Ambivalent: 1.12 (0.39, 2.25) AOR Likely 2.19 (0.59, 8.07) *Involved in pregnancy at follow-up 2 (male)* AOR Ambivalent: 1.68 (0.71, 3.99) AOR Likely: 1.93 (0.60, 6.24)
Anderson 2007	South Africa	Youth in households near Cape Town	14-22	Baseline: 4752 (86-93%) Follow-up 3 (3 years post-baseline): 3536 (75%) Analytic: 3017	School enrolment	Enrolled at school at baseline (self-report)	*Ever had sex at follow-up 3* UOR 0.58 (SE=0.12), p<.01

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Beguy 2014	Kenya	Young women living in Korogocho and Viwandani slums	15-22	Baseline: 4058 Follow-up (~1 year post-baseline): 2674 (66%) Analytic: 849	School enrolment	Completed secondary or higher at baseline (self-report)	*Ever pregnant at follow-up 2* Unadjusted Hazard Ration (UHR) 0.95 (0.72-1.26)
						Currently in school at baseline (self-report)	*Ever pregnant at follow-up 2* UHR 0.41 (0.19-0.91), p<.05
Bonell 2005	England, UK	Girls in co-educational secondary schools enrolled in a randomised trial	13-14	Baseline: 4248 (Not reported) Follow-up 1 (1 year post-baseline): 3749 (88%) Follow-up 2 (2 years post baseline): 3230 (76%)	Attitude to School	Attitude to school at baseline (self-report)	*Protected first sex at follow-up 1* Ambivalent AOR 1.30 (0.97, 1.74) Dislike AOR 1.70 (1.16, 2.51) p=0.001 *Unprotected first sex at follow-up 1* Ambivalent AOR 2.38 (1.33, 4.26) Dislike AOR 2.66 (1.17, 6.06) p=0.012 *Protected first sex between follow-ups 1 and 2* Ambivalent AOR 1.13 (0.93, 1.37) Dislike AOR 1.59 (1.07, 2.25) p=0.028 *Unprotected first sex follow-ups 1 and 2* Ambivalent AOR 1.14 (0.71, 1.82) Dislike AOR 0.49 (0.22, 1.08) p=0.177 *Unprotected last sex at follow-up 2* Ambivalent AOR 1.31 (0.76, 2.27) Dislike AOR 1.77 (1.02, 3.06) p=0.102 *Pregnancy at follow-up 2* Ambivalent AOR 0.65 (0.28, 1.55) Dislike AOR 2.04 (0.97, 4.26) p=0.013

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Bonell 2005, cont.					School plans and expectations	Lack of expectation of being in education or training by age 20 at baseline (self-report)	*Protected first sex at follow-up 1* Unsure AOR 1.19 (0.92, 1.55) Yes AOR 1.60 (0.66, 3.90) p=0.346 *Unprotected first sex at follow-up 1* Unsure AOR 0.93 (0.51, 1.68) Yes AOR 2.53 (0.89, 7.41) p=0.226 *Protected first sex between follow-ups 1 and 2* Unsure AOR 1.11 (0.82, 1.50) Yes AOR 1.81 (0.66, 4.98) p=0.381 *Unprotected first sex follow-ups 1 and 2* Unsure AOR 1.55 (0.91, 2.65) Yes AOR 1.92 (0.26, 14.04) p=0.265 *Unprotected last sex at follow-up 2* Unsure AOR 1.12 (0.72, 1.75) Yes AOR 3.85 (1.25, 11.87) p=0.00 *Pregnancy at follow-up 2* Unsure AOR 1.73 (0.91, 3.29) Yes AOR 4.89 (1.48, 16.10) p=0.048
Chen 2010	United States	Nationally representative sample of adolescents in middle and high schools	12-18	Baseline: 20,745 (79%) Follow-up 1 (1 year post-baseline): 16,706 (88.6%) Analytic: 4466	Academic performance	Grade point average at baseline (self-report)	*Sexual risk index at follow-up 2* (ever had sex, ever had anal sex, ever had sex for drugs/money, ever had non-romantic sex, never used condom) Adjusted Incidence Rate Ratio (AIRR) 0.95, p<.01 *Non-romantic sexual partners* AIRR 0.92, p<.001

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Chen 2010, cont.					School connectedness	Extent to which students felt safe, happy, and close to people at their school at baseline (self-report)	*Sexual risk index at follow-up 2* AIRR 1.02, p=Not significant (NS) *Non-romantic sexual partners at follow-up 2* AIRR 1.02, p=NS
Costa 1995	United States	Students enrolled in middle or high schools in Rocky Mountain region	12-15	Baseline: 2410 (49-67%) Follow-up 3 (3 years post-baseline): 1782 (75%) Analytic: 1330	Academic performance	Grade point average at baseline (school record)	*Ever had sex by follow-up 3 (white)* Adjusted Mean Difference Risk (ARR) 1.4, p<.01 *Ever had sex by follow-up 3 (Latinx)* ARR 1.1, p=NS *Ever had sex by follow-up 3 (African American)* ARR 1.2, p=NS
					Academic expectations	Expects academic achievement at baseline (self-report)	*Ever had sex by follow-up 3 (white)* ARR 1.1, p=NS *Ever had sex by follow-up 3 (Latinx*) ARR 1.0, p=NS *Ever had sex by follow-up 3 (African American)* ARR 1.0, p=NS
					Academic engagement	Difference between value of independence and academic expectations at baseline (self-report)	*Ever had sex by follow-up 3 (white)* ARR 1.0, p=NS *Ever had sex by follow-up 3 (Latinx*) ARR 1.1, p<.05 *Ever had sex by follow-up 3 (African American)* ARR 1.1, p=NS

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Cubbin 2010	United States	Nationally representative sample of adolescents in middle and high schools who self-identified as black, Cuban American, Mexican American, Puerto Rican or White	11-17	Baseline: 20,745 (79%) Follow-up 1 (1 year post-baseline): 16,706 (88.6%) Analytic: 5838	School plans and expectations	Desire to go to college at baseline (self-report)	*Ever had sex at follow-up 1 (female)* AOR 0.92 (0.78, 1.08) Ever had sex at follow-up 1 (male) AOR 1.02 (0.87, 1.21)
						Likelihood of going to college at baseline (self-report)	*Ever had sex at follow-up 1 (female)* AOR 0.93 (0.78, 1.11) *Ever had sex at follow-up 1 (male)* Boys AOR 0.96 (0.81, 1.12)
Ford 2005	United States	Nationally representative sample of adolescents in middle and high schools	11-17	Baseline: 18,924 Follow-up 3 (7 years post-baseline): 14,322 (75.7%) Analytic: 11,594 (81.0%)	Academic performance	Grade point average (GPA) at baseline (self-report)	*STI diagnosis (bio sample) at follow-up 2* GPA 1.0-2.0: AOR 1.41 (1.03, 1.93) GPA 2.25-3.0: AOR 1.18 (1.01, 1.38) GPA: 3.25-4.0 Reference
					School connectedness	Extent to which students felt safe, happy, and close to people at their school at baseline (self-report)	*STI diagnoses (bio sample) at follow-up 2* Low AOR 0.96 (0.63-1.46) Moderate AOR 0.98 (0.81-1.19) High Referent
Forste 2002	United States	Nationally representative sample of never married U.S. males	15-19	Baseline: 1880 (Not reported) Follow-up (2 years post-baseline): 1689 (90%) Analytic: 612	Academic performance	Average grades at baseline (self-report)	*Ever had sex at follow-up* UOR 0.60, p<.001
					Grade repetition	Ever repeated a grade at baseline (self-report)	*Ever had sex at follow-up* UOR 0.44, p<.01

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Gambadauro 2018	10 European countries (Austria, Estonia, France, Germany, Hungary, Ireland, Italy, Slovenia, Romania, Spain)	Adolescents enrolled in secondary schools	14-15	Baseline: 10,757 (96.8%) Follow-up (1 year post-baseline): 7111 (81.8%)	Truancy	Missed class without permission in the last two weeks at baseline (self-report)	*Ever had sex at follow-up* UOR 1.79 (1.49-2.14)
Glynn 2018	Malawi	Adolescents living in rural northern Malawi	10-18	Analytic: ~16,000 (not reported)	School enrolment	Current school status at baseline by age (source not reported)	*Ever had sex at follow-up 1(males)* In primary: reference Dropped out in primary AHR: 13 0.97 (0.38, 2.49) 14 1.92 (0.81, 4.55) 15 2.26 (1.16, 4.43) 16 1.35 (0.67, 2.70) 17 2.48 (1.39, 4.42) 18 3.80 (1.90, 7.62) In secondary AHR: 13 NA 14 0.43 (0.13, 1.41) 15 0.82 (0.40, 1.69) 16 0.73 (0.41, 1.30) 17 1.21 (0.72, 2.04) 18 1.16 (0.60, 2.27) *Ever had sex at follow-up 1 (female)* In primary: reference Dropped out in primary AHR: 13 6.29 (3.0, 13.1) 14 5.39 (3.27, 8.86) 15 3.50 (2.22, 5.52) 16 3.61 (2.21, 5.87) 17 3.39 (1.90, 6.07) 18 8.32 (3.2, 21.6)

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Glynn 2018, cont.							In secondary AHR: 13 0.50 (0.07, 3.78) 14 0.75 (0.32, 1.74) 15 0.85 (0.50, 1.45) 16 0.79 (0.49, 1.26) 17 1.01 (0.60, 1.68) 18 0.63 (0.24, 1.67) *Pregnancy at follow-up 1 (female)* In primary: reference Dropped out in primary AHR: 13 1.52 (1.01, 2.28) 14 2.39 (1.82, 3.12) 15 2.89 (2.35, 3.46) 16 2.84 (2.33, 3.47) 17 2.87 (2.23, 3.69) 18 3.87 (2.58, 5.83) In secondary AHR: 13 0.43 (0.19, 0.96) 14 0.42 (0.28, 0.63) 15 0.52 (0.40, 0.67) 16 0.52 (0.42, 0.65) 17 0.60 (0.46, 0.77) 18 0.75 (0.49, 1.13)
Greene 2018	United States	Adolescents in middle and high schools who identified as American Indian	12-16	Baseline: 510 (not reported) Follow-up 2 (7 years post-baseline): 456 (89.4%)	School connectedness	Extent to which students felt safe, happy, and close to people at their school at baseline (self-report)	*Had sex by age 15 at follow-up 2* AOR 0.650, SE=0.100, p <.01 *Sexual partners at follow-up 2* AOR 0.811, SE=0.055, p <.01 *Used a condom in past year at follow-up 2* Adjusted *B* =-0.10, SE=0.096, NS

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Hanson 1987	United States	Never married female adolescents enrolled as sophomores in high school	15-16	Analytic: ~10,000 (Not reported)	Academic performance	Grade point average at baseline (self-report)	*Adolescent Pregnancy at follow-up 1 (black)* Adjusted *B*= 0.04, NS *Adolescent Pregnancy at follow-up 1 (white)* Adjusted *B*= -0.08, NS
					School plans and expectations	Personal and parental expectations at baseline (self-report)	*Adolescent Pregnancy at follow-up 1 (black)* Adjusted *B*= -0.10, p<.01 *Adolescent Pregnancy at follow-up 1 (white)* Adjusted *B* = -0.05, p<.05
					Peers educational values	Perception of friends' college plans and perceptions of students with good grades at baseline (self-report)	*Adolescent Pregnancy at follow-up 1 (black)* Adjusted *B*= -0.01, NS *Adolescent pregnancy at follow-up 1 (white)* Adjusted *B* = -0.05, NS
					School behaviour	Skips class, seen as troublemaker, in trouble with law at baseline (self-report)	*Adolescent Pregnancy at follow-up 1 (black)* Adjusted *B*= 0.33, p<.01 *Adolescent Pregnancy at follow-up 1 (white)* Adjusted *B* = 0.11, p<.01
Henderson 2008	Scotland, UK	Students enrolled in a randomised trial in state schools in South-east Scotland	13-14	Baseline: 7616 (90.3%) Follow-up (2 years post-baseline: 5854 (70%) Analytic: 4926 (65%)	Attitude to school	Poor attitude to school at baseline (self-report)	*Ever had sex at follow-up 1 (male)* AOR 1.23 (1.08, 1.41) *Ever had sex at follow-up 1 (female)* AOR 1.41 (1.23, 1.62)

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Henderson 2008, cont.					School plans and expectations	Future college at baseline (self-report)	*Ever had sex at follow-up 1 (male)* Very Unlikely: AOR 2.73 (1.50, 4.99) Unlikely: AOR 1.32 (0.85, 2.06) Likely: AOR 0.94 (0.73, 1.22) Very Likely: AOR 0.83 (0.59, 1.17) Unsure: Reference *Ever had sex at follow-up 1 (female)* Very Unlikely: AOR 0.86, (0.36, 2.06) Unlikely: AOR 0.57 (0.34, 0.94) Likely: AOR 0.81 (0.62, 1.05) Very Likely: 0.73 (0.53, 0.99) Unsure: Reference
Hoskins 2015	United States	African American females in neighbourhoods made up of more than 10% of African American populations and more than 20% of families living in poverty	Average age 10	Baseline 889 (Not reported) Follow-up 2 (8 years post-baseline): Not reported Follow-up 3 (10 years post-baseline): Not reported Analytic: 305	Attitude to school	Likes school, school bores you, grades are important at baseline (self-report)	*Risky sexual behaviour at follow-up 2 (ever had sex, number of partners, frequency of sex and condom use in past 3 months)* Adjusted B = -0.19, p<.05 *Pregnancy prior to age 20 at follow-up 3* Adjusted B = -0.09, NS
Kim 2015	Malawi	All students enrolled in Form 1 to 3 in public secondary schools in Lilongwe District	Average age 16	Baseline: 7971 (80%) Follow-up (1 year post-baseline): 5702 (Effective survey rate: 90.8%)	Academic performance	Math performance at baseline (self-report)	*Ever had sex at follow-up* Adjusted Risk Ratio (ARR) 0.846, p<.05

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Kneale 2012	United Kingdom	Young women from three longitudinal cohort studies (National Child Development Study [NCDS], the British Birth Cohort [BCS70] and Longitudinal Study of Young People in England [LSYPE]) born in 1958, 1970 and 1989-90, respectively	Birth in 1958 (NCDS), 1970 (BCS70) and 1989-90 (LSYPE)	NCDS Baseline: 8859 (Not reported) Analytic: 3957 (40%) BCS70 Baseline: 8279 (Not reported) Analytic: 2752 (31%) LSYPE Baseline: 9636 (Not reported) Analytic: 3361 (44%)	Academic performance	Childhood educational ability at age 10-11 (source not reported)	*Birth by age 20 (NCDS)* Quartile 1: Reference Quartile 2: UOR 0.805 (0.62, 1.04), NS Quartile 3: UOR 0.408 (0.29, 0.57), p<.001 Highest quartile: UOR 0.314 (0.21, 0.48), p<.001 *Birth by age 20 (BCS70)* Quartile 1: Reference Quartile 2: UOR 0.848 (0.56, 1.28), NS Quartile 3: UOR 0.651 (0.42, 1.00), p<.05 Highest quartile: UOR 0.522 (0.31, 0.88), p<.05 *Birth by age 20 (LSYPE)* Quartile 1: Referent Quartile 2: UOR 0.883 (0.55, 1.41), NS Quartile 3: UOR 0.697 (0.38, 1.27), NS Highest quartile: UOR 0.260 (0.10, 0.69), p<.01
					Attitude to school	Dislike of school at age 16 (self-report)	*Birth by age 20 (NCDS)* Dislike/strongly dislike: Reference Like somewhat: UOR 0.686 (0.46, 1.02), NS Like or like strongly: UOR 0.606 (0.46, 0.80), p<.001 *Birth by age 20 (BCS70)* Dislike/strongly dislike: Reference Like somewhat: UOR 0.537 (0.31, 0.92), p<.05 Like or like strongly: UOR 0.532 (0.29, 0.97), p<.05 *Birth by age 20 (LSYPE)* Dislike/strongly dislike: Reference Like somewhat: UOR 0.665 (0.41, 1.08), NS Like or like strongly: UOR 0.503 (0.24, 1.04), NS

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Kneale 2012, cont.					School plans and expectations	Educational expectations at age 16 (self-report)	*Adolescent birth (NCDS)* Leave at minimum: Reference Leave at 17-18: UOR 0.470 (0.31, 0.72), p<.001 Higher education: UOR 0.323 (0.17, 0.62), p<.001 Unknown: UOR 0.644 (0.35, 1.19), NS *Adolescent birth (BCS70)* Leave at minimum: Reference Leave at 17-18: UOR 0.548 (0.28, 1.07), NS Higher education: UOR 0.273 (0.12, 0.64), p<.01 Unknown: 0.419 UOR (0.20, 0.88), p<.05 *Adolescent birth (LSYPE)* Leave at minimum: Reference Leave at 17-18: UOR 0.453 (0.24, 0.85), p<.05 Higher education: UOR 0.198 (0.10, 0.39), p<.001 Unknown: UOR 0.454 (0.23, 0.88), p<.05
Koon-Magnin 2010	United States	Nationally representative sample of adolescents in middle and high schools	11-17	Baseline: 20,745 (79%) Follow-up 1 (1 year post-baseline): 16,706 (89%) Analytic: 4266	School enrolment (partner)	Partner's educational status at baseline (self-report)	*Sexual intercourse within relationship at follow-up 1* Same school: Reference Different school: AOR 1.08, NS College: AOR 1.35, p<.10 Exited school: AOR 1.77, p<.01
					School plans and expectations	Wants to go to college at baseline (self-report)	*Ever had sex at follow-up 1* AOR 0.89, p<.05
Laflin 2008	United States	Students in grades 5-8 rural and suburban schools in the Midwest U.S.	Average age 12.8	Baseline and follow-up: Not reported Analytic: 832	Academic performance	Mostly A's and B's vs. other at baseline (self-report)	*Ever had sex at follow-up (male)* AOR 4.5 (2.3, 8.6) *Ever had sex at follow-up (female)* AOR 3.1 (1.6, 6.1)

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Laflin 2008, cont.					School plans and expectations	Desire to attend college (self-report)	*Ever had sex at follow-up (male)* 24.5% (less than college) vs. 14.9% (college), p=.091 *Ever had sex at follow-up (female)* 21.2% (less than college) vs. 8/8% (college), p=.005
Lauritsen 2015	United States	Nationally representative sample of adolescents obtained from U.S. households	11-17	Baseline: 1725 (73%) Follow-up (1 year post-baseline): 1673 (71%)	School plans and expectations	Importance of going to and completing college at baseline (self-report)	*Ever had sex at follow-up 1 (female)* Adjusted *B*=-0.16, t=3.22, p<0.05 *Ever had sex at follow-up 1 (male)* Adjusted *B*=-0.03, t=0.80, NS
					School plans and expectations	Expects educational disappointment at baseline (self-report)	*Ever had sex at follow-up 1 (female)* Adjusted *B*=0.71, t=2.36, p<0.05 *Ever had sex at follow-up 1 (male)* Adjusted *B*=0.06, t=0.27, NS
					Involvement in school	Time spent in conventional school activities at baseline (self-report)	*Ever had sex at follow-up 1 (female)* Adjusted *B*=-0.07, t=1.52, NS *Ever had sex at follow-up 1 (male)* Adjusted *B*=-0.06, t=1.88, p<0.05
Lou 2015	United States	Females from a nationally representative sample	6-14	Baseline; 3586 (Not reported) Follow-up (5-10 years post-baseline: Not reported Analytic: 703	Academic performance	Standardized test scores at baseline (assessment of academic skills)	*Adolescent birth at follow-up* Adjusted logistic coefficient -0.015, SE=0.013, NS
Manning 2000	United States	Women from a nationally representative sample in U.S.	Not reported	Baseline and follow-up: Not reported Analytic: 1593	Academic performance	Mostly A's to Mostly F's at report prior to outcome (self-report)	*Contraceptive use at first sex (<18 years) at follow-up* Mean 0.889, SE=0.039, p<.05

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Manning 2000, cont.					School behaviour	Expelled from school at report prior to outcome (self-report)	*Contraceptive use at first sex (<18 years) at follow-up* AOR 0.903, SE=0.166, NS
Marston 2013	Kenya	Youth who were sexually inexperienced at baseline from two informal settlements in Nairobi	12-16	Baseline: 4058 (Not reported) Follow-up (1 year post-baseline): 2674 (70%) Analytic: 1754	School plans and expectations	Importance of finishing secondary school, going to university, having a good job at baseline (self-report)	*Ever had sex at follow-up (female)* Very important: Reference Quite/not important: AOR 10.39 (1.92, 56.35), p<.01 *Ever had sex at follow-up (male)* Very important: Reference Quite/not important: AOR 0.99 (0.29, 3.34), NS
					School Enrolment	Enrolment at baseline *(<18 years)* (self-report)	*Ever had sex at follow-up (female)* Always in school: Reference Dropped out: AOR 21.77 (7.44, 63.71), p<.001 Restarted: AOR 3.67 (0.37, 36.12), NS Never in school: AOR 39.35 (9.75, 158.76), p<.001 *Ever had sex at follow-up (male)* Always in school: Reference Dropped out: AOR 6.87 (2.84, 16.57), p<.001 Restarted: AOR 1.77 (0.43, 7.24), NS Never in school: AOR 8.62 (2.80, 26.48), p<.001
McGrath 2009	South Africa	Young people living households in a rural district of KwaZulu-Natal, South Africa	12-25	Baseline and follow-up (4 years post-baseline): Not reported Analytic: 8753	School enrolment	School attendance under age 18 at report prior to outcome (self-report)	*Age at first sex at follow-up (female)* Attending: Reference Not in school UHR: 2.48 (2.07, 3.00) Complete secondary UHR: 1.34 (1.12, 1.60) *Age at first sex at follow-up (male)* Attending: Reference Not in school AHR: 1.44 (1.17, 1.77) Complete secondary AHR: 0.90 (0.71, 1.15) *Early first sex at follow-up (female)* Attending: Reference Not attending AHR 4.19 (3.27, 5.38), p<.001 *Early first sex at follow-up (male)* Not reported

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
McNeely 2004	United States	Nationally representative sample of adolescents in middle and high schools	11-17	Baseline: 20,745 (79%) Follow-up (1 year post-baseline): 14,738 (88.2%) Analytic: 13,570	School connectedness	Social belonging at school at baseline (self-report)	*Ever had sex with condom at follow-up* ARR: 0.95, SE=0.02, NS *Ever had sex w/o condom at follow-up* ARR 0.96, SE=0.03, NS
					School connectedness	Teacher Support at baseline (self-report)	*Ever had sex with condom at follow-up* ARR 0.88, SE=.03, p<.001 *Ever had sex w/o condom at follow-up* ARR 0.91, SE=.03, p<.05
Mersky 2007	United States	Minority women who attended Chicago public early childhood programs	3-4	Baseline: 768 (Not reported) Last follow-up (19 years post-baseline) 706 (92%)	Academic performance	Reading test at 8th grade (assessment of reading skills)	*Adolescent birth (< 18 years) at last follow-up* Percentage point difference: -0.002, NS
					School type	Attended magnet school between 4th and 8th grade (source not reported)	*First birth < age 18 at last follow-up* Percentage point difference: -0.206, p<.01
Moore 1998	United States	Female adolescents enrolled in 8th grade	13-14	Baseline: 24,599 (Not reported) Follow-up 2 (4 years post-baseline): 16,489 (95%) Analytic: 7930	Academic performance	Grades at baseline (self-report)	*Adolescent birth (<12th grade) at follow-up 2* AOR 0.61, p<.01
						Standardized test scores at baseline (assessment of academic skills)	*Adolescent birth (<12th grade) at follow-up 2* AOR 0.97, p<.01
						Performs below ability at baseline (teacher-rated)	*Adolescent birth (<12th grade) at follow-up 2* AOR 1.25, NS

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Moore 1998, cont.					School plans and expectations	Expectations for how far in school student would go at baseline (self-report)	*Adolescent birth (<12th grade) at follow-up 2* High school or less: Reference Beyond high school AOR 0.75, NS College grad AOR 0.58, p<.01 Grad school AOR 0.43, p<.01
					Grade repetition	Behind a grade level at baseline (based on age at interview)	*Adolescent birth (<12th grade) at follow-up 2* AOR 2.10, p<.001
					School mobility	Changed school 4+ times since 1st grade at baseline (source not reported)	*Adolescent birth (<12th grade) at follow-up 2* AOR 2.10, p<.001
					School safety	Physical conflict among students, vandalism of school property, student alcohol and drug use, physical and verbal abuse of teachers at baseline (self-report)	*Adolescent birth (<12th grade) at follow-up 2* AOR 1.01, NS
Ohannessian 1993	United States	Adolescents in rural Mid-Atlantic school district	Average age 13.7	Baseline: Not reported Follow-up 3 (4 years post-baseline): Not reported (77%) Analytic: 479	Academic performance	Grades at baseline (self-report)	*Ever had sex at follow-up 2 (female)* Adjusted β = -0.40, p<.001 *Ever had sex at follow-up 2 (male)* Not reported, NS
					School plans and expectations	Education aspirations (some high school to graduate training) at baseline (self-report)	*Ever had sex at follow-up 2 (female)* Not reported, NS *Ever had sex at follow-up 2 (male)* Not reported, NS

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Ohannessian 1993, cont.					Involvement in school	Time spent doing homework, school projects, and reading books at baseline (self-report)	*Ever had sex at follow-up 2 (female)* Not reported, NS *Ever had sex at follow-up 2 (male)* Not reported, NS
Oman 2013	United States	Adolescents from randomly selected households in Midwestern city	12-17	Baseline: 1111 (61%) Follow-up 4 (4 years post-baseline): 1032 (93%)	School plans and expectations	Educational aspirations for the future (self-report)	*Sexual initiation before 20 at follow-up* AHR 0.98 (0.82, 1.18), NS *Contraception at last sex at follow-up* AOR 1.31 (1.11, 1.55), p<.05 *Pregnancy before 20 at follow-up* AHR 0.55 (0.39, 0.77), p<.05
					School connectedness	Not described (self-report)	*Sexual initiation before 20 at follow-up* AHR 0.74 (0.62, 0.89), p<.05 *Contraception at last sex at follow-up* AOR 1.14 (0.94, 1.39), NS *Pregnancy before 20 at follow-up* AHR 0.71 (0.52, 0.98), p<.05
Oshima 2013	United States	Youth in legal custody of the state in 8 counties in Missouri	Average age 17	Baseline: 404 (Not reported) Follow-up (2 years post-baseline): 325 (80%)	Academic performance	Failing grades at baseline (self-report)	*Pregnancy before age 20 at follow-up (male)* AOR 2.80 (0.98, 7.96) *Pregnancy before age 20 at follow-up (female)* Not reported
					Involvement in school	Involved in at least one activity, such as sports or school club at baseline (self-report)	*Pregnancy before age 20 at follow-up (male)* Not reported *Pregnancy before age 20 at follow-up (female)* Not reported

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Parkes 2014	England, UK	Adolescents born in Avon County, England in 1991-1992	~1	Baseline: 13,988 (96%) Last follow-up (14 years post-baseline): 5180 (37%) Analytic: 4798	Academic performance	Reading, writing and mathematics test scores at 6-8 years (assessment of academic skills)	*Had sex before last follow-up (age 15)* AOR 0.89 (0.74, 0.00), p= 0.212
						Reading, writing and mathematics test scores at 10-11 years (assessment of academic skills)	*Had sex before last follow-up (age 15)* AOR 1.15 (0.95–0.00), p= 0.145
					Attitude to school	Dislike of school (how often like going to school, feel happy at school, schoolwork is boring, like school) at 6-8 years (self-report)	*Had sex before last follow-up (age 15)* AOR 0.99 (0.83, 1.07), p=0.873
					Attitude to school	Dislike of school (like to go to school each day, learning is fun, enjoy class, excited about schoolwork) at 10-11 years (self-report)	*Had sex before last follow-up (age 15)* AOR 1.26 (1.07, 1.39), p= 0.006

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes[†]
Paul 2000	New Zealand	Adolescents born in Dunedin in 1972-73	~3	Baseline: 1037 (91%) Last follow-up (15-18 years post-baseline) 935 (91.7%)	Academic performance	Reading test score at age 13 (assessment of reading skills)	*Had sex before 16 years at last follow-up (male)* <60: Reference 60-74: AOR 0.41 (0.13, 1.2) 75-89: AOR 0.67 (0.25, 1.8) 90-104: AOR 0.29 (0.10, 0.80) >105: AOR 0.20 (0.03, 1.6) *Had sex before 16 years at last follow-up (female)* <60: Reference 60-74: UOR 0.72 (0.24, 2.2) 75-89: UOR 1.1 (0.42, 2.7) 90-104: AOR 0.88 (0.34, 2.3) >105: AOR 1.3 (0.39, 4.1)
					School connectedness	Attachment to school at age 15 (self-report)	*Had sex before 16 years at last follow-up (male)* 0-1: Reference 2: AOR 0.23 (0.08, 0.70) 3: AOR 0.24 (0.09, 0.69) *Had sex before 16 years at last follow-up (female)* 0-1: Reference 2: AOR 0.32 (0.13, 0.81) 3: AOR 0.21 (0.09, 0.50)
					Attitude to school	School attitude at age 13 (self-report)	*Had sex before 16 years at last follow-up (male)* Poor: Reference Average: AOR 0.31 (0.8, 1.26) Above average: AOR 0.26 (0.06, 1.20) *Had sex before 16 years at last follow-up (female)* Average: Reference Above average: UOR 0.76 (0.49, 1.20)

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Paul 2000, cont.					School plans and expectations	Plan to stay at school at age 13 (self-report)	*Had sex before 16 years at last follow-up (male)* Up to 4 years: Reference 5 years: AOR 1.7 (0.86, 3.4) Don't know: AOR 0.11 (0.02, 0.63) *Had sex before 16 years (female)* Up to 4 years: Reference 5 years: AOR 0.56 (0.05, 1.1) Don't know: AOR 0.18 (0.05, 0.70)
Pearson 2012	United States	Adolescent girls from one public school district in New England	13-14	Baseline: 147 (Not reported) Follow-up (2 years post-baseline): 117 (80%)	Academic performance	Comparison to other students in class (top of class) at baseline (self-report)	*Ever had sex by 10th grade at follow-up* UOR 1.46 (0.83, 2.38), NS
					School plans and expectations	Desire to go to higher education at baseline (self-report)	*Ever had sex by 10th grade at follow-up* UOR 0.27 (0.12, 0.58), p<.01
Resnick 1997	United States	Nationally representative sample of adolescents in middle and high schools	11-17	Baseline: 20,745 (79%) Follow-up (1 year post-baseline): 14,738 (88.2%) Analytic: 11,572	Academic performance	Grade point average at baseline (self-report)	*Age of sexual debut at follow-up* ARR 0.80 (0.76, 0.84), p<.001 *Adolescent pregnancy* Not reported, NS
					School connectedness	Extent to which students felt safe, happy, and close to people at their school at baseline (self-report)	*Age of sexual debut at follow-up* ARR 0.77 (0.74, 0.81) *Adolescent pregnancy* Not reported, NS

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Rink 2007	United States	Female adolescents in nationally representative study attending high schools	15-19	Baseline: 20,745 (79%) Follow-up 1 (1 year post-baseline): 16,706 (88.6%) Follow-up 2 (7 years post-baseline): 14,322 (75.7%) Analytic: 3644	School connectedness	Extent to which students felt safe, happy, and close to people at their school at baseline (self-report)	*Ever had sex by follow-up 1* Disagree: Reference Neutral: UOR 0.49 (0.32, 0.76), p<.001 Agree: UOR 0.35 (0.21–0.59), p<.001 *Ever had sex by follow-up 2* Disagree: Reference Neutral: UOR 0.46 (0.15, 1.4), NS Agree: UOR 0.56 (0.17, 1.8), NS
Rosenberg 2015	South Africa	Young women living in Agincourt sub-district	12-18	Baseline and follow-up: Not reported Analytic: 15,457 (68.2% of eligible)	School enrolment	Enrolled in school (self-reported)	*Adolescent pregnancy at follow-up* ARR 0.53 (0.14, 2.11), p<0.4
Scaramella 1998	United States	Adolescents in 7th grade public and private schools in Iowa	Average age 12.5	Baseline: 451 (78%) Last follow-up (6 years post-baseline): Not reported (89%) Analytic: 368	Academic performance	Grade point average in 8th grade (mother- and self-reported)	*Ever pregnant by 12th grade at last follow-up* Adjusted *B*=-0.11, p<.05
Schofield 2008	United States	Adolescents in schools serving poor neighbourhoods in four states	Average age 6.4	Baseline and follow-up: Not reported Analytic: 694	School behaviour	Academic performance and motivation, social skills, conduct, adult relationships and maturity in 7th grade (teacher-rated)	*Had sex before 16 years at last follow-up* Teacher rated: r=0.39, p<.001
					School behaviour	Academic performance and motivation, social skills, conduct, adult relationships and maturity in 7th grade (parent-rated)	*Had sex before 16 years at last follow-up* Parent rated: r=0.36, p<.001

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Shneyderman 2013	United States	Adolescents from a nationally representative sample of middle and high school students who had initiated sexual intercourse by follow-up	11-17	Baseline: 20,745 (78.9%) Follow-up (1 year post-baseline): 14,738 (88.2%) Analytic: 6540	School connectedness	Extent to which students felt safe, happy, and close to people at their school (self-reported)	*Had sex before 15 years at follow-up* AOR 0.99 (0.93, 1.06), NS *Condom use at last sex at follow-up* AOR 1.05 (0.99, 1.11), NS *Under influence at first or last sex at follow-up* AOR 0.87 (0.81, 0.94) *STI diagnosis at follow-up* AOR 0.98 (0.89, 1.08), NS
Smith 1996	United States	Female adolescents attending public schools in Rochester New York.	Average age 14.8	Baseline: 1000 (75%) Last follow-up (4 years post-baseline): Not reported Analytic: 249	Academic performance	Reading test scores in grade 7 or 8 (school records)	*Adolescent pregnancy at last follow-up* AOR 0.97, p<.01
					School plans and expectations	Going to college is important in grade 7 or 8 (self-report)	*Adolescent pregnancy at last follow-up* AOR 0.38, p<.05
South 2000	United States	Young women in a nationally representative U.S. sample	7-11	Baseline: Not reported Follow-up 1 (12-16 years post-baseline): 699 (not reported) Follow-up 2 (11 years post-baseline): 571 (not reported) Analytic: 562	Attitude to school	Interested in schoolwork, satisfied with school, dislike of school at follow-up 1 (self-report)	*Adolescent pregnancy at follow-up 2* Adjusted β=-0.067, SE=0.055, NS
					School plans and expectations	Desires to complete high school/college at follow-up 1 (self-report)	*Adolescent pregnancy at follow-up 2* Adjusted β=-0.426, SE=.123, p<.05

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
South 2005	United States	Nationally representative sample of adolescents in middle and high schools	11-17	Baseline: 20,745 (78.9%) Follow-up (1 year post-baseline): 14,738 (88.2%) Analytic: 4862	Academic performance	Grade point average at baseline (self-report)	*Ever had sex at follow-up* Adjusted *B*=-0.33, SE=0.07, p<.01
					Peer academic performance	Peer grade point average (aggregated self-report)	*Ever had sex at follow-up* Adjusted *B*=-0.39, SE=0.15, p<.01
					Involvement in school	Number of after school activities at baseline (self-report)	*Ever had sex at follow-up* Adjusted *B*=0.01, SE=0.03, NS
Steiner 2014	United States	Nationally representative sample of adolescents in middle and high schools	11-17	Baseline: 20,745 (78.9%) Follow-up 3 (12 years post-baseline): 15,701 (80.3%) Analytic: 14,800	School connectedness	Extent to which students felt safe, happy, and close to people at their school at baseline (self-report)	*STI diagnosis at follow-up 3* AOR 0.97 (0.95, 0.98)
Stoner 2017	South Africa	Young women from a random sample of high school students in grades 8-11 in rural district of Mpumalanga province	13-20	Baseline: 2533 (Not reported) Last follow-up (1-3 years post-baseline): Not reported Analytic: 2360	School enrolment	Dropped out at follow-up prior to outcome (school record)	*Number of sexual partners in past 12 months by last follow-up* Adjusted Count Ratio (ACR) 1.85 (1.50, 2.28)
					Truancy	Average number of days attended in February, May and August at follow-up prior to outcome (school record)	*Number of sexual partners in past 12 months by last follow-up* <50%: ACR 1.06 (0.75, 1.49) 50-80% ACR 1.24 (0.95, 1.62) >80%: Reference

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Stouthamer 1998	United States	Adolescent males enrolled in Grades 7 in Pittsburgh public schools.	12-13	Baseline: ~850 (85%) Last follow-up (10 years post-baseline) Analytic: 506	Academic performance	Low standardized test scores at baseline (source unclear)	*Adolescent fatherhood (< 19 years) at last follow-up* UOR 3.1 (1.70, 5.69)
					Attitude to school	Poor attitude at baseline (source unclear)	*Adolescent fatherhood (< 19 years) at last follow-up* UOR 1.8 (1.02, 3.18)
					School behaviour	Low motivation (teacher-rated)	*Adolescent fatherhood (< 19 years) at last follow-up* UOR 2.5 (1.41, 4.34)
					School behaviour	Suspended from school (source unclear)	*Adolescent fatherhood (< 19 years) at last follow-up* UOR 3.0 (1.51, 5.89)
					Truancy	Truant (source unclear)	*Adolescent fatherhood (< 19 years) at last follow-up* UOR 2.0 (1.11, 3.62)
Thornberry 1997	United States	Adolescent males attending public schools in Rochester New York.	average age 13.5	Baseline: 1000 Last follow-up (7 years post baseline): 615 (84%)	Academic performance	Reading scores (school record)	*Adolescent fatherhood at last follow-up* Unadjusted β=-0.01, p<.01
					School connectedness	Commitment to school and importance of schoolwork (self-report)	*Adolescent fatherhood at last follow-up* Unadjusted β=0.004, NS
					School connectedness	Youth likes and respects teachers (self-report)	*Adolescent fatherhood at last follow-up* Unadjusted β=-0.01, NS
					School plans and expectations	Importance of attending college (self-report)	*Adolescent fatherhood at last follow-up* Unadjusted β=0.02, NS

Table 4.4 Longitudinal studies assessing individual-level factors, cont.							
Study	Location	Study population	Age at baseline	Sample size (Response rate)	Exposure		Outcomes†
Whitbeck 1999 .	United States	Adolescents in two parent households in Midwestern state or mother-headed households in Iowa	12-13	Baseline: 658 (78.8%-99%) Last follow-up (4 years post-baseline): 585 (88-90%) Analytic: 457	Attitude to school	Liked school, not bored, get along with teachers and classmates, difficulty of schoolwork and high GPA at report prior to outcome (self-report)	*Had sex in past year at last follow-up* Adjusted β=-0.05, p<.01
					School plans and expectations	Importance of attending college at report prior to outcome (self-report)	*Had sex in past year at last follow-up* Adjusted β=-0.22, NS
					Involvement in school	Hours spent on school activities and homework at report prior to outcome (self-report)	*Had sex in past year at last follow-up* Adjusted β=-0.29, p<.01
Zhou 2016	England, UK	Female adolescents from a nationally representative sample of English adolescents born in 1989-1990	13-14	Baseline and follow-up (6 years post-baseline): Not reported (74-92%) Analytic: 3837	School plans and expectations	Future educational intentions at follow-up 2 (self-report)	*Ever pregnant by 19 years at follow-up 5* Stay on: Reference Leaving but returning later: AOR 3.40 (2.39, 4.83) Leaving: AOR 4.46 (1.34, 14.77) Don't know: AOR 2.26 (1.16, 4.40)
					Truancy	Frequency of missing school in last year without permission at follow-up 2 (self-report)	*Ever pregnant by 19 years at follow-up 5* None: Reference Odd day or lesson: AOR 1.69 (1.30, 2.21) Particular lessons: AOR 2.64 (1.79, 3.91) Several days at a time: AOR 3.48 (1.90, 6.36) Weeks at a time: AOR 3.12 (1.40, 6.97)
† Outcomes are self-reported and for overall samples unless otherwise stated.							

School-level studies

Where individual-level studies indicate which assets may be important to promote in individual students, school-level studies suggest which features of school might influence young people sexual risk behaviours and outcomes. Ten school-level studies examined the association of school-level variables with early sexual debut, sexual activity, contraception use, STI diagnoses, adolescent pregnancy and birth. Six studies used a longitudinal design and were assessed as high (Ford et al., 2005; Kim, 2015; Resnick et al., 1997; White & Warner, 2015) or medium quality (Henderson et al., 2008; Moore et al., 1998). Four studies used a cross-sectional design and were assessed as medium (Maticka-Tyndale & Tenkorang, 2010; Teitler & Weiss, 2000) or low quality (McBride et al., 1995; Mollborn et al., 2014). Seven studies examined schools in the U.S. (Ford et al., 2005; McBride et al., 1995; Mollborn et al., 2014; Moore et al., 1998; Resnick et al., 1997; Teitler & Weiss, 2000; White & Warner, 2015), with one study each from Kenya (Maticka-Tyndale & Tenkorang, 2010), Malawi (Kim, 2015) and Scotland (Henderson et al., 2008).

In a high-quality study examining public secondary-school students in Malawi, Kim (2015) reported no association between school-level deprivation and subsequent early sexual debut after adjusting for individual-level and school-level factors. However, when only individual-level factors were taken into account, lower school-level deprivation was associated with higher rates of early sexual debut, suggesting that school environment factors delay the timing of first sex in adolescence. Among school-level factors explored, Kim found that mean academic performance and mean satisfaction with school were associated with lower rates of early sexual debut after adjusting for individual and school-level characteristics but that average class size and proportion of students who repeated a grade were not associated with later sexual behaviour.

Similarly, Henderson et al (2008) reported in their medium-quality study that differences in school-level deprivation explained only some variation in subsequent sexual debut across 24 schools in Scotland. The authors found that schools with lower levels of sexual experience among boys had higher classroom discipline as rated by researcher observations and schools with lower levels of sexual experience among girls had higher average scores for the researcher-rated quality of pupil-pupil relationships.

Moore et al (1998), in a medium-quality U.S. study, found no association between school-level deprivation and subsequent pregnancy among female adolescents, after adjusting for race/ethnicity, family structure and socio-economic status. While deprivation remained nonsignificant, school safety (including lower incidents of physical conflict, vandalism, illegal substance use and physical or verbal abuse by teachers) as rated by teachers, but not when rated by students, appeared to be associated with reduced pregnancy risk among black

Table 4.5 Longitudinal and cross-sectional studies assessing school-level factors and sexual health outcomes							
Study	Location	Design	Study population	Age at baseline	Sample size (Response rate)	Exposure	Outcomes†
Ford 2005	United States	Longitudinal	Nationally representative sample of adolescents in middle and high schools	11-17	Baseline: 18,924 students (not reported) Follow-up 3 (7 years post-baseline): 14,322 students (75.7%) Analytic: 11,594 (81.0%), schools not reported	School mean daily attendance (administrator-reported)	*STI diagnoses (bio sample) at follow-up 2* 74-79%: Reference 80-84%: AOR 1.13 (0.99, 1.28) 85-89%: AOR 1.27 (0.97, 1.65) 90-94%: AOR 1.42 (0.96, 2.11) 95-100%: AOR (1.6 (0.95, 2.71)
Henderson 2008	Scotland, UK	Longitudinal	Students enrolled in a randomised trial in state schools in South-east Scotland	13-14	Baseline: 7616 students (90.3%), 24 schools (53.1%) Follow-up (2 years post-baseline: 5854 students (70%), 25 schools (100%) Analytic: 4926 students, 24 schools	School-level deprivation (unemployment in school catchment area, deprivation score of local area, pupils' post school destination, proportion receiving free school meals, staying-on rates and attendance rates) (source not reported)	*Ever had sex at follow-up (male)* Residual variance: 0.042 *Ever had sex at follow-up (female)* Residual variance: 0.016
Kim 2015	Malawi	Longitudinal	All students enrolled in Form 1 to 3 in public secondary schools in Lilongwe District	Average age 16	Baseline: 7971 students (80%), schools not reported Follow-up (1 year post-baseline): 5702 students, (effective survey rate: 90.8%), schools not reported Analytic: 7916 students, 33 schools	School-level attitude to school (aggregated self-report)	*Ever had sex at follow-up* ARR 0.990, p<0.05
						School-level average class size (source not reported)	*Ever had sex at follow-up* ARR 0.995, NS
						School-level grade repetition (% ever repeated grade) (aggregated self-report)	*Ever had sex at follow-up* ARR 1.026, NS

Table 4.5 Longitudinal and cross-sectional studies assessing school-level factors, cont.							
Study	Location	Design	Study population	Age at baseline	Sample size (Response rate)	Exposure	Outcomes†
Kim 2015, cont.						School-level deprivation (percentage of students with top 10% wealth index, percentage parental education, percentage paternal occupation as professional or government officer) (aggregated self-report)	*Ever had sex at follow-up* ARR 0.910, NS
Maticka-Tyndale 2010	Kenya	Cross-sectional	Standard 6 and 7 students in public schools in Nyanza Province	11-17	Analytic: 3645 students (not reported), 160 schools (not reported)	School type (religious school sponsor) (source not reported)	*Condom use at last sex (male)* No Sponsor: Reference Catholic: AOR 0.481, SE=.253, p<.01 Mainline: AOR 0.559, SE=.236, p<.01 Protestant: AOR 0.633, SE=.268, NS *Condom use at last sex (female)* No Sponsor: Reference Catholic: AOR 0.806, SE=.361, NS Mainline: AOR 1.17, SE=.305, NS Protestant: AOR 1.13, SE=.433, NS
						School-level deprivation (physical characteristics of school facilities and basic resources such as desks, seats and books) (researcher observed)	*Condom use at last sex (male)* AOR 0.959, SE=.016, p<.01 *Condom use at last sex (female)* AOR 0.960, SE=.029, NS
McBride 1995	United States	Cross-sectional	Adolescents from 22 communities in western states	9th graders	Analytic: 8558 students (76%), 16 schools (80%)	School demographic profile (parental education, family structure, racial composition, class size) (aggregated self-report)	*Sex in past month (male)* Unadjusted *B*= 0.01, NS *Sex in past month (female)* Unadjusted *B* = 0.01, NS

Table 4.5 Longitudinal and cross-sectional studies assessing school-level factors, cont.							
Study	Location	Design	Study population	Age at baseline	Sample size (Response rate)	Exposure	Outcomes†
McBride 1995, cont.						School-level social bonding (aggregated relationships with family and friends, importance of education and contribution to society, and school involvement) (aggregated self-report of 12 graders)	*Sex in past month (male)* Unadjusted *B*=-0.02, NS *Sex in past month (females)* Unadjusted *B*=-0.10, p<.05
Molborn 2014	United States	Cross-sectional	Nationally representative sample of adolescents in high schools	14-17	8764 students (78.9%), 75 schools (not reported)	School racial composition (aggregated self-report)	*School-level pregnancy prevalence* Adjusted *B*=0.12, SE=0.02, p<.001
						School religious composition (aggregated self-report)	*School-level pregnancy prevalence* Adjusted *B*=-0.01, SE=0.03, NS
						School-level maternal education (college degree or higher) (aggregated self-report)	*School-level pregnancy prevalence* Adjusted *B*=-0.06, SE=0.05, NS
Moore 1998	United States	Longitudinal	Female adolescents enrolled in 8th at baseline	13-14	Baseline: 24,599 (Not reported) Follow-up 2 (4 years post-baseline): 16,489 (95%) Analytic: 7930 students, schools not reported	School racial composition (40%+ black students) (source not reported)	*Adolescent pregnancy at follow-up 2* AOR 1.24, NS
						School-level deprivation (50%+ free school meals) (source not reported)	*Adolescent pregnancy at follow-up 2* AOR 1.16, NS
						School-level family structure (50%+ single parent) (aggregated self-report)	*Adolescent pregnancy at follow-up 2* AOR 0.84, NS
						School-level safety (top 20%+) (aggregated teacher-report)	*Adolescent pregnancy at follow-up 2* AOR 0.66, NS

Table 4.5 Longitudinal and cross-sectional studies assessing school-level factors, cont.

Study	Location	Design	Study population	Age at baseline	Sample size (Response rate)	Exposure	Outcomes†
Resnick 1997	United States	Longitudinal	Nationally representative sample of adolescents in middle and high schools	11-17	Baseline: 20,745 students (79%), 134 schools (79%) Follow-up (1 year post-baseline): 14,738 students (88.2%), 129 schools (96%) Analytic: 11,572 students, 130 schools	School-level mean daily attendance at baseline (administrator-report)	*Age of sexual debut at follow-up* ARR 0.95 (0.91, 0.99), p<.05 *Adolescent pregnancy at follow-up* Not reported, NS
Teitler 2000	United States	Cross-sectional	Youths from multiple random samples of Philadelphia tracts and households	14-18	2080 youths (95%), 70 schools	School-level variance (between school) (aggregated self-report)	*Ever had sex* Adjusted variance: 0.104, SE=0.064, NS
White 2015	United States	Longitudinal	Nationally representative sample of adolescents in middle and high schools	11-17	Baseline: 20,745 students (78.9%) Follow-up 3 (12 years post-baseline): 15,701 (80.3%) Analytic: 10,596, 76 schools	School-level educational expectations (aggregated-self report)	*Ever had sex at follow-up 3 (female)* Adjusted *B*= 1.44SE=.37, p<.001 *Ever had sex at follow-up 3 (male)* Adjusted *B*=1.02 SE=.4, p<.05

† Outcomes are self-reported unless otherwise stated.

students. Other school-level factors, including proportion of students with a single parent and proportion of black students, did not appear to be associated with subsequent risk of pregnancy overall or in subgroups by race/ethnicity.

White and Warner (2015) were the only authors to examine associations between school-level expectations for higher education and sexual health outcomes in a high-quality study. Using longitudinal Add Health data, the authors reported that attending a school with more students who planned to attend university was associated with fewer students reporting subsequent sexual debut, adjusting for school location, size, and racial/ethnic composition and individual-level race/ethnicity, age, parental factors and non-sexual risk behaviours.

Two high-quality studies also using Add Health samples examined aggregated attendance and sexual health outcomes. Adjusting for socio-demographic and family structure variables, the studies found that attending a school with higher mean attendance rate was associated with early sexual debut (Resnick et al., 1997) but not adolescent pregnancy (Resnick et al., 1997) or STI diagnoses (Ford et al., 2005).

In a Kenya-based, longitudinal study, low school-level deprivation was associated with reduced risk of condom use for male students after adjusting for age, ethnicity, SES, attitudes and access to supportive social networks; however, no association was reported for female students (Maticka-Tyndale & Tenkorang, 2010). Likewise, the authors found that male (but not female) students who attended schools with a Catholic or mainline religious sponsor were less likely to report condom use at last sex after adjusting for age, ethnicity, SES, attitudes and access to supportive social networks.

Molborn et al (2014), using a cross-sectional sample of the U.S. Add Health study, reported no association between school-level deprivation and school-level pregnancy after adjusting for racial/ethnic composition and aggregated religiosity. Likewise, school-level religiosity was not associated with pregnancy. However, after adjusting for covariates, school-level deprivation and religiosity, school racial/ethnic composition was associated with school-level pregnancy, where schools with lower rates of non-Hispanic black students had lower rates of pregnancy.

In a medium-quality, cross-sectional U.S. study, Teitler and Weiss's (2000) did not find significant variation in sexual debut across schools after adjusting for age, gender and race/ethnicity. In sub-analysis, the authors concluded that variance in behaviours could not be explained by racial/ethnic composition (when comparing schools with predominantly African American or predominantly white student population) after adjusting for age and gender. However, some variation appears to be due to attending a state-funded versus privately funded school. This study did not adjust for socio-economic status.

McBride (1995), in a low-quality cross-sectional study, included deprivation in their measure of school-level socio-demographics, as measured by aggregated parent education, family structure, race/ethnicity and dropout rates. This variable was not associated with sexual activity in the past month for either male or female students. While school socio-demographics were not directly associated with rates of sexual activity, they were associated with higher levels of school-level bonding (as measured by aggregated 12th grade bonding), which was itself associated with lower risk of sexual activity among 9th grade girls. This may indicate that socio-demographic composition of school has an indirect role on factors important for sexual decision-making.

Discussion

The purpose of this review was to investigate whether school-related factors, such as those proposed by the theory of human functioning and school organisation, are associated with sexual behaviour and health outcomes. Overall, there is sufficient evidence from high- and medium-quality observational studies to suggest that multiple school-related factors are associated with sexual health outcomes. In particular, delayed sexual debut appears to be associated with enrolment, academic performance, attitude and connectedness to school. Further, increased contraception use seems to be associated with school plans and expectations to attend higher education, as well as attitude to school, whereas reduced risk of adolescent pregnancy appears to be associated with school plans and expectations to go onto higher education (for female adolescents only) and academic performance. Associations of individual-level school factors with recent sexual activity, number of sexual partners and STI diagnoses were less consistent across measures of school involvement, school behaviour and achievement. School-level studies indicate that school-level deprivation does not appear to fully account for differences in sexual behaviour and outcomes across schools, after adjusting for individual- and school-level socio-demographic factors. Findings from multiple longitudinal, medium- and high-quality studies suggest that other composition and contextual school-level factors may be important for later sexual decision-making, including proportion of students satisfied with school or planning to go on to higher education, school safety and discipline, and aggregated social belonging with peers.

Findings from school-level and longitudinal individual-level studies provide some empirical support for the theory of human functioning and school organisation as a framework for understanding how school processes and experiences might influence young people's sexual health. The theory assumes that enrolment in schools is necessary for receiving the potential benefits of the school environment but that other factors, such as school connectedness and relationships, are also important. The association of higher academic achievement with delayed sexual debut and pregnancy may reflect a young person's

commitment to learning and/or ability for practical reasoning. Markham and Aveyard (2003) also suggest that students who are similarly 'committed' tend to socialize with each other, suggesting that adolescents' sexual partner enrolment status (Koon-Magnin et al., 2010) and their peers' academic achievement (S. J. South et al., 2005) might reflect an adolescent's own commitment, or lack thereof, with school. Attending schools with romantic partners and peers exposes them to the same opportunities for school engagement, and thus, they may be similarly committed to school.

Markham and Aveyard (2003) suggest that for students who are 'estranged' – those who are committed to the values of the school but lack proficiency in the instructional requirements – improving academic ability will also improve their health behaviour through better decision-making skills and greater exposure to committed students. However, 'detached' students, those who are capable of meeting the academic demands of school but whose orientation to school and future education prevents alignment with the broader values of school, may also attain high academic achievement. This may be the case with foster youth (Oshima et al., 2013), whose social disadvantage may not be overcome through a focus on academic skills. In order for detached or alienated students to become committed, they may require schools to provide opportunities for developing a sense of affiliation – or connectedness – with teachers, other students and school values.

Studies which measured connectedness differed slightly in the items they used to measure attachment or connection. Other categories of exposure, including attitude to school and school plans and expectations, might represent further connection or commitment to school. High-quality studies suggest that teacher relationships and attitudes towards school and future education are potentially important for decisions related to initiating sex, contraceptive use and pregnancy prevention, and align with the theory. Markham and Aveyard (2003) focus on teacher-student relationships as important for increasing students' capacity for affiliation and practical reasoning, through joint decision-making in curriculum and pedagogy. Combined with academic achievement, attitudes towards school and expectations for higher education may reflect 'committed' students in the sense that students see themselves as members of the school community, align with the school value of going on to higher education, and have the capacity to achieve those expectations. Multiple high- and medium-quality studies reflect this commitment to traditional school pathways by both avoiding unplanned pregnancy and taking measures to prevent pregnancy through contraception use.

Involvement is conceptualised differently in the identified studies reviewed here than in the theory. Markham and Aveyard (2003) emphasise students' involvement in the development of the school policies and curriculum; however, included studies focused on hours spent studying or extracurricular activities. While time spent on school-related activities

may reduce the number of opportunities to have sex, involvement in sports or other activities could potentially widen social networks, increase time spent with peers who have norms incongruent with health-promoting behaviours, and provide opportunities to meet new sexual partners (Wiggins et al., 2009). Since studies did not assess participation in school processes, included studies cannot provide insight into whether school involvement as Markham and Aveyard (2003) conceptualised it is important for commitment to school and, ultimately, health decisions.

Markham and Aveyard (2003) suggest in their theory that committed students are more likely to come from the middle class, indicating that schools with more students in socio-demographically advantaged groups will be associated with better health outcomes because students are pre-disposed to the values of the school. While a few studies support that socio-demographic composition predicts variation of sexual behaviour between schools, school-level studies also suggest, as Markham and Aveyard would predict based on their theory, that other processes are important beyond socio-demographic profiles, such as school safety, discipline, and peer connections. Further, attending school with other committed students (i.e. academically competent, expect higher education) may facilitate greater commitment by individual students. Markham and Aveyard developed a construct to specifically assess the additional 'value-added' that schools provide to overcome social disadvantage experienced by students, informed by the theory of human functioning and school organisation. Several studies have examined the concept of 'value-added education' (VAE) with other health outcomes and found associations with smoking, substance use, and misbehaviour (Aveyard, Markham, Lancashire, et al., 2004; Bisset, Markham, & Aveyard, 2007; Bonell et al., 2017; W. A. Markham et al., 2008; W. A. Markham, Young, Sweeting, West, & Aveyard, 2012; Tobler, Komro, Dabroski, Aveyard, & Markham, 2011). Findings from school-level studies suggest that school-level processes and characteristics, such as VAE, may influence sexual health. This is explored further in the next chapter.

Limitations of included studies

Findings from this literature review must be interpreted in the context of the limitations of the identified studies. Seventeen of the 53 included studies were assessed as having low quality, primarily because these studies did not adjust for confounders known to be associated with sexual behaviour and outcomes, such as socio-economic status, gender or age. This review attempted to aid interpretation of study findings by identifying studies by quality and presenting findings of low-quality studies separately from high- and medium-quality studies. To assess the temporality of associations, individual-level studies were only included if they employed a longitudinal design with exposures measured before outcomes. Even so, longitudinal observational studies cannot provide evidence of causation. Factors which were

found to be associated with sexual health outcomes require further exploration via experimental studies.

School-level studies were included to assess associations between sexual health outcomes and factors that operate at the level of the school, such as compositional or contextual features. The review anticipated finding few longitudinal studies examining school-level processes, and so studies which employed cross-sectional designs were also included. It is unlikely that these studies were subject to reverse causality. All four cross-sectional studies examined school-level socio-demographic factors that would be improbable for sexual health outcomes to change, including racial/ethnic composition (McBride et al., 1995; Mollborn et al., 2014; Teitler & Weiss, 2000), religiosity (Mollborn et al., 2014), economic deprivation (Maticka-Tyndale & Tenkorang, 2010; McBride et al., 1995; Mollborn et al., 2014), and school sponsorship (Maticka-Tyndale & Tenkorang, 2010). It is possible that drop-out rates could be influenced by sexual health outcomes, especially pregnancy, but this was included in only one study as a part of a multi-item socio-demographic variable (McBride et al., 1995). McBride et al (1995) also looked at the effects of social belonging among 12th graders on sexual health outcomes among 9th graders; it is implausible that these behaviours had a reverse causal effect on 12th graders attitudes. Even so, additional longitudinal multi-level studies are needed to establish temporal relationships between school-level factors and outcomes. Further, several school-level studies used convenience samples from studies not intended to assess the influence of school environments on sexual health and did not use measures informed by theory.

While studies were conducted across high-, middle- and low-income countries, these looked at different arrays of school-related factors. The majority of LMIC studies examined enrolment, with only a few examining other school-related exposures. On the other hand, the majority of high-income countries did not examine enrolment at all, and instead focused on attainment, connectedness, involvement and attitudes to school. Indeed, only three of 11 studies from LMIC settings examined variables outside of enrolment, which included school-level variables (Kim, 2015; Maticka-Tyndale & Tenkorang, 2010) and school plans (Marston et al., 2013) and school attendance (Stoner et al., 2017). While this provides some indication that school is important beyond enrolment, there is still limited evidence from observational literature on which potential processes are important for students attending schools in LMICs.

Limitations of review

While the search strategy aimed to prioritise sensitivity in database searches, studies could have been missed during screening phase if they did not adequately describe their exposure or outcome variables in the title or abstract. Due to time and resource constraints, data were not extracted by multiple reviewers, which increases the chances of missed data. Meta-analysis

was considered, however, it was determined that the substantial heterogeneity across exposure and outcomes measures and subgroups would make synthesis of quantitative and narrative elements conceptually difficult. Meta-analysis would have provided additional insight into which school-related factors have the strongest evidence of association with sexual behaviour and health outcomes.

Implications for research and policy

Findings from this literature review indicate that individual-level experiences with school as well as school-level processes and characteristics are likely to be important influences on adolescent sexual behaviour and pregnancy, and that the theory of human functioning and organisation is worth exploring as an explanatory model for young people's sexual health. The limitations of existing observational research suggest, however, that additional research is needed to refine theory about how school environments influence adolescent sexual health.

Additional studies are needed to examine how school processes may influence sexual health specifically in LMIC settings. This may include how individual assets, such as academic achievement or attitude to school, influence sexual behaviour and pregnancy choices. Studies from low-, middle- and high-income countries should continue to explore school-level processes through longitudinal multi-level studies, which can establish temporality and disentangle the effects operating and the individual- and school-levels. Most included studies in this review focus on the compositional features of school, such as schools' socio-demographic profiles. Additional research is needed that explores contextual features derived from administrative data, teacher- or administrator-reported measures, or observed by researchers. These could include discipline policies or practices, physical features of the school, or school climate measures, such as incidents related to bullying or sexual harassment. To specifically explore the theory of human functioning and school organisation, these measures should align with key theory constructs, such as commitment, practical reasoning, and affiliation as well as concepts of boundaries, relationships and framing. Further, school-level studies should appropriately adjust for potential confounders but not for potential mediators.

Studies exploring connectedness to school could examine specific variables from multi-item scales to further understand which aspects of connectedness (i.e. to teacher, peers, curriculum) create strongest connection to school. Additionally, few studies examined how peers' behaviours or attitudes impacted student behaviour. Future studies might explore education- and school-related factors, such as attitude to school, educational plans or sense of belonging, by social networks within schools. Further, the majority of included studies examined overall populations with some additional analyses by gender and race/ethnicity. New studies might explore how students' attitudes towards school or education and

subsequent sexual behaviour might differ depending on the timing of those attitudes (e.g. before and after key transitions such as from middle to high school in the U.S.) and whether students attend schools with peers with similar or different socio-demographic backgrounds. Larger samples are needed to not only investigate overall associations but how specific exposures are associated with measures of socio-economic status and other aspects of social disadvantage, such as gender or race/ethnicity.

These relationships might be explored in existing or future observational studies. However, they may only point to potential school-related factors that influence sexual decision-making in adolescence. Experimental studies can help identify possible causal relationships with sexual health outcomes where interventions include components that address educational assets or the school environment. Additionally, qualitative studies can explore student accounts of school experience and how these are thought to relate to decisions about sexual behaviour and health (A.J. Peterson & Bonell, 2018). While they cannot identify associations across time or space, qualitative studies can shed light on school processes, identified through observational or intervention studies, as they relate student health and may identify new potential factors which have not been previously explored in quantitative analyses.

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RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed <u>for each</u> research paper included within a thesis.

<u>SECTION A – Student Details</u>

Student ID Number	232033	**Title**	Ms
First Name(s)	Amy		
Surname/Family Name	Peterson		
Thesis Title	Effects of the school environment on adolescent sexual behavior: a mixed methods assessment of the theory of human functioning and school organisation		
Primary Supervisor	Chris Bonell		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

<u>SECTION B – Paper already published</u>

Where was the work published?			
When was the work published?			
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*	Choose an item.	Was the work subject to academic peer review?	Choose an item.

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<u>SECTION C – Prepared for publication, but not yet published</u>

Where is the work intended to be published?	Journal of Adolescent Health
Please list the paper's authors in the intended authorship order:	Peterson, A., Allen, E., Viner, R., and Bonell, C.

Stage of publication	**Not yet submitted**

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	Data for this study came from the INCLUSIVE trial directed by Chris Bonell and Russell Viner (UCL Great Ormond St. Institute of Child Health). I conceived the analysis, designed and conducted the analysis and drafted the paper. Chris Bonell and Elizabeth Allen supervised the work and contributed to the design of the analysis. Russell Viner contributed to the design of data collection instruments and contributed to the planning of the analysis.

SECTION E

Student Signature	
Date	4 August 2019

Supervisor Signature	
Date	5 August 2019

Chapter 5

Effects of the school environment on sexual risk behavior: a longitudinal analysis of students in English secondary schools

The paper that forms this chapter has been prepared for submission to the Journal of Adolescent Health.

Effects of the school environment on sexual risk behavior: a longitudinal analysis of students in English secondary schools

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Introduction

While commonly used as settings for interventions to promote sexual health, the school environment is itself likely to be a social determinant of young people's sexual health.[1] Students with stronger attachment,[2–6] involvement,[7], attitude,[8,9] and relationships[10] in school report reduced sexual risk behaviors and outcomes, including early sexual debut, failure to use contraception, pregnancy and STIs. Further, school-level studies suggest that students who attend schools with higher aggregate levels of positive attitude towards school, [11] expectations of higher education[12] and attendance[13] report delayed sexual debut. These patterns extend to other risk behaviors,[14] suggesting that modifying school environments might be an effective public health strategy.[15–18]

Studies of school health effects are commonly informed by the theory of human functioning and school organization developed by Markham and Aveyard,[19] which proposes that schools can promote student health by increasing students' commitment to learning and sense of belonging in school through strong staff-student relationships and a focus on student needs and engagement. In turn, an increased sense of commitment and belonging is suggested to encourage students to make health-promoting choices by developing their ability for practical reasoning and increasing their access to social supports. These strategies are theorized to work most effectively for students of low socio-economic status for whom engagement with school, which predominantly represent the values and goals of middle socioeconomic classes, cannot be assumed to be the default.

Previous empirical studies have assessed this theory using 'value-added education' (VAE), a proxy measure of school-level aggregate student commitment and belonging.[15] VAE measures the degree to which schools achieve higher student attainment in public examinations and attendance than would be expected based on the socio-demographic characteristics of their students. Several studies have examined the relationship of VAE with health outcomes, including smoking, substance use, bullying and misbehavior.[15–18,20–22] VAE was associated with smoking in three studies [16–18] and with alcohol and misbehavior in one study.[18] Associations of VAE with sexual behaviors have not been examined to date.

VAE relies on administrative data on attainment and attendance to assess belonging and commitment rather than on direct measures of engagement with school environment. Several studies have attempted to assess the theory with reliable direct measures of student engagement from student reports, operating at both student and school levels, but have not examined sexual risk behavior.[21,22] Previous school-level associations of school-related factors with sexual behaviour have been studied, however, these have primarily focused on the associations of school-level deprivation with sexual health, [9,11,23,24] rather than measures related to belonging in and commitment to school. An exception is a 1995 study from the

western U.S. which found that school-level bonding – measured via aggregate self-reported belonging among 12th graders – was associated with lower rates of recent sexual activity among 9th grade boys.[25] This study, however, did not account for known confounders of sexual behavior and could not establish temporality given its cross-sectional design. Further, previous school-level analyses used measures that were developed from available data rather than measures based on theory and established prior to data collection.

This paper aims, for the first time, to assess the theory of human functioning and school organization as it relates to sexual behavior, using VAE as well as direct measures of school- and student-level engagement with the school environment aligned with the theory. In addition to assessing the importance of commitment to learning and sense of belonging, this analysis also examines two variables which Markham and Aveyard theorized as ways to improve student engagement in school belonging, including relationships with teachers and participation in school activities. Using longitudinal data from control schools in the INCLUSIVE trial,[26] we examine the effect of these school- and student-level factors on sexual behavior. Our analysis addresses the following questions: 1) Is value-added education at baseline associated with student-level sexual behavior at follow-up? 2) Are direct school- and student-level measures of engagement with school environment (i.e. commitment, belonging, relationships and participation) at baseline associated with student-level sexual behavior at follow-up? 3) Do student-level measures of engagement with school environment mediate the relationship between VAE and sexual behavior?

Methods

Design

The data for this paper comes from English secondary schools enrolled in the INCLUSIVE two-arm cluster randomized controlled trial (RCT) of a multi-component intervention to reduce bullying and aggression. We have limited the analysis to the 20 schools participating in the control arm of the RCT, which implemented standard health education, to avoid any confounding from intervention effects.

The INCLUSIVE trial was conducted from 2014 to 2017. State secondary schools were eligible to participate if they were within one-hour train ride from London and not evaluated as 'inadequate' by national school inspectors. Schools were allocated using computer-generated random numbers stratified by the following criteria: single- or mixed-sex enrollment; high or low rates of students receiving free school meals (FSM) (a proxy for government benefits entitlement); and school-level attainment in public examinations. Students provided written informed consent to participate in surveys with the option of parents withdrawing their children. Consenting students were surveyed prior to random

allocation at baseline (age 11-12 years) and at 24-month and 36-month follow-up, when the students were 12-13 and 14-15, respectively. Trained field workers, blind to allocation, administered paper questionnaires to students in classrooms. Full details of the INCLUSIVE trial are published elsewhere.[26,27]

Measures

To establish temporality, we examined exposure variables, including VAE and school-level and student-level commitment, belonging, relationships and participation, at baseline. Outcome variables, sexual debut and contraception use at first sex, were measured at 24- and 36-month follow-up. We also include student-level commitment, belonging, relationships and participation at 24-month follow-up to examine potential mediation between VAE and outcomes.

Value-added education: Exposure variable VAE was constructed as a continuous variable using administrative data as established in prior studies.[15–18] VAE is the difference between observed attainment and absence rates and those expected from a model based on the school's socio-demographic student profile. Attainment rates were five-year (2009-2013) averages of the proportion of students in year 11 passing at least five General Certificate of Secondary Education (GCSE) exams graded A*-C. Absence rates were five-year (2009-2013) averages of the proportion of half-days missed. Measures on ethnicity, sex, socio-economic status (income deprivation, FSM eligibility and Family Affluence Scale), and English as an additional language were used to create a socio-demographic profile for each school. Ethnicity and Family Affluence Scale[28] data were derived from the study survey; all other socio-demographic data came from government websites. To calculate VAE, two logistic regression models using attainment and absence rates were created with the socio-demographic exposures. A single continuous variable was created using principal components analysis then standardized into a VAE score where +1 represented schools with performance one standard deviation (SD) above average and -1 indicated schools with one SD below average.

Engagement with school environment scales: School environment exposure variables were collected from students at baseline using multi-item scales from the Beyond Blue School Climate Questionnaire.[29] These continuous measures included a four-item commitment to learnings sub-scale (Cronbach's α=0.82), an eight-item sense of belonging sub-scale (α=0.85), a nine-item relationships with teachers sub-scale (α=0.89), and a six-item participation in school sub-scale (α=0.81) (Table 5.1). Students were asked to rate each item with one of four possible responses between 0 ('totally disagree') and 3 ('yes, totally agree'). School-level variables were calculated as aggregates of student-level scores.

Sexual risk behavior: Questions used to assess sexual risk behaviors at 24- and 36-month follow-up derived from previous surveys.[30] A dichotomous outcome *sexual debut* (i.e., ever had sex with man/boy or woman/girl) was measured among all students. And among those who reported sexual debut, a second dichotomous variable of *did not use contraception at first sex* was measured, with an answer of 'yes' indicating risk.

Covariates: The following covariates were used in the adjusted regression models described below, pre-hypothesized as potential confounders and effect modifiers. School size, school-level income deprivation affecting index (IDACI) and proportion of students eligible for FSM were derived from data on government websites. Student-level factors from the baseline student surveys included sex, ethnicity, family structure, levels of household employment and housing tenure.

Analysis

Analysis was conducted in several stages using Stata 15.[31] Descriptive analyses presents the proportion and means of baseline exposures and covariates, including VAE, school environment measures and socio-demographic characteristics. Intraclass correlations, which assesses how similar individuals within schools respond to a variable, were calculated for outcomes at each time point. Unadjusted longitudinal associations were then calculated between VAE, school- and student-level school environment measures at baseline and outcomes at 24- and 36-month follow-up, using logistic mixed-regression models. We then assessed for interactions with the

Table 5.1 Subscale items of student-reported school environment measures

Commitment to learning subscale:
I try hard in school
Doing well in school is important to me
Continuing or completing my education is important to me
I feel like I am successful in this school
Sense of belonging subscale:
I feel very different from most other students here
I can really be myself at this school
Other students in this school take my opinions seriously
I am encouraged to express my own views in my class(es)
Most of the students in my class(es) enjoy being together
Most of the students in my class(es) are kind and helpful
Most other students accept me as I am
I feel I belong at this school
Relationships with teachers subscale:
My teachers are fair in dealing with students
There's at least one teacher or other adult in this school I can talk to if I have a problem
I feel I can go to my teacher with the things that are on my mind
In this school, teachers believe all students can learn
In this school, students' ideas are listened to and valued
In this school, teachers and students really trust one another
In this school, teachers treat students with respect
This school really cares about students as individuals
Most of my teachers really listen to what I have to say
Participation in school subscale:
There are lots of chances for students at my school to get involved in sports, clubs and other activities outside class
Teachers notice when students are doing a good job and let them know about it
At my school, students have a lot of chances to help decide and plan things like school activities, events and policies
Student activities at this school offer something for everyone
Students have a say in decisions affecting them at this school
Students at this school are encouraged to take part in activities, programs and special events
*All items come from the Beyond Blue Questionnaire (M. G. Sawyer et al., 2010)

Table 5.2 Baseline descriptive statistics	
Exposure Variables and Covariates	**Prevalence/mean (SD)**
School-level	
VAE	0.03 (1.02)
Belonging	2.97 (0.10)
Commitment	3.62 (0.05)
Relationships	3.08 (0.13)
Participation	3.29 (0.11)
School size	11.76 (3.25)
Free School Meals	0.35 (0.18)
IDACI Score	0.26 (0.20)
Student-level	
Belonging	2.97 (0.57)
Commitment	3.62 (0.43)
Relationships	3.08 (0.57)
Participation	3.29 (0.54)
Sex	
Male	50%
Female	50%
Ethnicity	
White British	42%
White Other	9%
Asian/Asian British	26%
Black/Black British	12%
Mixed ethnicity	7%
Other	4%
Family affluence	
Low	4%
Medium	33%
High	63%
Household composition	
Two-parent	79%
Single-parent	19%
Other	1%
Parental employment	
In work	74%
Not in work	9%
Do not know	17%
Housing tenure	
Rented from council/ housing association	14%
Rented from landlord	12%
Owned by family	44%
Other	2%
Do not know/not sure	28%

covariates prior to running adjusted analysis for each model. Where interactions were present ($p \leq 0.01$), we report adjusted analyses by strata. We used multiple imputation by chained equations to account for missing participant data in regression models. Complete case analysis was used to inform model building, then data was imputed by accounting for variables in final models. All associations were adjusted for clustering at the school level.

To assess whether VAE is mediated by student-level reports of school engagement (i.e. belonging, commitment, relationships and participation), we first explored associations between: 1) VAE and student-level school environment measures at 24-month follow-up using linear mixed-regression; and 2) student-level school environment measures at 24-month follow-up and sexual behavior at 36-month follow-up using logistic mixed-regression. As no associations were found between VAE and 24-month school environment variables, no further mediation analysis was done.

Results

Across control schools, 3347 students completed surveys at baseline (92.7% of students eligible). Of these, 3195 (90.4% of eligible) and 3087 (85.0% of eligible) completed surveys at 24- and 36-months respectively. At baseline, about half of students were female. Almost 60% of students reported their ethnicity as other

than White British. The majority of students reported living with two parents (79%) with at least one parent working (75%). Just under half (44%) of all students reported living in a home owned by their family.

At 24-month follow-up, 4.5% of students reported sexual debut. Female students were less likely than male students to report ever having had sex (Supplementary Table 5.5). Of all students reporting sexual debut at 24-months, 30.3% reported not using contraception at first sex. Outcomes at 24-months varied by school from 0-15.5% for sexual debut and 0-60% for no contraception at first sex. The ICCs at 24 months were 0.11 for sexual debut and 0.51 for contraception use.

At 36-month follow-up, 10.4% of students overall reported sexual debut with female students being less likely to report sexual debut than male students (Supplementary Table 5.5). Of those reporting sexual debut at 36-months, 23.9% reported not using contraception at first sex. Outcomes at 36 months varied by school from 2.9-17.1% for sexual debut and 0-42.2% for no contraception at first sex. Outcome ICCs at 36 months were 0.14 for sexual debut and 0.55 for contraception use.

VAE and sexual behavior

In unadjusted (Table 5.3) and adjusted analyses (Table 5.4), students attending schools with higher levels of baseline VAE were more likely to report sexual debut at 24-month follow-up. Sexual debut at 36 months and contraception use at both timepoint was not associated with VAE in either unadjusted or adjusted analyses.

School-level school environment and sexual behavior

School-level associations indicate whether attending a school with higher levels of aggregate engagement with the school environment (i.e. commitment, belonging, relationships and participation) at baseline is associated with students' subsequent sexual behavior. In unadjusted analyses, direct school-level measures of the school environment at baseline did not appear to be associated with sexual behavior outcomes at 24 or 36 months. However, after identifying interactions and adjusting for school- and individual-level sociodemographic factors (Table 5.4), students who attended schools with low deprivation and higher levels of aggregate commitment to learning appeared less likely to report sexual debut at 24 months.

Further, in adjusted analyses, students who attended schools with higher levels of baseline school-level commitment to learning and belonging were less likely to report sexual debut at 36 months. Additionally, male students who attended schools with higher aggregate levels of relationships with teachers appeared less likely to report sexual debut at 36 months. School-level baseline variables were not associated with contraception use at 24 or 36 months, even after adjusting for sociodemographic factors.

Table 5.3 Unadjusted associations of baseline exposures with outcomes at follow-ups								
Exposure Variable or Covariate	Unadjusted OR (CI)	P value	Unadjusted OR (CI)	P value	Unadjusted OR (CI)	P value	Unadjusted OR (CI)	P value
	Ever had sex				Did not use contraception at first sex			
	24-month follow-up (n=3337)		*36-month follow-up* (n=3337)		*24-month follow-up* (n=111)		*36-month follow-up* (n=237)	
School-level								
VAE	1.42 (1.07, 1.88)	0.01	0.94 (0.77, 1.15)	0.54	1.45 (0.77, 2.77)	0.25	0.85 (0.64, 1.13)	0.26
Commitment	1.35 (0.72, 2.54)	0.35	0.65 (0.41, 1.02)	0.06	1.54 (0.50, 4.74)	0.45	0.73 (0.34, 1.53)	0.40
Belonging	1.12 (0.82, 1.53)	0.46	0.84 (0.67, 1.05)	0.13	1.44 (0.83, 2.48)	0.20	0.77 (0.55, 1.07)	0.12
Relationships	0.99 (0.79, 1.26)	0.98	0.92 (0.78, 1.08)	0.31	1.08 (0.68, 1.72)	0.77	0.83 (0.67, 1.03)	0.10
Participation	1.08 (0.82, 1.44)	0.58	0.94 (0.76, 1.15)	0.53	1.24 (0.74, 2.09)	0.41	0.83 (0.63, 1.10)	0.19
Student-level								
Commitment	0.42 (0.29, 0.61)	0.00	0.40 (0.29, 0.55)	0.00	0.89 (0.31, 2.53)	0.83	1.01 (0.47, 2.18)	0.98
Belonging	0.90 (0.66, 1.24)	0.53	0.78 (0.61, 1.00)	0.05	0.71 (0.32, 1.54)	0.38	0.78 (0.45, 1.33)	0.35
Relationships	0.46 (0.34, 0.62)	0.00	0.60 (0.48, 0.76)	0.00	0.86 (0.41, 1.79)	0.72	0.48 (0.26, 0.90)	0.02
Participation	0.73 (0.51, 1.04)	0.08	0.85 (0.67, 1.09)	0.20	0.64 (0.28, 1.42)	0.29	0.63 (0.36, 1.13)	0.12
Adjusted for clustering.								

Student-level engagement with school environment and sexual behavior

Student-level associations indicate whether a student's own engagement with school (i.e. commitment, sense of belonging, etc.) at baseline is associated with their subsequent sexual behavior. Several student-level associations were identified at 24 and 36 months. Unadjusted and adjusted analyses showed that increased student-level commitment and relationships with teachers were significantly associated with decreased odds of sexual debut at 24-months. After testing for interactions and adjusting for school- and individual-level sociodemographic factors, analyses suggested that, among students who attended schools with low deprivation, those who reported greater participation in school appeared less likely to report sexual debut at 24 months. None of the student-level measures of school engagement were associated with contraception use at 24 months.

At 36-month follow-up, baseline students who reported higher commitment to learning, in both unadjusted and adjusted analyses, were less likely to report sexual debut. After adjusting for sociodemographic factors, students with stronger relationships with teachers were less likely to report sexual debut at 36 months, and, among those who were sexually active, students with stronger relationships were less likely to report not using contraception at 36 months. Additionally, among students who attended small schools, students with higher levels of belonging appeared less likely to report sexual debut at 36 months.

Mediation of VAE and sexual behavior by student-level engagement with school environment

We found that VAE was not associated with any of the student-level measures of engagement with the school environment at 24-months (Supplementary Table 5.6) or sexual behavior outcomes at 36-months in unadjusted or adjusted analyses, and thus mediation analysis was not possible. We did find that student-level measures of increased commitment and relationships at 24 months were significantly associated with reduced odds of sexual debut at 36 months adjusting for previous sexual behavior (Supplementary Table 5.7). Additionally, students with stronger relationships with teachers were less likely to report not using contraception at first sex at 36 months. These relationships were maintained after adjusting for school- and individual-level sociodemographic variables.

Discussion

Summary of Findings

We found no evidence that attending schools with higher levels of VAE was associated with reduced sexual risk behavior. In fact, findings appear to show that increased VAE was associated with greater sexual risk at 24 months. Based on direct measures of engaging school environments, we found some evidence that school-level commitment and belonging can

Table 5.4 Adjusted relationships between VAE and school environment at baseline and sexual behavior outcomes at 24- and 36-months						
Exposure	Variables with moderations	Overall or Stratified OR (CI)	P value	Variables with moderations	Overall or Stratified OR (CI)	P value
Ever had sex (n=3337)						
	24-month follow-up			*36-month follow-up*		
School-level						
VAE		1.45 (1.14, 1.86)	0.00		0.96 (0.81, 1.14)	0.64
Commitment	Low deprivation	0.31 (0.10, 0.97)	0.05		0.61 (0.36, 1.00)	0.05
	High deprivation	2.4 (0.93, 6.19)	0.07			
Belonging		1.20 (0.89, 1.61)	0.22		0.80 (0.65, 0.97)	0.02
Relationships		0.99 (0.78, 1.26)	0.96	Female	0.95 (0.80, 1.13)	0.56
				Male	0.76 (0.62, 0.93)	0.01
Participation		1.03 (0.78, 1.36)	0.85		0.86 (0.72, 1.03)	0.10
Student-level						
Commitment		0.47 (0.32, 0.69)	0.00	Two parents	0.34 (0.24, 0.50)	0.00
				One parents	0.56 (0.34,0.92)	0.02
Belonging	Low deprivation	0.60 (0.37, 1.00)	0.05	Small School	0.66 (0.46, 0.94)	0.02
	High deprivation	1.24 (0.81, 1.91)	0.33	Large School	0.91 (0.63, 1.30)	0.59
Relationships	Low deprivation	0.34 (0.21, 0.55)	0.00		0.62 (0.48, 0.79)	0.00
	High deprivation	0.64 (0.43, 0.96)	0.03			
Participation	Low deprivation	0.55 (0.30, 0.98)	0.04		0.83 (0.65, 1.08)	0.17
	High deprivation	0.96 (0.61, 1.50)	0.85			
Reported by stratification at $p<0.01$. Adjusted for clustering, school size, school-level deprivation and proportion of students eligible for FSM, and student-level sex, ethnicity, family structure, levels of household employment and housing tenure.						

Table 5.4, cont. Adjusted relationships between VAE and school environment at baseline and sexual behavior outcomes at 24- and 36-months						
Exposures	Variables with moderations	Overall or Stratified OR (CI)	P value	Variables with moderations	Overall or Stratified OR (CI)	P value
Did not use contraception						
	24-month follow-up (n=111)			*36-month follow-up (n=237)*		
School-level						
VAE		1.16 (0.52, 2.60)	0.71		0.74 (0.51, 1.07)	0.11
Commitment		1.41 (0.10, 20.51)	0.80	Female	3.54 (0.64, 19.50)	0.15
				Male	0.58 (0.13, 2.57)	0.47
Belonging		0.86 (0.36, 2.04)	0.73		0.69 (0.42, 1.13)	0.14
Relationships		0.86 (0.48, 1.56)	0.62		0.75 (0.53, 1.05)	0.09
Participation		1.08 (0.56, 2.08)	0.82		0.90 (0.62, 1.29)	0.56
Student-level						
Commitment		0.35 (0.05, 2.42)	0.29		1.02 (0.41, 2.51)	0.98
Belonging		0.60 (0.17, 2.11)	0.43		0.76 (0.39, 1.49)	0.42
Relationships	Family owns home	0.40 (0.09, 1.85)	0.24		0.35 (0.16, 0.78)	0.01
	Family rents home	9.31 (0.88, 98.55)	0.06			
Participation		0.66 (0.20, 2.14)	0.49		0.60 (0.28, 1.31)	0.20
Reported by stratification at $p<0.01$. Adjusted for clustering, school size, school-level deprivation and proportion of students eligible for FSM, and student-level sex, ethnicity, family structure, levels of household employment and housing tenure.						

reduce the likelihood of early sexual debut. Other school-level associations appear to be isolated to particular subgroups, such as male students and schools with low deprivation, and should be interpreted with caution given that interaction tests were underpowered. Student-level measures of engagement with the school environment were more strongly associated with reduced risk of sexual behavior. In particular, relationships with teachers appeared to be most consistently associated with sexual behavior, across school- and student-levels, timepoints and outcomes.

Limitations

While the analysis used a longitudinal design with a relatively large sample, some analyses were underpowered, such as interaction tests. Further, the sample for contraception use was very small due to the low prevalence of students reporting sexual debut, likely making associations difficult to detect. It is also possible that we did not account for all school- or individual-level confounders; however, the inclusion of our covariates was based on known influences on sexual behavior. Despite adequate retention, multiple imputation was used to account for missing outcome data. We did not adjust for multiple testing but instead were cautious in our interpretation of significance tests. Given the UK setting, our findings may not be generalizable to other settings. For example, calculation of VAE may be based on other measures of attainment and attendance in other country settings,[17] potentially producing a different relationship between VAE and risk behaviors.

Implications for research and policy

This study is the first to assess the theory of human functioning and school organization[19] for sexual behaviors, contributing to the overall assessment of the theory on student health outcomes. Our findings indicate that having higher levels of personal engagement with the school environment, as well as attending schools with higher aggregate levels of engagement, are important for subsequent sexual decision-making. These findings add to the body of research on the school effects on sexual behavior by using a longitudinal design and theoretically-aligned variables of commitment, belonging, relationships and participation in school.

While several reports have found positive or null associations between VAE and risk behaviors,[15,16,18,20–22] our finding of a possible harmful effect of VAE on sexual behavior at 24 months is consistent with a previous study from Scotland which found similar associations with substance use.[17] It has been argued that VAE relies too much on academic attainment rates which, as a result of a more narrow focus on achieving attainment rates in recent U.K. policy, may not be representative of students' engagement with the school environment or their capacity for practical reasoning and affiliation.[21] Our analysis appears to support this line

of thinking as VAE was not associated with any of our direct measures of student-level engagement in the school environment at 24 months.

Our findings that school-level commitment, belonging and relationships are associated with reduced sexual risk behavior suggests that school environment factors are important for student health above and beyond personal disposition towards school. This is consistent with previous reports of direct school-level measures of the school environment on other risk behaviors [21,22] and provides support for the theory of human functioning and school organization in that attending schools with other students who have positive associations with school may delay sexual debut. More associations were present at 36-month follow-up than at 24-months, indicating early school environment experiences are important for shaping behavior over time.

This research confirms that at the individual level, students who engage with school are less likely to report sexual risk behaviors. These findings align with the theory of human functioning and school organization in that students who are unable to meet the academic demands or feel alienated from the school community are more likely to engage in risk behaviors. Higher levels of student-level belonging and participation were associated with delayed sexual debut at 24 months only among students attending schools with low deprivation, perhaps aligning with Markham and Aveyard's assumption that students with higher socioeconomic backgrounds are more likely to be aligned with school values. Having stronger relationships with teachers, however, was associated with sexual debut at 24 months for students who attended schools with either low or high deprivation, suggesting teacher relationships potentially mitigate the effects of socioeconomic status on early initiation of sex.

Indeed, across school-level and student-level exposures, relationships appeared to be an important determinant of sexual behavior, which the theory of human functioning and school organization theorizes is critical for improving student commitment to school. Attending a school with higher levels of good teacher-student relationships appeared to be associated with lower risk of sexual debut among male students. Further, personally having good relationships with teachers appears to reduce the risk of early sexual debut and failure to use contraception when initiating sex. Qualitative research supports this finding in that adolescent mothers reported negative experiences with teachers and school staff, resulting in a disconnection from school prior to pregnancy.[32] At the school-level, students may be responding to how teachers connect with others in the classroom. The finding that school-level relationships may be associated with sexual debut only for boys might result from the higher proportion of boys having sex. However, it may also reflect gendered experiences in school; for example, students may bond with teachers differently based on teachers' characteristics or observations of how teachers interact with other students depending on their gender.

Our research indicates that engagement with the school environment is an important social determinant of young people's sexual health. New research is needed on interventions that address the school environment. Results from a recent meta-analysis indicate that programs addressing the school environment can be effective at promoting young people's sexual health.[33] Given the findings on VAE in this study and others, interventions should be careful in solely focusing on academic attainment and attendance as indicators of commitment and belonging. More research is also needed on the mechanisms by which the school environment influences sexual behaviors. These mechanisms may differ from other risk behaviors as engagement in sexual behavior becomes more biologically and developmentally appropriate with age. As this study used schools representative of south-east England, replication of this analysis in other settings would be useful for understanding the extent to which school-related factors influence sexual health, especially in low- or middle-income country settings and in schools with higher levels of deprivation in high-income countries.

Supporting Information

Table 5.5 Unadjusted associations of baseline covariates with outcomes				
Covariate	Unadjusted OR (CI)	P value	Unadjusted OR (CI)	P value
Ever had sex (n=3337)				
	24-month follow-up		*36-month follow-up*	
School-level				
School size				
Small	Reference		Reference	
Large	0.81 (0.44, 1.49)	0.50	1.33 (0.86, 2.04)	0.20
Free School Meals				
Low score	Reference		Reference	
High score	1.34 (0.73, 2.45)	0.34	0.63 (0.43, 0.94)	0.02
IDACI Score				
Low score	Reference		Reference	
High score	1.42 (0.78, 2.58)	0.25	0.80 (0.52, 1.24)	0.32
Student-level				
Sex				
Male	Reference		Reference	
Female	0.56 (0.34, 0.87)	0.01	0.66 (0.50, 0.87)	0.00
Ethnicity				
White British	Reference		Reference	
White Other	1.61 (0.77, 3.34)		0.99 (0.60, 1.64)	
Asian/Asian British	1.56 (0.84, 2.89)		0.55 (0.35, 0.84)	
Black/Black British	1.97 (0.95, 4.11)		0.91 (0.56, 1.46)	
Mixed ethnicity	2.68 (1.28, 5.61)		1.32 (0.78, 2.23)	
Other	2.07 (0.85, 5.04)	0.11	1.09 (0.57, 2.09)	0.05
Family affluence				
High	Reference		Reference	
Medium	0.84 (0.41, 2.47)		0.75 (0.56, 1.01)	
Low	1.00 (0.41, 2.47)	0.69	0.77 (0.34, 1.73)	0.17
Household composition				
Two-parent	Reference		Reference	
Single-parent	1.66 (1.08, 2.55)		1.49 (1.08, 2.05)	
Other	1.88 (0.49, 7.24)	0.06	1.55 (0.55, 4.39)	0.04
Parental employment				
At least one parent in work	Reference		Reference	
Neither parent in work	0.99 (0.51, 1.91)		0.44 (0.20, 0.97)	
Do not know	0.90 (0.56, 1.44)	0.91	0.91 (0.61, 2.35)	0.10
Housing tenure				
Privately owned	Reference		Reference	
Rented from council	1.34 (0.75, 2.40)		1.12 (0.74, 1.70)	
Rented from landlord	0.98 (0.50, 1.90)		1.09 (0.72, 1.67)	
Other	0.77 (0.12, 4.89)		1.37 (0.58, 3.21)	
Don't Know	1.11 (0.68, 1.83)	0.87	0.84 (0.58, 1.21)	0.60
Table 5.5 Unadjusted associations of baseline covariates with outcomes, cont.				

Covariate	Unadjusted OR (CI)	P value	Unadjusted OR (CI)	P value
Did not use contraception at first sex				
	24-month follow-up (n=111)		*36-month follow-up* (n=237)	
School-level				
School size				
Small	Reference		Reference	
Large	1.16 (0.37, 3.63)	0.80	0.83 (0.43, 1.60)	0.58
Free School Meals				
Low score	Reference		Reference	
High score	0.79 (0.26, 2.46)	0.69	0.76, (0.39, 1.47)	
IDACI Score				
Low score	Reference		Reference	
High score	0.87 (0.28, 2.71)	0.81	0.72 (0.38, 1.36)	0.30
Student-level				
Sex				
Male	Reference		Reference	
Female	1.33 (0.47, 3.74)	0.59	1.01 (0.53, 1.92)	0.98
Ethnicity				
White British	Reference		Reference	
White Other	1.33 (0.16, 11.26)		0.68 (0.22, 2.14)	
Asian/Asian British	1.71 (0.44, 6.68)		0.57 (0.21, 1.53)	
Black/Black British	1.41 (0.26, 7.57)		1.76 (0.62, 5.00)	
Mixed ethnicity	1.87 (0.34, 10.32)		0.84 (0.25, 2.86)	
Other	1.72 (0.22, 13.49)	0.98	0.64 (0.13, 3.15)	0.61
Family affluence				
High	Reference		Reference	
Medium	2.25 (0.80, 6.35)		0.67 (0.30, 1.52)	
Low	7.00 (0.84, 58.23)	0.10	1.52 (0.27, 8.61)	0.54
Household composition				
Two-parent	Reference		Reference	
Single-parent	2.52 (0.83, 7.70)		1.16 (0.56, 2.42)	
Other	-	0.24	2.77 (0.17, 45.54)	0.71
Parental employment				
At least one parent in work	Reference		Reference	
Neither parent in work	3.44 (0.70, 16.97)		0.52 (0.06, 4.43)	
Do not know	1.17 (0.34, 4.03)	0.31	0.66 (0.22, 1.98)	0.64
Housing tenure				
Privately owned	Reference		Reference	
Rented from council	0.93 (0.22, 3.96)		0.60 (0.21, 1.72)	
Rented from landlord	2.39 (0.51, 11.31)		0.83 (0.28, 2.51)	
Other	-		-	
Don’t Know	2.95 (0.88, 0.84)	0.30	0.98 (0.44, 2.19)	0.92

Table 5.6 Unadjusted and adjusted associations between value-added education and student-level variables at 24 months				
	(n=3337)			
	Unadjusted		*Adjusted*	
Unadjusted	Coefficient	P value	Coefficient	P value
Student-Level				
Commitment	0.01 (-0.01, 0.03)	0.23	0.01 (-0.01, 0.03)	0.53
Belonging	0.02 (-0.01, 0.05)	0.16	0.01 (-0.02, 0.04)	0.45
Relationships	0.00 (-0.05, 0.05)	0.78	0.01 (-0.04, 0.05)	0.77
Participation	0.01 (-0.03, 0.05)	0.61	0.01 (-0.03, 0.05)	0.52
Adjusted for clustering, school size, school-level deprivation and proportion of students eligible for FSM, and student-level sex, ethnicity, family structure, levels of household employment and housing tenure.				

Table 5.7 Unadjusted and adjusted associations between student-level variables at 24 months and sexual behavior outcomes at 36 months				
Exposures	*Unadjusted*		*Adjusted*	
	OR (CI)	P value	OR (CI)	P value
Ever had sex (n=3337)				
Commitment	0.55 (0.40, 0.77)	0.00	0.59 (0.42, 0.82)	0.00
Belonging	0.82 (0.62, 1.07)	0.14	0.81 (0.61, 1.07)	0.13
Relationships	0.57 (0.42, 0.77)	0.00	0.57 (0.43, 0.77)	0.00
Participation	0.81 (0.62, 1.05)	0.11	0.81 (0.61, 2.07)	0.13
Did not use contraception at first sex (n=237)				
Commitment	0.88 (0.45, 1.72)	0.70	0.69 (0.27, 1.77)	0.44
Belonging	0.76 (0.44, 1.33)	0.34	0.65 (0.29, 1.49)	0.23
Relationships	0.56 (0.31, 1.03)	0.06	0.40 (0.18, 0.89)	0.03
Participation	0.68 (0.37, 1.22)	0.19	0.53 (0.4, 1.17)	0.12
Adjusted for clustering, previous sexual behavior, school size, school-level deprivation and proportion of students eligible for FSM, and student-level sex, ethnicity, family structure, levels of household employment and housing tenure.				

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RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed <u>for each</u> research paper included within a thesis.

<u>SECTION A – Student Details</u>

Student ID Number	232033	**Title**	Ms
First Name(s)	Amy		
Surname/Family Name	Peterson		
Thesis Title	Effects of the school environment on adolescent sexual behavior: a mixed methods assessment of the theory of human functioning and school organisation		
Primary Supervisor	Chris Bonell		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

<u>SECTION B – Paper already published</u>

Where was the work published?	Perspectives on Sexual and Reproductive Health		
When was the work published?	June 2019		
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*	**No**	Was the work subject to academic peer review?	**Yes**

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SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I conceptualized the study and conducted major aspects of the research, including searching, screening, extraction, quality assessment, meta-analysis, narrative synthesis and writing. Melissa Donze (New York Department of Health and Mental Hygiene) was as second screener, data extractor and quality assessor. Chris Bonell supervised the research and contributed to eligibility decisions, quality assessment, and synthesis. Elizabeth Allen supervised the meta-analysis aspects of research.

SECTION E

Student Signature	
Date	4 August 2019

Supervisor Signature	
Date	5 August 2019

Chapter 6

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

The paper that forms this chapter is published as:

Peterson, A.J., Donze, M., Allen, E., Bonell, C. (2019). Effects of interventions addressing school environments or educational assets on adolescent sexual: systematic review and meta-analysis. *Perspectives in Sexual and Reproductive Health,* 51(2): 91-107 doi: 10.1363/psrh

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Effects of Interventions Addressing School Environments or Educational Assets on Adolescent Sexual Health: Systematic Review and Meta-analysis

By Amy J. Peterson, Melissa Donze, Elizabeth Allen and Chris Bonell

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.

METHODS: Nine databases were searched in July 2017 for randomized and quasi-experimental evaluations of interventions addressing school-level environment or student-level educational assets, to examine whether such interventions can promote young people's sexual health. Searches were limited to studies published since 1990 but were not restricted by language. Studies were assessed for risk of bias and synthesized narratively and meta-analytically.

RESULTS: Searches yielded 11 evaluations, published from 1999 to 2016, of interventions related to school-level environment or student-level educational assets. Because of inconsistent reporting, the risk of bias was not clear for most studies, and meta-analysis was possible for only one outcome. The meta-analysis of three randomized trials provided some evidence that school-environment interventions may delay sexual debut (pooled odds ratio, 0.5). Narrative synthesis of the remaining outcomes found mixed results, but suggests that interventions addressing school-level environment may delay sexual debut and that those addressing student-level educational assets may reduce risk of pregnancy and STDs.

CONCLUSIONS: Additional and more rigorous evidence is needed to assess the probability that interventions addressing school-related factors are effective and to provide better understanding of the mechanisms by which they may work to improve adolescent sexual health.

Perspectives on Sexual and Reproductive Health, 2019, 51(2): 91-107.

Introduction

Adolescent pregnancy and STDs remain public health concerns in the United States and internationally. Although rates of unintended pregnancy and unplanned birth are declining globally,[1] they vary widely by geography and are disproportionately high among young people who are disadvantaged in terms of socioeconomic status, ethnicity and educational attainment.[2–4] Moreover, young people aged 15–24 have the highest global rates of new diagnoses of curable STDs.[5] The elevated rates of these outcomes in young populations are driven by disproportionate levels of sexual risk behaviors—including early sexual initiation, having multiple sex partners and lack of contraceptive or condom use—among socially disadvantaged youth.[6–8] Government policy to address these behaviors globally has largely focused on classroom-based sex education;[9] however, the effects of such education are inconsistent and often unsustained,[10,11] suggesting that sex education is insufficient to produce long-term changes in sexual behavior,[12] perhaps because it typically fails to address such social factors as educational disengagement and underattainment.[13,14] Furthermore, curriculum-based sex education is becoming increasingly difficult to implement, given the demands on schools to meet academic targets,[15,16] and may be particularly challenging to sustain in areas with conservative sex education policies.[17] Thus, a role may exist for school-based interventions that aim to modify the school environment or promote educational attainment as "upstream" (i.e., distal) determinants of sexual health.[18]

Several theoretical models have posited that schools play an important role in youths' sexual behavior, such as the positive youth development framework[19] and the social developmental model.[20] In particular, these models suggest that educational engagement, skill development, and attachments to prosocial individuals and institutions are associated with reductions in sexual risk behaviors. However, these frameworks have not fully theorized the mechanisms by which school environments and educational assets might work to promote sexual health.[21] The theory of human functioning and school organization[22] is unique in proposing that institutional processes might facilitate student commitment to learning and to the school's community and values. These 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 behaviors over riskier ones (Appendix Figure 6.1, Supporting Information). The institutional processes theorized to build student commitment involve: ensuring that instruction, 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 those of their local communities. This theory has been empirically and

explicitly assessed via observational studies with measures of substance use and violence, but not with sexual health outcomes.[23–26]

Observational studies from high-income countries indicate that youth who report having caring relationships with adults at school,[27] feeling attachment to school,[28–31] being involved with school,[32–34] having positive attitudes toward school[35,36] and having high educational expectations and aspirations[30–32,37] also report reduced rates of sexual risk behaviors and outcomes, including early sexual initiation, unprotected sex, and pregnancy and birth. Moreover, school-level studies suggest that higher rates of school-level student bonding, positive attitudes toward school and educational expectations are associated with lower rates of early sexual debut and recent sexual activity.[29,37,38] Furthermore, other academic attainment outcomes appear to have important associations with sexual health outcomes globally. A review of longitudinal studies from high-income countries found evidence that academic ability and achievement reduce the risk of early sexual debut, pregnancy and birth, and increase the likelihood of contraceptive use.[39] In addition, observational studies from low- and middle-income countries provide strong evidence that school enrollment is associated with reduced rates of subsequent sexual debut and pregnancy.[40,41] Although such evidence points to the potential for interventions that address these factors to promote sexual health, observational studies cannot control for confounding characteristics, such as socioeconomic status and other family-related factors, and cannot tell us whether, and to what extent, school- and education-related interventions can modify students' sexual behavior and 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 improve health outcomes. For example, a review of cash transfer programs in low- and middle-income countries found that these programs consistently improved access to education in the short term, especially when the cash transfer was conditional (i.e., enrollment or attendance was required).[42] A Cochrane review of the impact on student well-being of interventions modifying the school ethos or environment reported benefits for several aspects of student health (physical activity, tobacco use, nutrition and bullying victimization), but not for sexual health.[43] The review could not assess academic-related outcomes because relevant measures were not reported. The Cochrane review, along with several other reviews, did explore the effects on sexual health of school-based interventions addressing school-level environments or student-level educational assets.[43–45] However, these reviews are now several years old and did not aim to explore intervention mechanisms.

In this article, we build on past reviews by providing an up-to-date synthesis of evidence from studies that evaluated the effects of interventions addressing school-level environments or student-level educational assets (or both) 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 that align 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 we 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

Study Design

This review followed a registered protocol (PROSPERO record number CRD42017072169) and PRISMA guidelines.[46] Studies were included if they reported evaluations of outcomes from school-based interventions that targeted adolescents (aged 10–19) and that explicitly described activities that either changed aspects of the school-level environment or aimed to improve student-level educational assets. We defined school-level environment interventions as those meant to improve school climate or culture, increase safety, change policies, improve access and connection to caring adults, or provide opportunities for student engagement in the school or community. Interventions were classified as addressing educational assets if they were designed to increase or improve student-level academic goal-setting, attendance, attainment, interest in school and school work, relationships with teachers and staff, and engagement with school.

To ensure that interventions met the aims of the review, we amended the review's protocol at the start of full-text screening to clarify that for studies to be included, school-level or student-level intervention activities could not focus solely on sexual health education or services, but needed to engage more broadly with school organization or student educational assets. Thus, studies were excluded if they reported on interventions designed specifically to improve knowledge, attitudes, skills or services related to sexual health. In addition, to be eligible for the review, studies had to employ a randomized trial or quasi-experimental design, in which control groups received usual treatment or a comparison intervention, and they must have reported at least one sexual health outcome, such as pregnancy, STDs or sexual behaviors associated with increased risk of pregnancy or STDs. There were no language restrictions in searches or screening. We limited the searches to studies published in or after 1990, to avoid spending time screening older references that were unlikely to yield pertinent studies and to ensure that the included studies would be most applicable to relevant current policy.

Data Collection

The search, conducted in July 2017, involved nine bibliographic databases: BiblioMap, CINAHL Plus, ERIC, IBSS, OpenGrey, ProQuest Dissertations & Theses, PsycINFO, Medline and Web of Science Core Collection. Our search strategy consisted of free-text and subject-heading searches (Appendix Figure 6.2, Supporting Information). The search terms linked three concepts: school and education (i.e., the population and setting); sexual behavior, pregnancy or parenthood (the outcome); and intervention studies (the study type). We also searched Google using these concepts, checked references of included studies, and contacted subject matter experts using a standard form. Citations were managed using EPPI-Reviewer 4.[47]

For each identified reference, we screened the title, abstract and, when necessary, the full report. Two of the authors double-screened 50 titles and abstracts and 15 full reports to pilot-test the eligibility tool and ensure that agreement between screeners was more than 90%; the remaining references were divided among the two screeners 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 references identified via web searches were imported into EPPI-Reviewer 4. A final check of all included studies was made by two of the authors.

Using an extraction tool, two of the authors extracted data from each article or report on the study location, intervention, study design, sample size at baseline, attrition by follow-up, participant characteristics, sampling methods and all sexual health outcomes reported. We pilot-tested the extraction tool and codes by inputting data from four studies and then comparing inputs; when discrepancies occurred, the guidelines for the codes were discussed and modified. A standard contact form was used to request information from primary authors when detail was insufficient. If relevant, multiple reports of the same study were extracted separately and 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 tool,[48] and for quasi-experimental studies using the adapted EPPI-Centre tool.[49] Bias domains assessed were random generation of allocation sequence; allocation concealment; blinding of participants, personnel and outcome assessors; completeness of outcome data; selective outcome reporting; accounting for clustering; and other sources of bias. Two of the authors independently assessed studies and assigned ratings (low, high or unclear risk, or not applicable) to domains within each study. Scores were then reconciled in EPPI-Reviewer 4 by one author and checked by another author.

Analysis

Randomized trials and quasi-experimental studies were synthesized narratively and, when appropriate, meta-analytically. Narrative summaries are reported by intervention type (i.e., school-level environment vs. student-level educational assets) and then by outcome and follow-up time. Effect sizes were imported into a Microsoft Excel spreadsheet and converted to uniform effect sizes (e.g., odds ratios) where required. Meta-analysis was conducted via EPPI-Reviewer 4's meta-analysis function, using fixed-effects analysis. The meta-analysis was done by intervention type and outcome, and prioritized the most long-term follow-up reported. Heterogeneity is reported using I^2 estimates. When insufficient data or heterogeneity precluded meta-analysis, narrative summaries of effects are reported.

Results

Overview of Included Studies

The search yielded 28,810 unique references, of which 28,485 were excluded on the basis of title and abstract (Appendix Figure 6.3, Supporting Information). We were able to obtain full reports for all but five of the remaining 325 references, and found that 11 outcome evaluations presented in 17 study reports published between 1999 and 2016 met the eligibility criteria (Table 6.1).[50–65] Five of the 11 studies were from high-income countries (Australia and United States), four from middle-income countries (South Africa and Kenya) and two from low-income countries (Malawi and Zimbabwe). Five studies met the inclusion criteria for school-level environment interventions,[52,55,58–63,65] and six for student-level educational asset interventions.[50,51,53,54,56,57,64,66]

Nine studies used a randomized design with allocation at the level of school,[52,54,55,57,62–65] region[50,51,53,56] or individual,[64] while two used a quasi-experimental design that matched intervention and comparison schools nonrandomly.[58–61,66] Insufficient detail prevented complete assessment for most domains of bias risk; as a result, we rated the risk of bias as "not clear" for at least one domain in each study (Table 6.2). Only two randomized trials reported information on the majority of relevant domains,[50,51,62] and none reported on all. The only domain for which most studies reported sufficient information was clustering: All but two cluster-allocated studies properly accounted for clustering.[50–52,54,55,57,59,62,63,65] The authors of one quasi-experimental study confirmed that they did not adjust for school-level clustering because the study included only two schools.[66] For one randomized trial,[53,56] it was not clear from the study reports whether effects were adjusted for household-level clustering, and the authors did not respond to inquiries.

School-Level Environment Interventions

Of the five school-level environment interventions, three employed teams of school staff and students to improve school policies or practices addressing school climate[52,55,63,65] or to improve safety and prevent sexual violence.[62] Two interventions provided teachers with knowledge and skills related to classroom management and interactive teaching[58–61] or to strategies to support actions recommended by school teams.[63] All interventions addressing school-level environment included other components, such as social development or sexual health education curricula.

Only one meta-analysis was possible for outcomes of school-environment studies. Three randomized trials[52,62,63] reported intervention effects on sexual debut (i.e., whether students had ever had sex) and were included in the meta-analysis. The first trial, the Gatehouse Project,[63] involved 25 secondary schools in Australia and reported sexual debut outcomes (i.e., whether students had ever had sexual intercourse) among cross-sectional samples of eighth-grade students at two and four years after baseline. Positive Action,[52,65] the second trial, assessed sexual debut (i.e., lifetime voluntary sexual activity with the opposite gender) at four years postbaseline among a sample of U.S. youth from 20 schools who had been fifth graders at baseline. The third trial, PREPARE,[62] was the only school-level environment intervention evaluated in a low- or middle-income country (South Africa). Sexual debut outcomes (i.e., whether youth had ever had vaginal or anal sex) were reported at six and 12 months after baseline among students (average age, 13 years at baseline) from 42 schools. A pooled analysis that included effect sizes for the three trials at the most long-term follow-up found that students in the intervention arms were less likely than those in the control arms to report sexual debut (odds ratio, 0.5; 95% confidence interval, 0.4–0.7). There was, however, substantial between-study statistical heterogeneity (I^2=76%). The three studies were heterogeneous by location, follow-up times and participant age at intervention. The pooled estimate remained statistically significant in sensitivity analyses that focused on the first follow-up (0.6 [0.4–0.9]) or that was restricted to interventions from high-income countries (0.5 [0.4–0.6]).

Two sexual debut outcomes were not included in the meta-analysis. In addition to assessing initiation of vaginal or anal intercourse (the measure considered above), PREPARE examined a broader definition of sexual debut that included oral sex as well as vaginal and anal sex, and found no benefits from the intervention at either time point.[62] The sexual debut outcome (i.e., lifetime sexual activity) from the Seattle Social Development Project[58] (SSDP) was not included in the pooled analysis because the U.S. study used a quasi-experimental design. SSDP was a three-armed trial in which students from 17 schools received either the

"full" intervention (from first to sixth grade) or a "late" intervention (only in fifth and sixth grades), or attended control schools. At six years postintervention, the proportion of students who reported having ever had sex was 11 percentage points lower in the full intervention group than in the control group. Outcomes did not differ between students receiving the late intervention and those in the control arm.

We could not perform meta-analyses for the remaining outcomes in studies of school-level environment interventions because the number of studies or information on effect sizes was insufficient. Instead, we summarize the findings narratively. The studies examined four sexual behavior outcomes: whether respondents had had sex recently; the frequency of sex; whether sex had been protected (condoms or contraceptives had been used); and number of sexual partners. The Aban Aya Project,[55] which was the only study to measure recent engagement in sexual intercourse (though "recent" was undefined), was a three-armed randomized trial conducted in the United States; it compared a school and community intervention, a social development curriculum and a standard health curriculum control group. The researchers reported that three years after baseline, male students in the school and community arm were less likely than their counterparts in the control group to have had recent sexual intercourse (coefficient from generalized estimating equation, 0.7); no effects were evident, however, among female students. PREPARE was the only study to measure frequency of vaginal or anal sex, and it found no effects six or 12 months after baseline.[62]

Two randomized trials[55,62] and one quasi-experimental study[60,61] reported mixed results regarding protected sexual intercourse. Three years after baseline, male students in the Aban Aya school/community arm reported proportionately more condom use "all the time" than did controls (coefficient from generalized estimating equation, 0.7), but no effects were found among female students.[55] Youth who had received the full intervention in the quasi-experimental SSDP study were more likely than comparison students to report at the nine-year follow-up that they had used condoms at last intercourse (odds ratio, 1.9).[60,61] The study reports did not indicate whether this association was related to increases in overall sexual activity. No associations were found for condom use at first sex (SSDP), condom or contraceptive use at last sex (PREPARE) or frequency of condom use (PREPARE and SSDP).[60–62]

One randomized trial[62] and one quasi-experimental study[58,61] reported findings for measures of number of sexual partners. In the PREPARE trial, the intervention and comparison groups did not differ in this outcome six or 12 months after baseline.[62] In the SSDP study, six years after the intervention, the proportion of students who reported having had more than one sexual partner by age 18 was 12 percentage points lower in the full intervention schools than in

control schools; the late-intervention group did not differ from the control group.[58] At the nine-year follow-up, the effects of the intervention were no longer evident among the full-intervention students in analyses that measured number of partners as a continuous variable.[61]

The SSDP study was the only evaluation of a school-level environment intervention to report outcomes related to pregnancies, births or STDs.[58–61] At six years postintervention, no differences were evident in the pregnancy or birth rate between the full- or late-intervention and control groups.[58] Nine years after the intervention, females in the full intervention group were less likely than those in the control group to report having ever been pregnant (odds ratio, 0.5) or having had a birth (0.4); no differences were observed among male participants in causing a pregnancy or fathering a child.[60,61] At the same time point, the full-intervention and control groups did not differ in their lifetime rates of STDs; at 18 years postintervention, the full-intervention participants were less likely than participants in the control group to report having had an STD in the last three years (0.3), but the late-intervention and control groups did not differ.[59]

Three studies of school-level environment interventions reported academic or school-related outcomes (not shown). In the Gatehouse Project, students in the intervention group were less likely than those in the control group to have low school attachment, but the difference was statistically significant only in the last of the three cross-sectional samples.[67] Higher rates of good academic behavior (e.g., working hard, setting goals, solving problems) were reported by students and their teachers in the intervention arm of the Positive Action study than by those in the control arm.[65] Additional analysis revealed that such academic behavior partially mediated the intervention's effect on sexual debut. The SSDP study measured a number of academic variables when students were aged 18 (six years postintervention) and found mixed results.[58] Students who received the full intervention reported stronger commitment and attachment to school, and greater academic achievement, than did youth in the control group; their grade point average was higher as well, though the difference fell slightly short of statistical significance. Youth in the intervention and control groups did not differ in their likelihood of dropping out of school or in their standardized test scores, and no differences in any outcome were evident between the late-intervention and control groups.

Table 6.1 Selected characteristics of studies included in the systematic analysis of the effects of interventions addressing school environments or educational assets on adolescent sexual health

Intervention	Intervention description	Study design and sample	Participant characteristics	Outcomes
School environment studies				
Aban Aya Youth Project, United States [55]	Based on theory of triadic influence, Aban Aya consisted of a social development curriculum and a school/community intervention that aimed to reduce high-risk behaviors by targeting risk and protective factors, enhancing sense of self and cognitive-behavioral skills, and strengthening family and community ties. The intervention was intended to affect all social domains that influence children (family, school, community) by providing parental support, increasing youth-support programs in school, and forging links among parents, schools and local businesses through a school task force.	•Randomized controlled trial •Unit of randomization: School •Baseline sample: Intervention group had 366 students at 4 schools; comparison group had 372 students at 4 schools •Follow-up: 3 years postbaseline •Attrition: 20% turnover each year; 51% of original sample completed final follow-up	•Mean age: 11 (5th grade) •Gender: 51% female, 49% male •Race/ethnicity: School populations were 91% African American •Socioeconomic status: 77% of students received federally subsidized school meals	3 years postbaseline •*Recent sexual intercourse* Males: Effect size from GEE, 0.65 (p=.02)* Females: not reported •*Used a condom "all the time"* Males: Effect size from GEE, 0.66 (p=.05)† Females: not reported
Gatehouse Project, Australia[63]	Gatehouse's goal was to reduce risk behaviors and improve emotional well-being by promoting social inclusion and commitment to education. The intervention had four components: a student survey about security, school life and communication with teachers; a school action team focused on school policies and teacher practices; consultation and training on intervention strategies; and a 10-week social-emotional curriculum. Strategies varied among schools but always addressed school policy,	•Randomized controlled trial •Unit of randomization: School •Baseline sample: Intervention group had 966–1,343 students (number varied by year) at 11 schools; comparison group had 1,342–1,497 students at 14 schools •Follow-up: 2 and 4 years postbaseline •Response rates: 66–75%	•Age: 13–14 (8th grade) •Gender: 52–55% female •Race/ethnicity: Not stated •Socioeconomic status: Not stated	2 years postbaseline •*Ever had sex:* Odds ratio, 0.8 (0.6–1.2) 4 years postbaseline • *Ever had sex:* Odds ratio, 0.6 (0.4–0.8)***

Table 6.1 Selected characteristics of studies, cont.				
Intervention	Intervention description	Study design and sample	Participant characteristics	Outcomes
Gatehouse Project, cont.	included the curriculum and promoted inclusive relationships within the classroom. Intervention and comparison group each consisted of three cross-sectional samples, two years apart, all of which were followed for four years.			
Positive Action, United States[52,65]	Based on the theory of self-concept, Positive Action was a multicomponent, school-based program designed to improve student behaviors by strengthening school climate, relationships and engagement in learning. The program included a classroom curriculum as well as family and community involvement components; principals received a kit providing directions for a schoolwide climate program to promote the core elements of the curriculum and to encourage and reinforce positive actions throughout the school.	•Randomized controlled trial •Unit of randomization: School •Follow-up sample: Intervention group had 976 students at 10 schools; comparison group had 738 students at 10 schools •Follow-up: 5 years postbaseline •Attrition: Baseline sample size and attrition not reported	•Age: 10–11 (5th grade) •Gender: 50% female, 50% male •Race/ethnicity: 26% Hawaiian, 23% multiethnic, 9% white, 5% other Pacific Islander, 5% Japanese, 21% other Asian, 2% Native American, 2% black, 8% other, 2% unknown •Socioeconomic status: Not stated	5 years postbaseline • *Lifetime sexual activity with opposite gender:* Odds ratio, 0.2 (0.1–0.7)*
PREPARE, South Africa[62]	PREPARE was a multicomponent intervention hypothesized to synergistically reduce sexual risk behaviors and intimate partner violence by providing social support and by changing norms. The intervention comprised a 21-session educational program, school health services delivered by a nurse and a school safety program. The latter had two components: Teams consisting of principals, teachers, school safety	•Randomized controlled trial •Unit of randomization: School •Baseline sample: Intervention group had 1,748 students at 20 schools; comparison group had 1,703 students at 22 schools •Follow-up: 6 and 12 months postbaseline •Attrition: 6% at 6 months and 12% at 12 months	•Mean age: 13.7 •Gender: 58–62% female •Race/ethnicity: Not stated •Socioeconomic status: Mean score of 6.0 (standard deviation, 1.7) in both groups on an undefined socioeconomic index	6 months postbaseline •*Ever had vaginal or anal sex:* Odds ratio, 1.0 (0.8–1.5) •*Ever had vaginal, anal or oral sex* Odds ratio, 1.2 (1.0–1.5) •*Vaginal sex frequency in last 6 months:* beta=0.12 (−0.03 to 0.3) •*Anal sex frequency in last 6 months:* beta= 0.02 (−0.1 to 0.1) •*Condom use at last sex:* Odds ratio, 0.7 (0.4–1.4)

Table 6.1 Selected characteristics of studies, cont.				
Intervention	Intervention description	Study design and sample	Participant characteristics	Outcomes
PREPARE, cont.	officers, parents and police officers attended a two-day training session on laws regarding sexual violence and on action plans for a school safety audit; and 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.			•*Condom use frequency in last 6 months:* beta=0.1 (−0.2 to 0.4) •*Contraceptive use (excluding condoms) at last sex:* Odds ratio, 1.2 (0.7–2.3) •*Number of lifetime partners:* beta=0.4 (−0.4 to 1.0) 12 months postbaseline •*Ever had vaginal or anal sex:* Odds ratio, 1.1 (0.8–1.4) •*Ever had vaginal, anal or oral sex):* Odds ratio, 1.1 (0.8–1.4) •*Vaginal sex frequency in last 6 months:* beta=0.08 (−0.1 to 0.3) •*Anal sex frequency in last 6 months:* beta= 0.1 (−0.02 to 0.3) •*Condom use at last sex:* Odds ratio, 0.6 (0.3–1.3) •*Condom use frequency:* beta=−0.1 (−0.4 to 0.3) •*Contraceptive use (excluding condoms) at last sex:* Odds ratio, 1.2 (0.7–2.1) •*Number of lifetime partners:* beta= −0.03 (−0.7 to 0.6)

Table 6.1 Selected characteristics of studies, cont.				
Intervention	Intervention description	Study design and sample	Participant characteristics	Outcomes
Seattle Social Development Project (SSDP), United States[58–61]	Based on the social development model, SSDP was theorized to reduce risk behaviors by increasing student bonding to school via teacher training, parent education and social competence training. Teachers received in-service training on three instructional methods: proactive classroom engagement, interactive teaching and cooperative learning. First-grade teachers delivered a cognitive and social skills training curriculum. Students assigned to the "full" intervention group attended intervention schools for grades 1–6; those in the "late" intervention group attended such schools in grades 5–6.	•Quasi-experimental study •Unit of study: school •Baseline sample: Intervention group had 156 students (full) and 267 students (late) at 12 schools; comparison group had 220 students at 5 schools •Follow-up: 6, 9 and 18 years postintervention •Attrition: 7% at 6 years, 7% at 9 years and 6% at 18 years	•Mean age: 11 (5th grade) at baseline survey •Gender: 46–51% female in the three groups •Race/ethnicity: 47% white, 26% black, 21% Asian, 7% other •Socioeconomic status: 56–59% of students in the three groups were enrolled in National School Lunch/School Breakfast Program	6 years postintervention Mean difference between intervention groups and control group: •*Lifetime sexual intercourse:* Full intervention: −10.9 (−19.2 to −1.4)* Late intervention: −6.9 (−14.0, 1.0) •*Lifetime multiple partners:* Full: −11.8 (−21.7 to −0.7)* Late: −2.4 (−11.1 to 7.2) •*Ever pregnant:* Full: −9.3 (−17.3 to 0.0) Late: 1.0 (−7.8 to 8.9) •*Ever gave birth:* Full: −7.3 (−15.4 to 2.0) Late: 1.9 (−6.8 to 9.1) 9 years postintervention Comparison between full intervention group and control group: •*Ever had sex:* Not reported •*Age at sexual debut:* Mean difference: −0.6 (–1.1 to −0.1)† •*Condom use frequency in past year* Mean difference: −0.2 (−0.6 to 0.2)• *Condom use at last sex:* Odds ratio, 1.9 (1.1–3.2)* •*Condom use at first sex:* Odds ratio, 1.4 (0.9–2.3) •*Number of partners:* Mean difference: 0.6 (0.1–1.0)* •*Ever pregnant/caused a pregnancy:* Female: Odds ratio, 0.5 (0.3–0.9)* Male: Odds ratio, 1.0 (0.5–1.8)

Table 6.1 Selected characteristics of studies, cont.				
Intervention	Intervention description	Study design and sample	Participant characteristics	Outcomes
Seattle Social Development Project, cont.				•*Ever had birth/fathered a child:* Female: Odds ratio, 0.4 (0.2–0.8)* Male: Odds ratio, 1.2 (0.6–2.5) •*Ever had STD:* Odds ratio, 0.7 (0.4–1.3) 18 years postintervention Comparison between intervention groups and control group •*Age at sexual debut:* Not reported •*Ever had STD:* Full: Odds ratio, 0.3 (p=0.005)** Late: Odds ratio, 0.8 (p=0.3)
Educational assets studies				
Kenya Education Subsidy Program, Kenya[54]	The Kenya Education Subsidy intervention aimed to reduce adolescents' dropout, pregnancy and marriage rates by subsidizing the cost of education for upper primary school students, thereby reducing economic risk factors. A free school uniform was distributed to each student at the beginning of grade 6, and a second uniform was delivered a year later if the student was still enrolled in the same school. The subsidy, delivered over two years, totaled ~$US12 per student.	•Randomized controlled trial •Unit of randomization: School •Baseline sample: Intervention and comparison groups had a total of 19,289 students; each group had 82 schools •Follow-up: 3, 5 and 7 years postintervention •Attrition: 4% (both sexes) at 3 years; 15% of females and 9% of males at 5 years; and 40% of females and 33% of males at 7 years	•Mean age: 13 •Gender: 49% female, 51% male •Race/ethnicity: Not stated •Socioeconomic status: Not stated	Outcomes reported by participants, teachers and peers 3 years postintervention •*Ever pregnant/caused a pregnancy:* Females: Difference, −0.03 (SE=0.01)* Males: Difference, −0.002 (SE=0.003) 5 years postintervention •*Ever pregnant/caused a pregnancy:* Females: Difference, −0.04 (SE=0.02)** Males: Difference, 0.005 (SE=0.005) 7 years postintervention •*Condom use at last sex:* Females: Difference, 0.017 (SE=0.021)

Table 6.1 Selected characteristics of studies, cont.				
Intervention	Intervention description	Study design and sample	Participant characteristics	Outcomes
Kenya Education Subsidy Program, cont.				•*Age of oldest partner ever:* Females: Difference, −0.269 (SE=0.226) •*Ever pregnant/caused a pregnancy:* Females: Difference, −0.03 (SE=0.02) Males: Difference, −0.002 (SE=0.02) Biomarkers 7 years postintervention •*Tested positive for HIV:* Females: Difference, 0.004 (SE=0.01) Males: Difference, 0.001 (SE=0.002) •*Tested positive for HSV-2:* Females: Difference, 0.01 (SE=0.01) Males: Difference, 0.01 (SE=0.01)
Kenya School Support Program, Kenya[53,56]	Based on the social development model, the Kenya School Support Program provided orphaned adolescents with financial support and counseling to increase attachment to school and reduce the risk of dropout, and thereby reduce levels of HIV risk factors. Intervention participants received school uniforms, school fees, sanitary pads and underpants, as well as monitoring and assistance from a community visitor. All households in the intervention and comparison groups received twice-monthly food supplements and mosquito nets and blankets.	•Randomized controlled trial •Unit of randomization: Households in close proximity •Baseline sample: intervention group had 53; comparison group had 52 •Follow-up: 12 and 24 months postbaseline •Attrition: 2% in both groups at 12 months, and 2% in intervention group and 6% in comparison group at 24 months	•Age: 12–14 (mean, 12.9) •Gender: 59% female, 41% male •Race/ethnicity: 100% Luo •Socioeconomic status: Not stated	12 months postbaseline *Ever had sex:* GEE, −1.5 (p=0.1) 24 months postbaseline *Ever had sex:* GEE, −0.1 (p=0.7)

Table 6.1 Selected characteristics of studies, cont.				
Intervention	Intervention description	Study design and sample	Participant characteristics	Outcomes
Promise Place Program, United States[66]	Promise Place was a school-based case management intervention to prevent repeat teenage pregnancy. Family Advocates met with intervention participants to identify and help set family, personal and graduation goals, and to help prioritize needs and identify resources. Advocates spent at least two hours/month with students including counseling and (for those on maternity leave or with failing attendance) home visits. When a student graduated, dropped out or returned to their school, they were considered to be in aftercare, which helped students obtain community resources and care.	•Quasi-experimental study •Unit of study: School •Baseline sample: Intervention group consisted of 64 pregnant and 76 parenting students at 1 school; comparison group consisted of 47 pregnant and 16 parenting students at 1 school •Follow-up: 24 months postbaseline •Attrition: 44% in intervention group and 46% in control group	•Age: 13 or older; >70% in each group were aged 16–18 •Gender: 100% female •Race/ethnicity: 46% Hispanic, 34% black, 8% white, 12% other in intervention group; 70% Hispanic, 13% black, 8% white, 10% other in comparison group •Socioeconomic status: 64–65% of students enrolled in Medicaid	24 months postbaseline •*Proportion not pregnant, among those pregnant at baseline:* Control: 0.66 (0.41–0.82) Intervention: 0.90 (0.72–0.97) Risk difference: p=0.002** •*Proportion not pregnant, among those parenting at baseline:* Control: 1.00 (CI not reported) Intervention: 0.93 (0.79–0.98) Risk difference: p=0.92
South Africa Cash Transfer Program, South Africa[64]	This conditional cash transfer program was designed to reduce HIV incidence among young women by increasing school enrollment. Each month, intervention participants received 100 Rands (R), and their parent/guardian received R200, if the student attended school on at least 80% of school days in that month, for up to three years. The funds were deposited directly into separate bank accounts for the young woman and for the parent/guardian.	•Randomized controlled trial •Unit of randomization: Individual •Baseline sample: Intervention group had 1,225 youth; comparison group had 1,223 youth •Follow-up: 12 months (survey) and 36 months (STD testing) postbaseline •Attrition at final follow-up: 5% in intervention group and 13% in comparison group	•Age: grades 8–11 (range, 20–28% per grade) •Gender: 100% female •Race/ethnicity: Not stated •Socioeconomic status: 33–35% of students had food insecurity	12 months postbaseline •*Pregnancy in past 12 months:* Relative risk, 0.9 (0.8–1.2) •*Sexual debut:* Hazard ratio per person-year, 0.9 (0.8–1.1) •*Unprotected sex in past three months:* Relative risk, 0.8 (0.7– 1.0)† •*Had multiple partners in past 12 months:* Relative risk, 0.9 (0.7– 1.1) •*Partner aged ≥25:* Relative risk, 0.9 (0.6–1.1) •*Partner age difference ≥5 years:* Relative risk, 0.9 (0.72–1.1)

Table 6.1 Selected characteristics of studies, cont.				
Intervention	Intervention description	Study design and sample	Participant characteristics	Outcomes
South Africa Cash Transfer Program, cont.				36 months postbaseline •*Tested positive for HIV:* Hazard ratio, 1.2 (0.9–1.7) •*Tested positive for HSV-2:* Hazard ratio, 0.9 (0.7–1.2)
Zimbabwe School Support Program, Zimbabwe[57]	Based on the social development model, this intervention provided support to keep orphan girls in school to reduce their HIV risk. Mechanisms of support included payment of school fees and provision of exercise books, uniforms and other supplies (e.g., soap, sanitary napkins); helpers (female teachers) were trained to monitor participants' attendance and to assist with absenteeism problems, but were not to provide special HIV or life-skills training. When girls started high school, new helpers were selected and trained for those schools.	•Randomized controlled trial •Unit of randomization: School •Baseline sample: Intervention group had 184 students at 13 schools; comparison group had 145 students at 12 schools •Follow-up: 12 and 24 months postbaseline •Attrition: 3% in intervention group and 4% in comparison group at 12 months, and 7% in intervention group and 18% in comparison group at 24 months	•Mean age: 12 •Gender: 100% female •Race/ethnicity: Not stated •Socioeconomic status: Mean no. of assets in home was 3.2–3.3 in each group (scale, 0–12)	12 months postbaseline •*Ever had sexual intercourse:* Not reported 24 months postbaseline •*Ever had sexual intercourse:* GEE, −0.3 •*Pregnancy status (as reported by teachers/peers):* Not reported
Zomba Cash Transfer Program, Malawi[50,51]	Theorized to reduce levels of economic risk factors for HIV and increase school enrollment, this program provided monthly cash transfers to participants and their guardians to reduce risk of STIs. Cash transfers were provided either unconditionally or on the condition that the participant had attended school at least 75-80% of the time during the previous month. Cash was split between guardian and participant; the	•Randomized controlled trial •Unit of randomization: Enumeration area •Baseline sample: Intervention group had 727 participants from 88 enumeration areas; comparison group had 1,050 participants from 88 enumeration areas •Follow-up: 12 months (survey) and 18 months (STI	•Age: 12–22 (mean, 15.6) •Gender: 100% female •Race/ethnicity: Not stated •Socioeconomic status: Not stated	12 months postbaseline •*Sexual debut:* Among schoolgirls at baseline: Odds ratio, 0.7 (0.4–1.1) Among dropouts at baseline: Odds ratio, 0.7 (0.3–1.5) •*Condom use with at least one partner:* Among schoolgirls at baseline: Odds ratio, 1.1 (0.7–1.8) Among dropouts at baseline: Odds ratio, 0.7 (0.4–1.2) •*Had sex once per week:* Among schoolgirls at baseline: Odds ratio, 0.5 (0.3–0.8)***

Table 6.1 Selected characteristics of studies, cont.				
Intervention	Intervention description	Study design and sample	Participant characteristics	Outcomes
Zomba Cash Transfer Program, cont.	amount varied randomly by enumeration area and by individual. School fees were paid directly to the school for recipients eligible to attend secondary school. The program targeted two groups of young women: those enrolled in school at baseline (baseline schoolgirls) and those who were out of school at baseline (baseline dropouts).	testing) postbaseline •Attrition: At 12 months, 7–10% in the intervention group (depending on baseline school attendance status), but not reported for the comparison group; at 24 months, 4% overall		Among dropouts at baseline: Odds ratio, 0.5 (0.3–0.9)*** •*Had partner older than 25:* Among schoolgirls at baseline: Odds ratio, 0.2 (0.1–0.6)*** Among dropouts at baseline: Odds ratio, 0.8 (0.4–1.5) •*Currently pregnant:* Among schoolgirls at baseline: Odds ratio, 0.7 (0.4–1.4) Among dropouts at baseline: Odds ratio, 0.6 (0.3–1.1) 18 months postbaseline •*Tested positive for HIV:* Among schoolgirls at baseline: Odds ratio, 0.4 (0.1–0.9)* Among dropouts at baseline: Odds ratio, 1.4 (0.7–2.6) •*Tested positive for HSV-2:* Among schoolgirls at baseline: Odds ratio, 0.2 (0.1–0.7)*** Among dropouts at baseline: Odds ratio, 1.0 (0.5–2.2) •*Tested positive for syphilis:* Among schoolgirls at baseline: Odds ratio, 0.9 (0.1–6.9) Among dropouts at baseline: Odds ratio, 1.6 (0.3–10.0)
Notes: Unless otherwise noted, all effect sizes represent outcomes in the intervention group relative to the comparison group, "sex" refers to vaginal intercourse, and outcomes were self-reported. Percentages may not total 100% because of rounding. GEE=generalized estimating equation. ns=not significant. SE=standard error. CI=confidence interval. †p<.10, *p<.05, **p<.01, ***p<.001				

Student-Level Educational Assets Interventions

Six of the 11 interventions were related to student-level educational assets. Two of these were cash transfer programs in which female students and their families received a monthly allowance either unconditionally[50] or on the condition that they had attended school on at least 75–80% of school days in the previous month;[50,51,64] the investigators hypothesized that these programs would reduce economic risk, and thus improve school attendance and sexual health outcomes. Four interventions subsidized expenses by paying school fees[50,51,53,56,57] or by providing uniforms[53,54,56,57] or additional supplies (e.g., pens, sanitary napkins).[53,56,57] Three interventions provided support or case-management services to students, including access to adults who assisted students with absenteeism problems[53,56,57,66] and support in setting academic and career goals.[66]

We could not conduct a meta-analysis of outcomes from interventions targeting student educational assets because of missing information and variability in reporting overall effect sizes; the results of these studies are thus synthesized narratively. All of the studies reported at least one sexual behavior outcome, such as sexual debut and engagement in protected sexual intercourse. Five randomized trials reported outcomes related to sexual debut during the intervention period,[50,51,53,56,57] immediately after the intervention[53,56,57,64] or at long-term follow-up.[54] None of the studies found differences in these outcomes between the intervention and control groups.

Three trials reported on measures of protected and unprotected sex.[50,54,64] Only one, a cash transfer program based in South Africa, reported a small intervention effect: At 12 months after baseline, youth in the intervention group were less likely than those in the control group to report having had unprotected sex in the past three months (relative risk, 0.8).[64] The three trials also examined partner-related variables, and two found a significant intervention effect. Among a subgroup of Malawian females who had been attending school at baseline, those in the cash transfer group were less likely than those in the control group to report having a sexual partner older than 25 (odds ratio, 0.2).[50] However, no difference was observed among females who were out of school at baseline. The cash transfer program in South Africa found that at follow-up, recipients were less likely than participants in the control group to have had any sex partner in the past 12 months, though no differences were apparent in measures of partner age or partner age difference.[64] The third study, the Kenya Education Subsidy Program—a large randomized trial examining the effects of educational subsidies—found that at seven years postintervention the age of participants' oldest partner did not differ between the intervention and comparison groups.[54]

Sexual health outcomes—pregnancy, parenthood and STDs—were reported in four randomized trials[50,51,54,57,64] and one quasi-experimental study.[66] The two cash transfer programs reported no intervention effects on current pregnancy at 12 months postbaseline in Malawi[50,51] or on any pregnancy during the study period in South Africa.[64] The Kenya subsidy program resulted in fewer lifetime pregnancies three years (mean difference, –0.03) and five years after the intervention (mean difference, –0.04) among intervention participants compared to the control group, though no difference was apparent at seven years;[54] among males, no differences in having caused a lifetime pregnancy were evident between groups at any time point. Only two pregnancies (both within the control group) occurred during the two-year randomized trial of the Zimbabwe School Support Program, so an effect size was not reported.[57] In the only quasi-experimental educational assets study—the Promise Place Program, conducted in the United States—young women who had been pregnant at baseline were less likely to report having had a repeat pregnancy at the 24-month follow-up if they had been in the intervention group (34%) rather than in the control group (10%), but no difference was found among young women who were already parents at baseline.[66] These findings should be interpreted cautiously, however, as the study included only one treatment school and one comparison school, and the proportion of participants who were pregnant and parenting differed across treatment arms.

The two cash transfer trials and the Kenyan educational subsidy trial reported prevalence of STDs—HIV, herpes simplex virus 2 (HSV-2) and syphilis—measured via biomarkers among either a random subsample[50,64] or all participants.[54] In the Malawi cash-transfer trial, among young women who had been enrolled in school at baseline, those in the intervention group were less likely than their counterparts in the control group to test positive for HIV (odds ratio, 0.4) or HSV-2 (0.2) 18 months after baseline.[50] No effects on HIV or HSV-2 were found among participants who had dropped out of school at baseline, or on syphilis among participants in either subgroup. The South African cash transfer program tested for HIV and HSV-2 at baseline and at 12, 24 and 36 months (or until graduation, if it occurred before the end of the trial); no effects were apparent for either STD.[64] The Kenyan subsidy trial collected biomarker data from participants seven years after the intervention; again, no differences were found between intervention and control groups for HIV or HSV-2 among either female or male participants.[54]

All six studies that examined student-level educational assets reported on academic outcomes or school-related measures (not shown). In three randomized trials, students in the intervention group were more likely to be still enrolled in school at follow-up,[50] less likely to drop out of school[53,56] or more likely to reach the eighth grade[54] than were youth in control

Table 6.2 Risk of bias in included studies							
Intervention	Random generation of allocation sequence	Allocation concealment	Blinding	Complete outcome data	Selective outcome reporting	Accounted for clustering	Other sources of bias
Aban Aya Youth Project[55]	Unclear	Unclear	Unclear	Unclear	Unclear	Low	High
Gatehouse Project[63]	Unclear	Unclear	Unclear	Unclear	Unclear	Low	Low
Kenya Education Subsidy Program[54]	Low	Unclear	Unclear	High	Unclear	Low	High
Kenya School Support Program[53,56]	Low	Unclear	Unclear	Low	Unclear	Unclear	High
Positive Action[52,65]	Unclear	Unclear	Unclear	Unclear	Unclear	Low	Low
PREPARE[62]	Low	Low	High	Unclear	Unclear	Low	High
Promise Place Program[66]	na	na	Unclear	High	Unclear	High	High
Seattle Social Development Project[58–61]	na	na	Unclear	Unclear	Unclear	Low	Low
South Africa Cash Transfer Program[64]	Unclear	Low	Unclear	Unclear	High	na	High
Zimbabwe School Support Program[57]	Unclear	Unclear	Unclear	Unclear	Unclear	Low	High
Zomba Cash Transfer Program[50,51]	Low	Unclear	Unclear	Low	High	Low	Low
na=not applicable							

arms. An exception was the South African cash-transfer program, which did not have any effects on dropout or attendance.[64] Similarly, no differences in attendance between groups were evident in the Kenya Education Subsidy Program,[54] though benefits were found for all other academic outcomes in this large study. Effects on absenteeism were mixed in two small, randomized trials.[56,57] Finally, the quasi-experimental Promise Place study reported that a lower proportion of intervention students than control students dropped out among those who had been parenting—but not among those who had been pregnant—at baseline.[66]

Discussion

Eleven outcome evaluations were included in this systematic review. Five studies assessed interventions that were related to the school-level environment and that, in particular, sought to change the school climate and culture through action teams and teacher training. The remaining six studies evaluated interventions designed to improve student-level educational assets; most of these programs provided financial incentives to increase school enrollment and attendance. Although all but two studies were randomized trials, poor reporting made quality assessment difficult, and in many studies, and across many domains, we were not able to clearly determine the risk of bias.

Our findings offer insights into whether the theory of human functioning and school organization might apply to sexual behaviors and sexual health outcomes. The theory posits 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.[22]

Findings from the meta-analysis of the effects of school-level environment interventions on sexual debut, along with the findings on recent sex and condom use from the Aban Aya trial, provide some support for the theory. School-level environment interventions employed school action teams to improve school climate,[55,62,63] engaged young people in schoolwide activities[55,62,63] and conducted teacher training to improve student–teacher relationships and strengthen student-centered learning.[58–61,63] These practices are congruent with evidence from observational and evaluation studies suggesting that teacher and school support, academic support and mentoring, and school and class restructuring are important for students' academic performance[68] and completion.[69] This evidence aligns with and supports the theory's contention that increasing students' commitment to school will encourage them to behave in ways that accord with the prosocial values of these institutions. In addition, findings on educational outcomes from three studies support the notion that intervention effects on attachment and commitment to school, and on academic behavior and achievement, may serve

a mediating or synergistic role in improving sexual health outcomes, further supporting the theory of human functioning and school organization.[59,65,67] However, more data from rigorous evaluations are 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.

Evidence for the effectiveness of school-level environmental interventions in improving other behavioral and health outcomes, including STDs and pregnancy, was mixed, and inconsistency in the outcomes measured across studies precluded meta-analysis. PREPARE was the only school-level environment intervention to demonstrate no effects on sexual behavior.[62] This intervention, which was evaluated in South Africa, differed substantially from the other school-level environment interventions in both setting and purpose. 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 applicable mainly to high-income countries, such as the United States and Australia, where educational and economic opportunities are more readily available and culturally acceptable.[70,71] However, it is also possible that the PREPARE intervention did not sufficiently align with constructs within the theory to provide an adequate empirical test.

Studies of interventions that address student-level educational assets provide less support for the theory of human functioning and school organization. Narrative synthesis suggests that the evidence is mixed as to whether these interventions, most of which provided financial support, can prevent pregnancies and STDs or reduce sexual risk behavior. For example, two large randomized trials each found an effect on either pregnancy[54] or STDs,[50] but not both. These studies also had significant impacts on rates of dropout[54] and enrollment,[50] which aligns with observational evidence that enrollment is important for sexual health outcomes.[40,41] However, the remaining studies demonstrated very few effects on measures of pregnancy, STDs or sexual behaviors. Across studies, our narrative synthesis found no clear pattern of how interventions did or did not impact educational outcomes or sexual behavior and health. This might be explained in part by the limitations described below.

Limitations

Some limitations of the interventions and evaluations, as well as of our analysis, may have hindered our ability to assess the theory of human functioning and school organization in the context of sexual health. In some studies—particularly of interventions targeting student-level educational assets—differences between treatment groups may have been masked by sample

sizes that were inadequate to detect effects[53,56,57] or by contextual factors (such as the availability of subsidies, unrelated to the intervention, to students in the control group).[56,64] Other studies may have been limited by a singular focus on increasing enrollment, and thus failed to address or overcome other factors important for sexual decision making, such as cultural norms that devalue females' education and sexual autonomy, support early marriage and stigmatize access to sexual health information.[72,73] Most interventions to promote student-level educational assets did not address the impact on sexual health outcomes of other components of schooling, such as education quality or school climate, thus limiting their relevance to empirical assessment of 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 enrollment and attendance, they also tend to improve the economic position of students and their families.[74] Since pregnancy and other sexual health outcomes are associated with family- and community-level socioeconomic status,[3] it is challenging to untangle the impact of school on sexual health outcomes from that of poverty alleviation in cash transfer and education subsidy programs. For example, an increase in income theoretically reduces the need for individuals to engage in transactional sex, thus possibly reducing the frequency of unprotected sex[64] and the number of sexual partners.[50,64] However, as one study in our analysis concluded, the benefits of cash transfers may not outweigh the social benefits of transactional sex.[64] Interventions that provide financial incentives for school enrollment 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 interventions related to school-level environment were conducted in high-income countries, and all but one of the studies of interventions related to student-level educational assets were conducted in middle- or low-income countries. Economic and cultural differences among countries may have affected the intervention components addressing school-related factors and how these components were received by participants. These differences could have been further compounded by selection bias, a possible risk in trials in which blinding is not possible;[75] however, the extent of this risk in the studies we examined is unclear because allocation concealment was poorly reported. Furthermore, although interventions related to educational assets did not include additional curriculum components, the majority of school-level environment interventions did, so that the effects of the school environment and those of curriculum components could not be disaggregated. However, results from the three-armed Aban Aya trial, in which 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.[55]

Our review itself also has limitations. Although we did not deviate from the established protocol, we modified it at the start of full-text screening to clarify which interventions were to be included. Because the inclusion criteria for intervention type were broad during screening of titles and abstracts, these modifications did not affect initial screening; however, some potentially relevant studies may have been excluded during screening of full reports if the interventions were insufficiently described. Although we sought to minimize location and language bias by searching multiple databases without language restrictions, it is possible that our exclusion of studies published prior to 1990 resulted in our missing some relevant research; however, because all of the studies we identified were published after 1998, and most were published within the past 10 years, we feel this cutoff was generous and reasonable. We were unable to assess publication bias owing to the small number of studies.

Given the variability in how data were reported, which is common in studies of social interventions,[76] analysis required transformation of data into standardized effects for school-level environment studies. Because several studies did not provide adequate information to standardize effect sizes or provided effect data only for subgroups of participants, we were unable to undertake meta-analyses of educational asset outcomes and most school-level environment outcomes. In the majority of cases, e-mails to authors for missing data were not answered. As a result of these issues, only a single meta-analysis was possible, and we could not conduct meta-regression analysis to explore the heterogeneity of effects.

Finally, while this review focused on interventions aimed at school-level environment and student-level educational assets to potentially illuminate the theory of human functioning and school organization,[22] we were disappointed to find that no studies addressed both school- and student-level domains simultaneously.

Implications for Policy and Research

Our findings are generally consistent with those of other reviews examining school-level environment interventions, which concluded that evidence is insufficient to assess the probability that these programs improve sexual health.[43,44] Unlike prior investigators, we were able to conduct a meta-analysis, the results of which suggest that interventions modifying aspects of the school environment, such as school climate or access to caring adults, have the potential to delay sexual debut. Our narrative synthesis indicates it is plausible that interventions aimed at improving student-level assets can be effective in reducing levels of pregnancy and STDs; this conclusion is supported by reviews that have examined the broader impacts of sexual health interventions in low- and middle-income countries.[72,76,77] However,

our analysis of the relationship between intervention effects on sexual behaviors and educational outcomes and those on pregnancy and STDs fails to reveal a clear pathway by which the interventions affect health outcomes. Because subsidy and cash transfer programs are expensive,[76] ample opportunity exists for new research to explore the causal mechanisms of these programs, as well as any added benefits to combining these programs with other intervention components known to improve sexual health.

More rigorous evaluation is needed to determine the effects of school-environment interventions on long-term sexual health outcomes, including pregnancy and STDs. Investigators studying interventions that modify school environment and educational assets should more clearly conceptualize the mechanisms of change, and assess the relationships between school-related outcomes and 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 influences 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 student–teacher relationships. As other reviews have concluded,[44] 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 component contributes independently or interdependently to improve outcomes. Finally, future reviews would greatly benefit from improved reporting on risk of bias domains.

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Supporting Information

Figure 6.1. The theory of human functioning and school organization

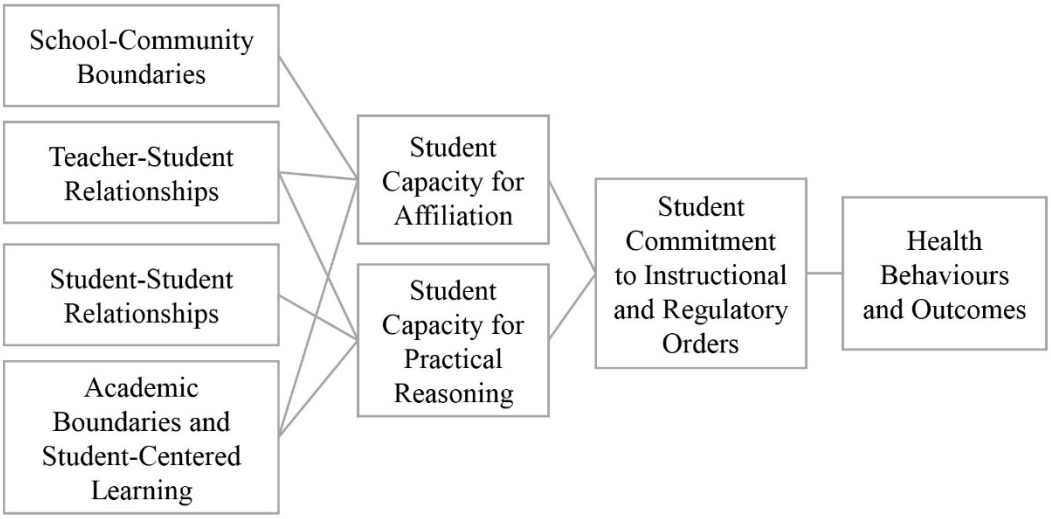
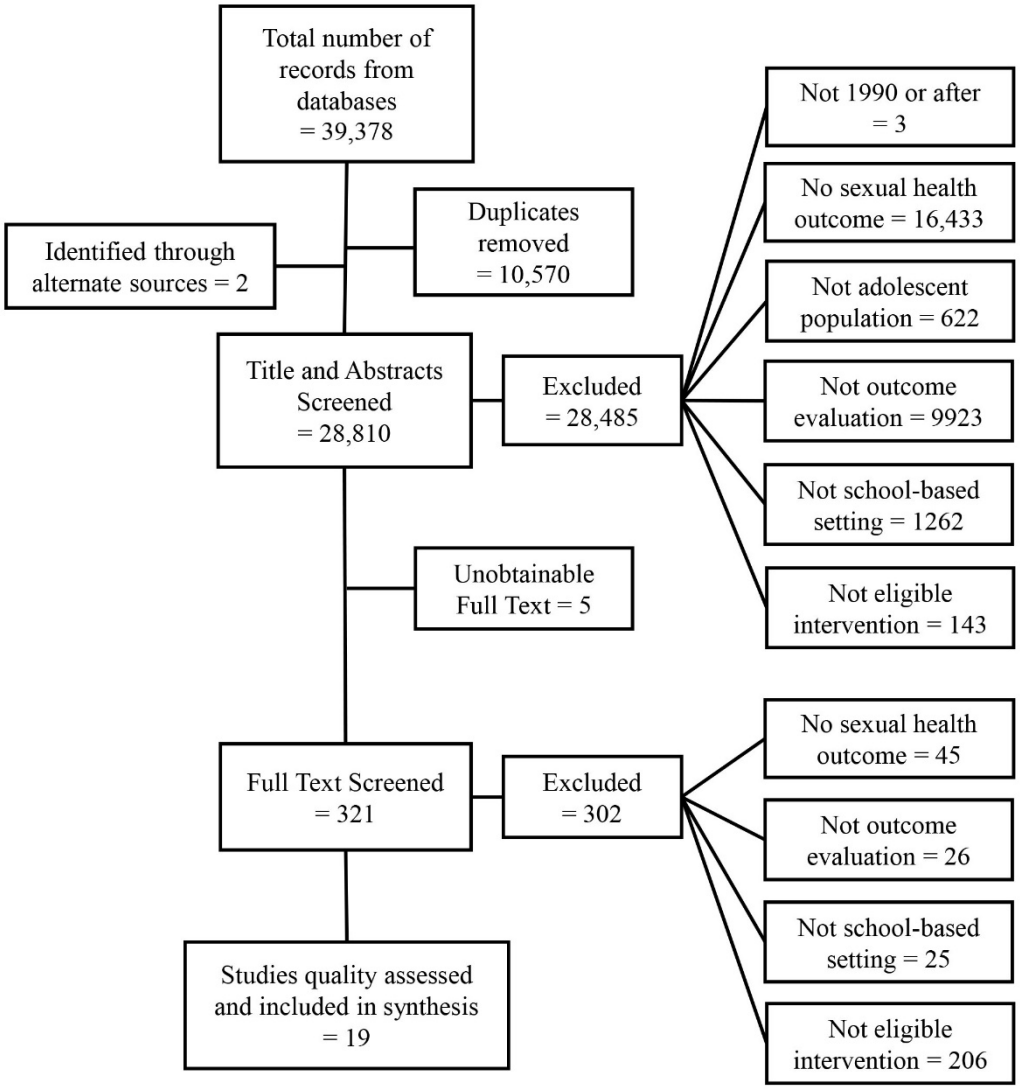


Figure 6.2 Sample Search String

Database: Medline Run Date: July 5, 2017		
#	**Query**	**Results**
S1	(Educat* OR school).ti,ab.	553564
S2	(Goal* OR likelihood OR probability OR intention* OR aspiration* OR engagement OR involvement OR commitment OR interest OR contribution OR dislike OR attainment OR asset* OR failure OR attendance OR success* OR system*).ti,ab.	4754599
S3	**S1 AND S2**	164580
S4	(wide OR ethos OR climate OR environment OR culture OR manag* OR organization OR aggregat* OR governance OR context OR effects OR difference* or inequalit* OR variation OR influence* OR factor*).ti,ab.	8091877
S5	**S1 ADJ3 S4**	26946
S6	("locus of control" OR "internal poverty" OR "external poverty" OR "positive youth development" or "youth development" OR "interschool variation").ti,ab.	6262
S7	**S3 OR S5 OR S6**	187238
S8	(pregnan* OR conception OR abortion OR "family planning" OR "safe* sex" OR "protected sex" OR "unsafe sex" OR "unprotected sex" OR "sexual behavio?r" OR "sexual risk" OR "sexual risk-taking" OR "sexual intercourse" OR "sexually active" OR sexuality OR (sex* ADJ2 initiation) OR (sex* ADJ2 activity) OR (sex* ADJ2 debut) OR condom OR STI OR STD OR "sexually transmitted infection" OR "sexually transmitted disease" OR chlamydia OR gonorrhea OR contracept* OR "birth control" OR abstinen* OR "barrier method*" OR (intrauterine ADJ1 (device OR system OR contracept*)) OR "long-acting reversible contracept*" OR LARC).ti,ab.	595332
S9	**S7 AND S8**	14346
S10	(evaluat* OR assess* OR intervention OR (randomi#e* ADJ3 (control OR controlled OR trial OR quasi)) OR "quasi-experimental" OR "control arm" OR "control group").ti,ab.	4530184
S11	(((process OR formative OR pilot OR preliminary) ADJ2 evaluation) OR feasib* OR accept* OR delivery OR (intervention ADJ3 (implementation OR planning))).ti,ab.	832521
S12	(program evaluation or research design or controlled clinical trials as topic or controlled clinical trial or evaluation studies).sh.	473913
S13	**S10 OR S11 OR S12**	5243120
S14	**S9 AND S13**	7766
S15	limit 14 to yr="1990 -Current"	6778

Figure 6.3 PRISMA Diagram



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Chapter 7

Discussion

Introduction

This chapter explores whether findings from the four empirical chapters support the theory of human functioning and school organisation (outlined in Chapter 1) in explaining how schools influence young people's sexual health. The chapter begins with a summary of findings from the reviews and syntheses of qualitative, observational and intervention studies and the multi-level longitudinal analysis, and consideration of the extent to which these support the theory. I then discuss how the limitations of these studies may affect their findings and the assessment of the theory in its application to adolescent sexual health. Lastly, I discuss the implications of the research for the theory by exploring ways the theory may be extended or refined, followed by implications for research, policy and practice.

Summary of findings

Findings from the systematic review and meta-ethnography of qualitative studies

The first aim of this thesis was to gain understanding of how young women's experiences in education and school may influence their sexual behaviours, pregnancy and parenting decisions by reviewing qualitative literature. The review sought to assess whether the processes outlined in the theory of human functioning and school organisation are consistent with young people's accounts of these decisions. Most prior qualitative reviews have not explicitly explored school or education as an influence on sexual decision-making or have not explored experiences prior to pregnancy. Those that have examined these themes were limited by location and were conducted 5-10 years ago. This systematic review of qualitative studies provides the most comprehensive synthesis to date of young women's views on school and education as they relate to sexual and reproductive decision-making.

Meta-ethnography of twenty-eight qualitative studies revealed that young women's education and life trajectories were shaped by their commitment to school values and their expectations for academic achievement and higher education. In contrast to Markham and Aveyard's (2003) assumption that commitment to school mediates impacts on health by improving capacities for practical reasoning and affiliation, educationally-committed students and young women with weak attachment to school appeared to both use the capacities for practical reasoning and affiliation to consider and adopt future plans based on whether they perceived education or parenthood would help them achieve adulthood status. These perceptions were informed by their experiences of school and education. For most educationally committed teens, pregnancy during adolescence was seen as a disruption to educational and career achievement, and thus their educational aspirations were a form of 'regulating' their sexual decisions through abstinence, contraception or abortion. These findings align with Markham and Aveyard's definition of 'committed' students whose goals and values were aligned with those of the school, viewing higher education and financial independence as the 'responsible' pathway.

For young women with weak attachment to school, pregnancy and childbirth were not viewed as disruptions to their life trajectories. However, their relationships with school and education were more complex than committed students, perhaps reflecting the varied responses of students to the instructional and regulatory orders that Markham and Aveyard outline. Some young women reported a lack of academic skills that prevented educational achievement even when it was desired (i.e. 'estranged') or rejected school expectations of higher education for other pathways (i.e. 'detached'). Others lacked both an interest and the ability to succeed in school (i.e. 'alienated'). Detached, estranged or alienated young women might plan for early parenthood or demonstrate ambivalence about pregnancy by inconsistent use of contraception or by weighing the benefits of relationships over the risk of pregnancy. For all young women, their pathway (higher education or parenthood) was seen as a legitimate and meaningful approach for obtaining adulthood and autonomy. Their choices were not, as Markham and Aveyard suggest, the result of an inability to imagine or think critically about their life plans.

Reciprocal translation also revealed multiple ways that young women's school experiences shaped their commitment to school. School values, especially for young women with social disadvantage, did not appear to adequately represent the cultural values and backgrounds of young women, and thus reflected heightened boundaries between the school and the communities to which students belonged. This was evident through reports of social isolation and discrimination, a lack of representation in curriculum or in recognition of student achievements, and a lack of support for students who faced language or cultural barriers. Part of the values imparted by schools included clear messages that pregnancy and parenthood

among students were unacceptable routes to the performance of adulthood and autonomy in school. In alignment with the theory's teacher-student boundaries, teachers were identified as important players in young women's school experiences whose explicit or implicit expectations influenced students' educational aspirations. The academic curriculum, in content and pedagogy, also failed to adequately meet student needs, either in the support required for academic achievement or in its relevance to young women's interests or broader development. These experiences align with Markham and Aveyard's broad definitions of how boundaries, when strongly framed, create imbalances across school processes and relationships that erode students' commitment to the instructional and/or regulatory orders. Synthesis also revealed ways in which schools could harm students' health which are not explicitly addressed in the theory. For example, schools could be physically and psychologically unsafe environments for students, resulting from disorganisation, violence among students, and sexual coercion by school staff.

Findings from the systematic review and synthesis of observational studies

The second aim of this thesis was to identify and synthesise school-related factors of adolescent sexual health outcomes from available observational research. Individual-level longitudinal studies examine associations between students' personal experience with school or education and their subsequent sexual health outcomes, where school-level studies examine how aspects of the contextual or compositional features of school may influence health. Previous reviews have explored school-related determinants of adolescent sexual behaviour but have not included school-level studies and have not wholly considered the quality of studies in their syntheses. This review explored both individual-level longitudinal studies and school-level longitudinal and cross-sectional studies to assess whether factors associated with sexual health outcomes align with the theory of human functioning and school organisation.

Findings from Chapter 2's systematic review of school-level and longitudinal individual-level studies suggest that school processes and experiences may influence young people's sexual health. In particular, there is sufficient evidence from high- and medium-quality observational studies to suggest that school-related factors, such as enrolment, academic performance, attitude to school, educational expectations and aspirations and connectedness to school, are predictive of sexual health outcomes. These findings align with Markham and Aveyard's conception that committed students possess academic abilities, as indicated by higher grades or test scores, and share values with the school community, as indicated by their aspirations for higher education, and that their subsequent health behaviours will align traditional school pathways such as avoiding unplanned pregnancy. Further, committed students may feel more connected to the school or enjoy school more because they have better relationships with teachers and other committed students. Additionally, some committed

students may be involved in conventional school activities, though this type of involvement in school was not involvement in school decision-making as Markham and Aveyard conceptualised. School-level studies revealed some support for the theory's notion that because committed students are more likely to come from the middle class (because schools primarily tend to reflect the values of the middle class), schools with more students in socio-demographically advantaged groups will be associated with better sexual health outcomes. However, studies also revealed, in support of the theory, that other school processes are important for sexual decision-making, including compositional features of peers' attitudes toward school and higher education and contextual features related to school safety, discipline and social belonging.

Overall, findings from observational studies suggest that school is an important determinant of sexual health and provide some empirical support for the theory of human functioning and school organisation in application to young people's sexual health. However, the majority of studies based in low- and middle-income country settings focused on enrolment in school and socio-economic composition of schools. While these studies suggest that enrolment is essential for accessing the potential benefits of the school environment and education, they do not reveal much about potential school processes important for students' health in these settings, and whether they are similar or different than those in high-income settings.

Findings from the multi-level longitudinal analysis

The third aim of this thesis was to assess the theory of human functioning and school organisation by examining associations of theory-aligned school-level and student-level measures of the school environment with subsequent adolescent sexual risk behaviours. Prior empirical studies have examined the role of value-added education and direct measures of the school environment aligned with the theory on health risk behaviours, such as smoking, substance use, bullying and misbehaviour (Aveyard et al., 2004; Bisset et al., 2007; Bonell et al., 2019, 2017; W. A. Markham et al., 2008, 2012; Tobler et al., 2011). This longitudinal analysis was the first to assess these theory-aligned measures on sexual risk behaviour, as well as examine the potential mediating impact of student-level commitment to academics, sense of belonging, relationships with teachers, and participation in school.

Results from the multi-level analysis revealed no evidence that attending schools with higher levels of VAE was protective against sexual risk behaviour and, instead, higher VAE was associated with greater sexual risk at 24 months. VAE may not, however, be the most representative measure of engagement in the school environment as proposed by the theory because it relies on attendance and academic data rather than direct measures of engagement. Indeed, associations on direct measures in this study suggested that more engaging school

environments may reduce the likelihood of early sexual debut. Specifically, school-level commitment and belonging at baseline were associated with delayed sexual debut, as would be predicted by the theory. School-level findings suggest that the compositional features of schools, particularly whether attending school with other students who are committed to the instructional and regulatory orders, are important for delaying sexual debut above and beyond individual disposition towards school.

Students' own commitment to school and a sense of belonging within school at baseline were also associated with a lower odds of early sexual debut at both 24- and 36-month follow-ups. Aligning with Rose's hypothesis that health risk and behaviours differ both within and between populations (Rose, 1992), these findings indicate that commitment to the school and sense of belonging are important at both the school- and student-level. These findings align with the theory in that students who feel unable to meet the school's academic demands or feel alienated from the school community are more likely to engage in health risk behaviours. While mediation analysis of VAE with student-level exposures and outcomes was not possible, it was revealed that student-level commitment – but not belonging – at 24 months was associated with outcomes at 36-month follow-up, suggesting that different types of engagement may be important at different points in development or in proximity to behaviour.

This analysis also explored two variables which aligned with constructs that Markham and Aveyard theorise as potential processes by which the school may influence commitment and belonging, and thereby, student health. School- and student-level participation in school demonstrated few associations. This finding contradicts the theory's premise that involvement in school decision-making and input in curriculum choices would increase commitment to school and influence health decisions. This could reflect few opportunities for students to be involved in these processes, or that the measure also included other forms of involvement not theorised by Markham and Aveyard, such as sports and arts activities. Relationships with teachers, however, appeared to be most consistently associated with sexual behaviour across school- and student-levels, timepoints and outcomes, aligning with the theory's notion that weakening boundaries between teachers and students will help improve student health. In particular, young men attending schools with students who reported stronger relationships with teachers at baseline were less likely to engage in sexual intercourse by 36-month follow-up (though this result should be treated cautiously given low statistical power on stratified results). Further, students' own relationships with teachers when measured at baseline and 24-months were associated with lower risk of sexual debut at follow-ups. In fact, this was the only exposure variable, when measured at both baseline and 24-month follow-up, that found an association with contraception use among sexually active students.

Findings from the intervention systematic review and meta-analysis

The final aim of this thesis was to identify and synthesise outcome evaluations of interventions aiming to modify school environment and student educational assets to improve adolescent sexual behaviour and sexual health outcomes. Findings from experimental studies provide the most rigorous evidence for assessing whether interventions that may align with components of the theory of human functioning and school organisation are effective at improving sexual health outcomes. Prior reviews on school environment interventions have examined broader student health but were not focused on sexual health outcomes. Building on past reviews, this systematic review and meta-analysis on school environment and educational assets interventions provides a current synthesis of evidence related to sexual behaviour, pregnancy and STI outcomes. Further, while not a primary aim of this synthesis, the review reports on educational outcomes which provide additional context in the narrative review.

Findings from the meta-analysis on sexual debut provide some support that school environment interventions aiming to address school practices and relationships can delay sexual intercourse. Interventions included in the meta-analysis employed methods that increased student engagement, including school action teams to improve school climate and engage young people in school-wide strategies. The theory suggests that these types of action teams or councils help weaken boundaries between staff and students by promoting understanding of each other's values and realities, and thus increase young people's capacities for practical reasoning and affiliation. Findings from outcomes synthesised narratively indicate that other strategies, such as teacher training in classroom management and parent engagement, implemented by Aban Aya (Flay et al., 2004) and the Seattle Social Development Project (J. D. Hawkins et al., 1999; Hill et al., 2014; Lonczak, 2000; Lonczak, Abbott, Hawkins, Kosterman, & Catalano, 2002), may also be effective in reducing risk behaviours. These strategies support the theory's notion of weakened framing by engaging in student-centred teaching practices and weakened school-community boundaries by involving parents in school activities and decision-making. Further, findings from three school environment studies on educational outcomes points to a synergistic or potential mediating role of academic behaviour or achievement on sexual health outcomes, suggesting that increasing commitment encourages students to engage in health behaviours that accord with the school's instructional and regulatory orders. Evidence for the effectiveness of school environment interventions on other behavioural and health outcomes, including STIs and pregnancy, was mixed, partially due to the inconsistency in outcomes measured across studies which precluded further meta-analysis. Notably, PREPARE (Mathews et al., 2016) – a high quality randomised control trial – was the only school environment study conducted in a LMIC and reported no effects on sexual behaviour.

Student-level educational-assets interventions in included studies did not align with school or educational processes outlined in the theory of human functioning and school organisation and, thus, cannot provide much support for the theory. These interventions were primarily conducted in low- and middle-income country settings, making it difficult to assess whether the theory could be relevant to these settings. Studies inconsistently reported effect sizes for comparable samples which prevented meta-analysis for these interventions. Narrative synthesis revealed mixed evidence that educational-assets interventions, most of which provided financial support to increase enrolment, prevent pregnancies and STIs or reduce sexual risk behaviour. One cash-transfer programme and one education-subsidy programme, both of which were assessed in large randomised trials, reported effects for sexual health outcomes, one for pregnancy (Duflo, Dupas, & Kremer, 2015) and one for STIs (Baird, Garfein, McIntosh, & Özler, 2012), but neither trial reported effects for both. These studies also reported significant effects on enrolment, suggesting this factor could be important for sexual health outcomes. However, the remaining studies reported mixed effects; no effects were reported on sexual debut across five RCTs and evidence on condom use and partner variables was mixed across the three high-quality studies that measured them. Across studies, narrative synthesis revealed no clear pattern of how educational-assets interventions did or did not impact educational and sexual health outcomes. Because educational processes, such as improving academic or social assets that increase student commitment to the school, were not explored in these interventions, it is not possible to assess which aspects of young people's educational experience contributed to outcomes, and whether these would have supported the theory's constructs.

Limitations

Systematic review and synthesis of qualitative studies

Limitations of included studies. The studies in this synthesis heavily represented low-income young women in the U.S. and U.K.; only four studies interviewed middle-class teens and only three were from LMIC. As a result, the synthesis was primarily informed by interview data from young people with early parenthood trajectories in high-income countries, limiting the exploration of the theory in other contexts. Further, the content and themes presented in included studies were shaped by the perspectives and interests of the researchers collecting and analysing the data. To distinguish between researcher and participant viewpoints, I attempted to highlight 'second order' themes where they were explicit (i.e. researchers' broader conclusions). However, because the aims of all included studies were broader than or different from that of this review, it is possible that details relevant to the theory of human functioning and school organisation were omitted by researchers.

The majority of studies were not longitudinal in nature. In studies that interviewed non-pregnant and non-parenting teens, young women may have provided rationale for avoiding pregnancy which later failed to prevent them from engaging in sexual risk behaviours. In studies that interviewed young mothers, it may have been difficult for young women to distinguish between school experiences prior to, during or after pregnancy. I chose to exclude studies that focused primarily on school experiences after pregnancy or parenthood, though these studies could have described comparisons between school before and after pregnancy that might have contributed to assessing the theory.

Limitations of review. Double screening and quality assessment of studies was not possible due to resources constraints, though it was attempted. Double screening is advantageous because it reduces and potentially corrects systematic and random errors that may lead to missed studies and selection bias (McDonagh, M, Peterson, K, Raina, P, Chang, S, & Shekelle, P, 2013); however, single extraction has been noted as an acceptable methodological shortcut when supported by specificity in the screening criteria and reviewer expertise (Waffenschmidt, Knelangen, Sieben, Bühn, & Pieper, 2019). To minimise bias, I piloted both the screening and quality appraisal tools to ensure sufficient specificity and discussed the results and rationale with a second reviewer before systematically applying the tools to the remaining studies. In addition, each phase was carefully documented; for example, quality assessment was documented in an Excel file which included a score and rationale for each quality domain in each study (Appendix A.7). Inevitably, some depth may have been lost in synthesis in attempting to identify and translate themes across the large number of studies included in the review. For example, several studies used in-depth case studies of a few or single students and explored themes which were outside the review aim. As is customary in reviews of qualitative studies, I did not exclude studies based on quality which could result in the exclusion of studies with data useful to the research question but that did not report their methods sufficiently well to receive a high reliability score. I began coding according to quality, starting with studies that were both high in reliability and usefulness as well as providing more qualitative weight to studies which were both useful and reliable. Appendix A.8 shows the contribution of studies to theme generation, with the majority of contributions coming from studies with high or medium reliability. This review focused on the experiences of youth who identified as female by excluding studies with samples that were not a majority female-identified. As a result, youth who identified as male or nonbinary did not contribute substantially to the findings of this synthesis. Conclusions about their own experiences in school and education, as well as differences in gender in the role of school in sexual and parenthood decision-making, cannot be inferred from the data.

Systematic review and synthesis of observational studies

Limitations of included studies. While observational studies can point to potential factors associated with health outcomes, they cannot provide evidence of causation. Further, because they are subject to confounding bias, it is critical that studies account for key factors known to be associated with sexual behaviour and outcomes. Seventeen of the 53 included studies were assessed as having low quality, primarily because they did not assess for key confounders, such as socio-economic status, gender or age. While longitudinal studies addressing individual-level and school-level factors were elevated as providing more rigorous evidence of associations as they establish temporality between the exposure and sexual health outcomes, this review did include school-level studies which used cross-sectional designs. However, it was unlikely that these studies were subject to reverse causality as they used measures that were improbable for sexual health outcomes to change, such as family socio-demographic variables, or used exposure and outcome data from separate populations. None of the included studies were designed to assess the theory of human functioning and school organisation so may reflect the measures used rather than constructs proposed by Markham and Aveyard. Only three of 11 studies from LMIC settings examined variables other than enrolment, providing limited evidence on whether and which school processes may be important for sexual health outcomes of students attending schools in LMICs.

Limitations of review. This review did not have a registered protocol, though I followed a standardised process for screening studies for inclusion, extracting data and critically appraising studies. Due to resource constraints, only three databases were searched, I did not contact subject matter experts, and data were not extracted by multiple reviewers, which increases the chances of missed studies or data. I did not exclude studies based on language, location or date minimizing location bias. However, searches were primarily executed in databases which favour peer-reviewed research; thus, grey literature, while not an exclusion criterion, was not prioritised. A major limitation of this study was that a meta-analysis was not conducted due substantial heterogeneity across exposures, outcomes and subgroups.

Longitudinal multi-level analysis

While the analysis used a longitudinal design with a relatively large sample, some analyses were underpowered, including interaction tests. As a result, I was cautious in my interpretation of these results as they apply to the theory of human functioning and school organisation. Further, the sample for contraception use was very small due to the low prevalence of students reporting sexual debut, likely making associations difficult to detect and, thus, interpret in relation to the theory. One major limitation of observational studies can be the failure to account for all confounding variables; however, the inclusion of covariates was based on known school- and individual-level influences on sexual behaviour. Given the

UK setting, findings may not be generalizable to other settings. For example, calculation of VAE may be based on other measures of attainment and attendance in other country settings, (W. A. Markham et al., 2012) potentially producing a different association between VAE and risk behaviours.

All the school-level measures used in this study reflect the compositional features of school. In other words, the measures used consider how the concentration of students who report engagement with school may influence health. However, these measures do not reflect other contextual or collective features of the school, such as observations of the physical and social environment or broader shared values and norms reported by other members of the school community.

Systematic review and meta-analysis of intervention studies

Limitations of included studies. Several studies, particularly studies of student-level educational assets, had limited sample sizes that were inadequate to detect effects (Cho et al., 2011; Hallfors, Cho, Mbai, Milimo, & Itindi, 2012; Hallfors et al., 2011). Several studies noted the that similar programs were available to students enrolled in control arms during trials, which may have reduced the potential effects of the intervention being studied (Hallfors et al., 2012; Pettifor et al., 2016). Most educational assets interventions did not address the role of other components of schooling on sexual health outcomes, focusing primarily on enrolment and making them less useful for assessing the theory, which is concerned with the quality rather than the 'dose' of education. Further, some of the causal mechanisms for improving sexual health outcomes are difficult to untangle, both because there was not a clear alignment between interventions and the theory and because interventions may have worked via mechanisms not concerned with the school environment or educational assets. For example, in cash transfer and education subsidy programs, the role of financial incentives in alleviating poverty, as opposed to increasing school enrolment, may have served as the primary cause of improving outcomes. Further, most school-environment interventions included additional program components, making it difficult to disaggregate the effects of school-environment and curriculum components. However, results from the Aban Aya trial, which included one arm focused on a curriculum intervention and one on an intervention with curriculum and environment components, indicate that changes to the school environment could have independent effects on sexual risk behaviours (Flay et al., 2004).

Generalizability of these interventions across settings, and their ability to assess the theory in context, appears fairly isolated to the regions in which studies were implemented. 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. Transferability is difficult to determine as

economic and cultural differences may have impacted the implementation of intervention components and how they were received by intervention participants. Thus, the review can provide limited support for the theory across various contexts, specifically in LMIC settings.

Limitations of review. In terms of limitations in review methods, there were no deviations from the established protocol. Additional criteria for study inclusion was added at the start of full text screening; however, screening on title and abstract was broad enough that studies would not have been excluded for this reason. However, relevant studies may have potentially been excluded because interventions were poorly described. Language and location bias were minimised by searching multiple databases without language restrictions. While it is possible that studies were missed because those published prior to 1990 were excluded, this cut off appears to be reasonable given that all studies were published since 1999 and most within the last 10 years. Due to the small number of studies, I was unable to assess publication bias.

One major limitation for assessing the theory is that only one meta-analysis was possible. There was substantial variability in reporting data across studies. As a result, meta-analysis of school-level environment studies required transformation of data into standardised effects to achieve a pooled effect size. For all other studies, inconsistency in reported data made it impossible to transform effect sizes for overall populations. Attempts to contact authors for missing data were made; however, in almost all cases, authors did not respond to these requests. I was unable to conduct additional meta-analyses, and could not conduct meta-regression or sensitivity analysis due to the small number of studies with accessible data. Because of journal preferences, precision estimates were not noted in the narrative synthesis; however, all precision estimates as reported by the authors of included studies are indicated in the Summary of Findings table (Table 6.1).

Implications for the theory of human functioning and school organisation

Despite these limitations, findings from the systematic reviews and longitudinal analysis suggest that schools are an important social determinant of young people's sexual health. The theory of human functioning and school organizations is a useful framework for examining the school processes and experiences that influence students' health and well-being. Results from this thesis, outlined in Chapter 3-6 and in the summary above, provide at least some evidence that the theory is applicable to sexual health. However, based on findings from this thesis, I propose additional areas where the theory may be extended or modified, and where further evidence is required.

Complex role of instructional and regulatory orders within schools

The first proposed area for refinement in relation to sexual health is that the theory of human functioning and school organisation take a more complex view of the role of the instructional and regulatory orders. The theory is rooted in the idea that young people who are 'committed' are more likely to build capacities of practical reasoning and affiliation that enable autonomy and, subsequently, health-promoting choices. Thus, a key process within the theory is to improve young people's individual commitment to the instructional and regulatory orders of schools. Associations from Chapter 5's multi-level analysis support the notion that students with higher levels of commitment to academic learning (i.e. attachment to the instructional order) and a greater sense of belonging (i.e. attachment to the regulatory order) are less likely to engage in risk behaviour. This is also supported by findings from the synthesis of qualitative studies that young women who later became adolescent parents were disconnected from school in varied ways, including from an inability to meet the demands of the instructional order due to academic problems or a lack of sympathy for the regulatory order due to lack of interest in higher education or a rejection of values held by teachers or other school staff. Findings, however, do not support the assertion that a lack of commitment to these orders leads to sexual risk behaviour via a failure to develop practical reasoning or affiliation capacities. Findings from the synthesis of qualitative studies suggest that students who choose young parenthood do so in the context of desiring and attempting to achieve autonomy, a fundamental task of adolescent development (Crone & Dahl, 2012), within the constraints of their circumstances. Young parenthood may represent the most viable pathway to gaining autonomy and adult status within their context, especially when it does not disrupt already poor opportunities for social mobility. Further, reduced commitment to school may lead to engagement in risk behaviours for pregnancy, not because young people lack the capacity for good decision-making, but because they establish priorities (e.g. romantic relationships) and value markers for adulthood (e.g. parenthood) outside traditional educational pathways. In fact, young parents' ability to 'transform their reality' is a reflection of their ability to adapt to 'external factors,' (W. A. Markham & Aveyard, 2003, p. 1212), characterizing the capacity for practical reasoning. Thus, strict emphasis by schools on achieving higher education pathways fails to acknowledge the broader social disadvantage young people experience and may only alienate them further from school.

Further, as others have suggested (Adam Fletcher & Bonell, 2013; Jamal et al., 2013), multiple instructional and regulatory orders may exist within school settings. Findings from the synthesis of qualitative studies suggest that young women formed and engaged in their own social spaces and 'girl culture' (Bettie, 2003), which validated young parenthood and alternative life pathways. This culture appears to operate within and parallel to the existing school regulatory and instructional orders, and is bolstered by school authorities' emphasis on

students with traditional educational pathways and lack of acknowledgment of students with performative sympathies towards young parenthood. Markham and Aveyard pay little attention to peer networks and relationships. Weakened boundaries between pupils are theorised to facilitate the ability to view the world, problems and solutions from multiple perspectives. However, the theory emphasises manufactured distinctions between students, such as year groups, and does not consider how peer social networks – which may span year groups, ages, classrooms and identities – contribute to commitment to school or health decisions. Research indicates a more powerful relationship between peers and sexual risk behaviour. Chapter 5's multi-level analysis suggests that attending schools with other students who have high levels of academic commitment and belonging can delay sexual debut, revealing – along with other school-level studies from Chapter 4's systematic review of observational studies – that the collective orientation to school by a young person's peers can influence their behaviour above and beyond their personal disposition towards school. Further, a 2015 meta-analysis found that adolescents were more likely to engage in sexual risk behaviour if they perceived that their peers: were more sexually active; had more positive attitudes towards having sex; or were pressuring them to have sex (van de Bongardt et al., 2015). Thus, the theory further needs to be refined in relation to how peer networks *in school* influence sexual health by promoting student commitment and/or sexual activity, and how the influence of peer networks alters when schools are weakly classified and weakly framed.

Increased specificity in boundaries between staff/teachers and students

A second area for refinement is to elaborate on the ways in which boundaries between teachers and pupils can be weakened. Markham and Aveyard proposed affiliation and practical reasoning can be built by involving students in school decision-making, such as through staff/student councils, which provide opportunities for both teachers and students to gain better understanding of each other's values and perspectives. Similar school councils are components in several of the interventions identified in Chapter 6's intervention review with effects on sexual behaviour, suggesting that this involvement is supportive of student's sexual health (Flay et al., 2004; Patton et al., 2006). It is not clear from these studies, however, whether it is the direct involvement in school decision-making or the impact of the policies implemented by school councils that modify behaviour. Chapter 5's multi-level analysis would suggest that participation in school activities, including decision-making at the school, is not strongly associated with subsequent sexual behaviour. It is possible that the effects on the school environment due to policies derived from school councils may have greater impact on behaviour than individual student involvement with school activities or decisions. For example, these school policies could enable stronger relationships with teachers as Markham and Aveyard suggest, an association which was strongly present in the multi-level study. Based on this evidence, the theory could provide more detail on the purpose and components

of these councils, such as the aim to address the school environment through policy based on student input (e.g. via student surveys) and to involve multiple members of the school community (e.g. school staff, students, parents and community members) in addressing school issues. School councils could be informed by theory on co-production, defined as the involvement of service recipients in the design and delivery of services (Ostrom, 1996). In addition to the inclusion of students in school councils, councils may be characterized based on the core elements of co-production (Heaton, Day, & Britten, 2016): 1) students as active agents in school decisions and processes; 2) greater equality of students' experiences as valid and valuable; 3) relationships among co-producers are mutually beneficial and reciprocal; 4) intention to transform practices to meet student needs; and 5) collaborations are facilitated to enable effective co-production. In practice, school councils may engage young people's views on envisioning the components of a health promoting school environment through focus groups (Simmons, Graham, & Thomas, 2015) and in developing and prototyping public health interventions based in school (J. Hawkins et al., 2017). Further, young people can be involved as active agents in research processes, including in the design, implementation and dissemination of studies evaluating co-produced interventions (Campbell et al., 2019).

Beyond staff/student councils, the theory does not specify other processes by which relationships between teachers and pupils are formed or maintained, yet teacher and staff relationships were a prominent theme in the synthesis of qualitative studies. Findings suggest that teachers influenced students' commitment to school and perhaps ultimately their sexual health by: demonstrating lowered expectations of students based on race/ethnicity, socio-economic status or gender; failing to recognise their capacity for autonomy and adult responsibilities and/or reinforcing students' child-like roles in school; and failing to support students academically. The theory, however, does not explore how teacher quality or characteristics influence student outcomes beyond that relationships between students and teachers matter for health. Research from the field of education suggests that the cumulative effect of teacher quality can perpetuate disparities in academic performance, and have broader implications for departmental and school functioning (Day & Sammons, 2016; Ko & Sammons, 2013). Further, the socio-demographic profile of teachers may have an effect on pregnancy outcomes, where an increase in the proportion of black teachers is negatively associated with pregnancy among black students (Atkins & Wilkins, 2013). The greater presence of black teachers may strengthen teacher-student relationships and improve the school's ability to address the needs of black students (Atkins & Wilkins, 2013). This resonates with the findings of the synthesis of qualitative studies in that young mothers with low attachment to school reported their identities were not represented positively in schools.

Qualitative findings from this thesis also illuminate that discipline practices may have contributed to sexual health outcomes by pushing out students with already weak attachment

to school. Disparities in discipline practices have received attention recently as restorative practice interventions have become more common (Fronius, Persson, Guckenberg, Hurley, & Petrosino, 2016). Restorative practice aims to shift the emphasis in schools from managing behaviour to building and repairing relationships that support student growth, and have demonstrated effects on improved school climate (Augustine et al., 2018), reduced disparities in suspension rates by race/ethnicity and income (Augustine et al., 2018), reduced risk behaviours (including smoking and substance use) (Bonell et al., 2018) and improved emotional health (Bonell et al., 2018).[*] These interventions largely focused on extensive professional development and engagement of teachers and staff. Similarly, several school environment interventions with effects on sexual health outcomes included staff training components on classroom management and school climate (Beets et al., 2009; J. D. Hawkins et al., 1999).

In descriptions of weakening boundaries, the theory alludes to the responsibilities of school leaders in developing relationships with the external community, engaging students in decision-making and setting the course of curriculum. However, the theory does not sufficiently describe the role that management by school leaders plays on school culture or on individual student commitment, particularly in ensuring that school does not harm young people's health and well-being. Thus, I propose a fifth category concerning the *Boundaries between school management and the school community* to elevate the role of the school leaders in developing the infrastructure for weakening classification and framing. In their review of studies concerning school leadership, Day and Sammons (2016) suggest that school leaders impact student outcomes directly by improving their motivation, behaviour and engagement in school and indirectly by improving teacher and staff capacity. Thus, this proposed category may entail: 1) weakening boundaries between management and students by establishing and enforcing school policies which are fair, equitable and transparent (Fronius et al., 2016); 2) weakening boundaries between management and teachers by hiring qualified teachers whose values align with those of both the school and broader community (Day & Sammons, 2016); and 3) enabling weakened boundaries between teachers and students by providing ongoing professional development of tools and skills which support the development of teacher-student relationships (Augustine et al., 2018).[†] These actions would

[*] The Learning Together/INCLUSIVE trial (Bonell et al., 2018) of an intervention, which was informed by the theory of human functioning and school organisation and combined whole-school and restorative approaches, measured sexual risk behaviour as a secondary outcome. While effects on multiple other risk behaviours and health outcomes were reported, there were no reported effects on students' sexual health. These findings may indicate that students were still too young (age 14-15 at last follow-up) to detect an effect between intervention and control students, or that the intervention did not sufficiently address determinants of sexual health.

[†] Day and Sammons (2016) outline other recommendations, such as the distribution of leadership responsibilities across staff, which were not explored in this thesis but may be relevant to the theory and to student health.

facilitate the capacity for affiliation by: enabling students to understand and value clear and fair rules and potential consequences; ensuring teachers reflect the shared values of the students and school; and ensuring teachers and other staff fairly enforce rules. Practical reasoning would be facilitated by supporting teachers in developing the skills to promote activities which would increase students understanding of the potential for multiple realities as experienced by teachers and their peers. Empirical studies could contribute to the development of this theoretical addition by examining school-level measures of leadership and management on sexual behaviour.

Developmental trajectory of theory and health behaviour

A third area for refinement is the exploration of the theory over time and development. Adolescence is characterised by the physical, cognitive and social development needed to prepare adolescents to take on the roles and responsibilities of adulthood (Crone & Dahl, 2012). The complexity of new skills and experiences brought on by development often occur within the context of school, where young people are navigating peer interactions, relationships with teachers, and the development of their personal expectations for education and their future. Therefore, school not only plays a role in young people's academic attainment but is intrinsically tied to adolescents' development, including the development of young people's sexual identities and experiences. The majority of school environment intervention studies identified in Chapter 6 and the longitudinal data from Chapter 5 measure findings from participants at early and middle adolescence. These findings suggest that interventions to the school environment may best be conducted in late childhood and early adolescence when young people are still determining their interest in and place at school. Though not the focus of this thesis, interventions in early childhood aiming to promote cognitive and social development may also support long term effects on sexual health (Gavin, Catalano, David-Ferdon, Gloppen, & Markham, 2010). Findings from this thesis also revealed particular opportunities during adolescence to promote sexual health. Findings from the qualitative synthesis indicate that key transitions during adolescence, specifically transitioning from lower- to upper-level schools, are periods of potential risk for becoming detached from school. Further, findings from the systematic review of interventions and the multi-level analysis provide support for the theory in relation to sexual debut, but not other behaviours, such as contraception use, which become relevant once sexuality activity has begun. Thus, the school-related factors important for sexual debut, such as commitment to learning and sense of belonging, are not necessarily the same for other STI and pregnancy prevention decisions which may occur later in adolescence. The theory needs further clarification in relation to how school processes might impact students' health at key periods of development, informed by research that explores school-related processes at varying ages. These refinements may include: 1) a strong emphasis on strengthening commitment to school prior to first sexual

experience (i.e. late childhood and early adolescence) (Reider, Robertson, & Sims, 2014) by implementing interventions in late primary and early secondary school; 2) implementing additional structural supports for academics and developing social networks within schools at key transition periods, including transition from lower to upper secondary school and when changing schools (Day & Sammons, 2016); and 3) opportunities for middle and older adolescents to utilise capacities for practical reasoning and affiliation in school (via greater control over educational choices) and in the context of sexual decision-making (via enabling access to contraception and reproductive health care once sexual activity begins) (S. M. Sawyer, Reavley, Bonell, & Patton, 2017).

Application to varying social and economic contexts

A further area for refinement is a more thorough exploration of how the theory operates in varying social and economic contexts. This thesis provides little support for the theory in low- and middle-income country settings, primarily because studies in LMIC settings identified through the systematic reviews of observational and intervention studies focused on enrolment in school and did not explore further school processes. However, one school-level study identified in Chapter 4's systematic review on observational studies suggests that school-level factors, such as mean academic performance and mean satisfaction with school, were associated with lower rates of early sexual debut (Kim, 2015), indicating that within-school processes are important for schools in these settings and that additional research examining these contexts are needed.

One such area further research should explore is indicated in findings from the systematic review and synthesis of qualitative studies which suggests that schools in some low-income settings were both a source of and protection from sexual coercion. Young women reported that some male teachers expected sexual relationships in exchange for better grades or treatment in school (Jones & Norton, 2007). As with other school sources of psychological or physical harm described in qualitative studies by young women from high-income countries, the erosion of trust may lead to a lack of commitment to school and a desire to drop out, possibly leading to an increased risk of adolescent pregnancy and STIs (as supported by evidence from observational and interventions studies on enrolment identified in Chapter 4 and 6).

Other young women from low-income country settings reported that school served as a physically safe space from potential sexual partners who expected sex in exchange for money or material goods (Willemsen & DeJaeghere, 2015), suggesting that strong, rather than weak, boundaries between the school and community were needed to prevent sexual risk behaviour and unintended pregnancy. The theory does not account for scenarios in which a weakening of community and school boundaries may lead to poorer health. This may be relevant for high-

income countries as well. For example, stronger boundaries between school and community may be particularly important in regions where conservative policies on sexual health education are associated with higher rates of adolescent pregnancies and birth, even after adjusting for state-level poverty and unemployment (Fox et al., 2019). The theory would benefit from additional study on how schools can protect student health in the context of communities that may perpetuate helpful and harmful values simultaneously. This may include, as others have suggested, experimental and observational studies that examine the relationship between school and neighbourhood effects across settings with varying socio-economic advantage and in LMIC settings (Bonell, Fletcher, et al., 2016).

Application to varying social and cultural identities

A final area for refinement is an exploration of the extent to which the theory applies to youth with varying social and cultural identities. This thesis focused on general populations of adolescents with potential access to school, and, therefore, did not specify particular groups in data collection or analyses based on gender, sexual orientation, race/ethnicity or socioeconomic status. The exception to this was the focus of the systematic review of qualitative studies on young women's experiences. The primary justification for this focus was the policy and research focus on the potential consequences of sexual and reproductive health outcomes, particularly pregnancy and parenthood, on girls' schooling status (Basch, 2011). Though some included studies represented mixed gender groups (n=7), the majority of study used female-only samples (n=21). While the qualitative synthesis revealed some broad themes which could reasonably be extended across gender, this approach is limited in its ability to explore differences by gender, such as how similar school experiences shaped the educational and life trajectories of male students, and whether those trajectories impacted their sexual decision-making in ways that align with or diverge from young women's accounts and from the theory. Later components of this thesis were expanded to be inclusive of all genders and reveal questions about differences in gender in response to interventions aligned with the theory. For example, the Aban Aya Project reported a 65% reduction in boys in a school environment intervention engaging in recent sexual activity compared with boys in the control; while reductions in recent sexual activity among girls in the intervention as compared to control, though similar in pattern, were not significant (Flay et al., 2004). The qualitative review can provide some insight into how specific intervention components might be developed for young women specifically, including a strong emphasis on relationship-building between teachers and students, incremental student control over educational interests and choices, greater representation intersectional identities in school curriculum, and policies which do not alienate young women sympathetic to young parenthood. Future research could expand on the specificity of these strategies, and how they align with the theory, by

comparing the ways in which male students respond differently to school and whether this has any impact on their sexual or reproductive choices.

Similarly, future research could expand on the ways that theory aligns with the experiences of sexual minority youth. LGTBQ youth were not explicitly excluded from this thesis (for example, students who reported sexual behaviour with someone of the same or different gender were both included in the longitudinal analysis); though, no studies included in the reviews explicitly focused on LGBTQ youth. Qualitative evidence on school climate suggests that LGBTQ youth identify similar themes in their school experiences, including the need for psychological and physical safety, relationships with teachers, and representation of their identities in school curriculum (McGuire, Anderson, Toomey, & Russell, 2010). LGBTQ youth also report choosing to attend schools that offer refuge from physical and emotional harm caused by fellow students and/or school personnel at previous schools but that do not offer the same academic rigor or range of extracurricular activities (McGuire et al., 2010), reducing opportunities to achieve academically, be involved in school or aim for higher education, all potential protective factors for sexual health. New research can examine how these experiences, as well as others that align with theory, may influence the sexual health decisions of LGBTQ youth during adolescence and into adulthood.

Race and ethnic identities were more commonly, though still infrequently, addressed in studies included in this thesis's reviews. Among studies that reported outcomes separately by race/ethnicity, educational factors appear consistently important for populations of black, Latinx and American Indian youth (Costa, Jessor, Donovan, & Fortenberry, 1995; Greene, Eitle, & Eitle, 2018; Hoskins, 2001; Mersky & Reynolds, 2007). Further several school environment intervention studies with evidence of effectiveness implemented in school districts had high proportions of black, Latinx and Pacific Islander students (Beets et al., 2009; Flay et al., 2004; J. D. Hawkins et al., 1999). While this quantitative evidence suggests that the theory aligns with how schools may work to influence sexual health among students of colour, the qualitative review provides insight into their unique experiences of school. The unfair treatment of black and Latinx young women in the qualitative synthesis was a recurring theme, indicated in the explicit and implicit messages about race and gender they received from their teachers, the lack of cultural representation at their schools and in the curriculum, and exclusion from school activities. As suggested previously, interventions which focus on restorative justice techniques both align with theory and place particular emphasis on the reconstruction of relationships which may have previously caused harmed through structural and interpersonal racism (Fronius et al., 2016). However, though they acknowledge the

general differences among groups of students with different socioeconomic status, Markham and Aveyard's theory does not reflect the racism, homophobia, transphobia and sexism that mark young people's school experiences with their teachers and peers as described in this thesis and elsewhere. Therefore, there is potential for the theory to be applied to interventions or strategies which do not take account for the experiences of young people with social disadvantage and, therefore, further exacerbate both educational and health disparities within schools.

Summary of theory refinements

Collective findings from this thesis suggest that in order for the theory of human functioning and school organisation to be applicable to sexual health, some refinements are essential. Figure 7.1 illustrates proposed refinements to the theory based on the empirical findings described above. The refined version outlines four components: 1) school processes which shape the school instructional and regulatory orders and students' commitment to the orders; 2) student commitment to parallel school-driven and student-driven instructional and regulatory orders; 3) student development and use of the capacities for practical reasoning and affiliation; and 4) health behaviours and outcomes. In Component 1, schools may implement strategies that weaken or strengthen boundaries between school and the external community, management and the school community, teachers and students, students and other students, and students and the academic curriculum. As in Markham and Aveyard's original theory, schools may seek to weaken these boundaries in order to more closely align the values and

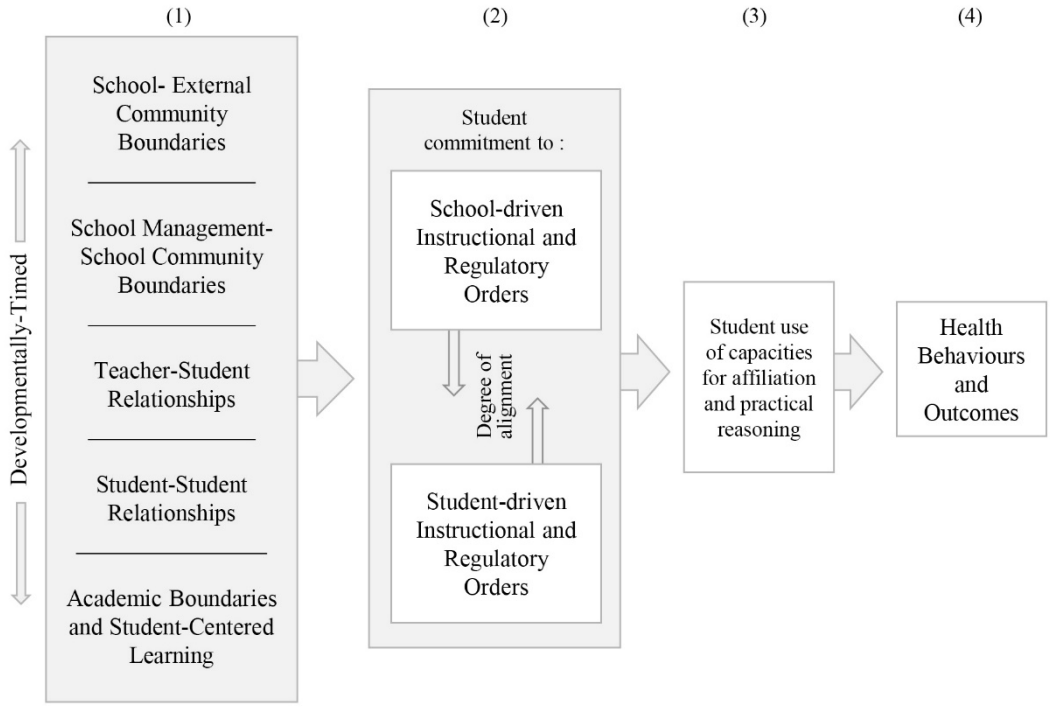

Figure 7.1: Refined theory of human functioning and school organisation

goals of stakeholders in the school community, including administrators, staff, students, and families. However, in certain cases, strengthening boundaries may be necessary, specifically when it concerns the protection of students from bullying, harassment and assault by other students, teachers or community members and from cultural norms that put students' health at risk, such as restrictive access to necessary reproductive health care. These strategies are best implemented when they are student-centred and consider the developmental age of students.

Component 2 concerns the degree to which students are committed to the school- or student-driven instructional and regulatory orders within the school community. Where school- and student-driven orders align substantially (by implementing strategies effectively in Component 1), it would result in high numbers of 'committed' students and less distinction between school- and student-driven orders, making it easier for any individual student to adopt and meet the expectations of the instructional and regulatory orders. Where school- and student-driven orders are left substantially out of alignment, the school may experience many different groups of committed, detached, estranged and alienated students, resulting in multiple instructional and regulatory orders. Students who find that committing to the school-driven instructional and/or regulatory orders is undesirable (i.e. detached or alienated students) would likely align with student-driven orders. Students who find themselves incapable of meeting the expectations of the school-driven instructional order but align with the values of the regulatory order (i.e. estranged) will likely be forced to manage competing school- and student-driven orders. As Markham and Aveyard suggest, commitment to the instructional and regulatory orders will contribute to the development of capacities for practical reasoning and affiliation. However, with competing school- and student-driven orders, these capacities can be, at least partially, developed without needing to commit fully to the school-driven orders.

In Component 3, students use the capacities for affiliation and practical reasoning they have developed to make health decisions (Component 4). The use of these capacities will be shaped by their values, which are aligned with either or both school- and student-driven instructional and regulatory orders. In schools with aligned school- and student-driven orders, some students may still make health choices, such as having sex during adolescence or becoming a young parent, which do not fit within traditional school values. However, health decisions around those choices (e.g. using contraception, getting tested and treated for STIs, accessing pre-natal care) may be more supportive of achieving long-term health, education and career goals than would have been possible in schools where school- and student-driven orders were out of alignment.

While these refinements are based on the findings of this thesis, and therefore are based in evidence on sexual health outcomes, the extensions I have proposed to the theory could likely

be applied more broadly to other health behaviours and outcomes. School environment research on health outcomes, such as substance use, suggests shared school-related determinants (Bonell, Parry, et al., 2013; A. Fletcher, Bonell, & Hargreaves, 2008; Shackleton et al., 2016) and has identified similar refinements to the theory (Bonell, Fletcher, et al., 2016; Jamal et al., 2013). Further, because engagement in school is a potential determinant of academic achievement (Kutsyuruba, Klinger, & Hussain, 2015), refinements to this theory may benefit other outcomes important to school functioning, including educational performance and school completion.

Implications for research

Further refinement of the theory can be supported by additional research on school-related determinants of adolescent sexual health. First, additional qualitative studies are needed to more explicitly explore, from the perspective of young people, constructs from the theory of human functioning and school organisation in relation to sexual health and commitment to school. Qualitative studies can assess the plausibility of the theory by investigating whether young people's accounts of school processes and experiences resonate with or contradict decisions or pathways as would be predicted by the theory, including whether accounts differ over time and how (or whether) young people acknowledge school experiences as conditions for their sexual and reproductive decision-making. Topics might include those areas identified as refinements to theory, such as peer regulatory and instructional orders, extent and type of involvement in school decision-making needed to increase commitment to school, the role of discipline and management policies, and key developmental or other transitions at risk for eroding commitment to school. Further, these topics should be explored in a broader range of low-, middle- and high-income country settings. Studies should include a broad range of students, and not just those who became young parents. Longitudinal qualitative studies could contribute to our understanding of factors important at different points of development, and whether young people's decision-making processes and behaviour later in adolescence align with how the theory would have predicted them.

Second, additional longitudinal studies are needed to explore potential school-related determinants of sexual health, specifically those that align with the constructs in the theory of human functioning and school organisation. Studies should examine the associations of sexual behaviour and health outcomes with the compositional and contextual features of school, as well as consider the interaction with neighbourhood effects. Studies should: examine direct measures of school engagement (i.e., compositional measures of aggregated student-reported commitment and belonging) rather than proxy measures based on academic attainment scores; assess contextual measures of school processes (e.g. teacher-reported or observed school policies, school climate, etc.); and explore possible parallel peer regulatory or instructional

orders (e.g., sense of belonging by subsets of social networks within schools). In addition, these studies should explore possible pathways via mediation analysis across three or more time points. Individual- and school-level studies should be conducted in LMIC settings that explore school-related factors beyond educational attainment, enrolment and material deprivation. Studies might also explore how engagement in school is associated with subsequent sexual behaviour depending on the timing of engagement (e.g. before and after transitions from lower to upper secondary school).

Finally, randomised control trials of school environment interventions addressing sexual health should be conducted in ways that can separate the effects of health and social development curricula from school environment components, such as by factorial designs or separate trials compared through meta-regression. Additionally, trials which can effectively compare and contrast intervention components, such as MOST evaluations, (Kugler, Balantekin, Birch, & Savage, 2016) could support our understanding of the relative and cumulative effectiveness of components aligned with different constructs of theory of human functioning and school organisation (e.g., teacher training to improve relationships with students, school/community action teams to align values and goals, etc.). These interventions should be informed by theory, be developed with young people, and aim to improve school-level commitment to school and student-level educational assets simultaneously. Trials of these interventions are needed in low- and middle-income settings and in various socio-economic contexts in high-income countries. Such studies should explore how students' gender and socio-economic status, as well as school-level institutional and neighbourhood factors, moderate the effects of interventions. While interventions should take place in late childhood or early adolescence, trial follow-up should extend later in adolescence in order to examine the effects on risk behaviours and conceptions when rates of sexual activity are higher.

Implications for policy and practice

Findings from this thesis suggest that the school is an important upstream determinant of sexual health. Interventions which address the school environment offer a pragmatic solution to current challenges in school-based sexuality education, such as limited timetables and conservative policies on sex education. In addition, they may also achieve other health and education benefits appealing to schools and communities. There is a diversity of opinions on the role of school in society from workforce preparation (Bernstein, 1975) to civic participation (Cohen, 2006). Yet, teachers are largely trained and held accountable for improving specific academic skills, such as language, mathematics and science (Cohen, 2006). While school staff may feel health is outside of their role and skill set, students are still bringing their broader developmental and health needs with them to school (O'Reilly et al.,

2018). The strategies outlined in this thesis provide a way for school staff and teachers to improve the functioning and relationships within their school, beneficial to their role as educators, while also promoting the health of their students. Interventions should include a range of strategies. Schools should be cautious in imparting implicit or explicit messages that stigmatise young parents or students without higher education trajectories. For example, policies which support 'success sequencing' – the idea that waiting to have sex until after graduating high school, becoming financially stable and marrying will lead to fewer adolescent pregnancies and less poverty – may actually further alienate young people with weak attachment to school, and contribute to unintended pregnancy and poorer health. To support young people's health, schools should consider the broader environment as well as the individual assets and relationships that promote commitment to school. For example, schools might administer and examine data from school climate surveys, such as the California Healthy Kids Survey (California Department of Education, 2019) or the Beyond Blue Climate Questionnaire (M. G. Sawyer et al., 2010), to identify features of the school environment related to sexual health in need of improvement. In addition, schools should involve young people, families and the community in decisions about the school, such as through school action teams, engaging those most at risk for becoming detached, estranged or alienated. Engaging young people in such activities leverages young people's development of autonomy by providing them more control over their lives and choices within school. Finally, schools should provide professional development and support for teachers in order to enable them to create and maintain positive relationships with students, especially during vulnerable periods of transition.

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Appendix A.1 Qualitative Systematic Review Protocol

A protocol for a systematic review examining the influence of school experiences and educational assets on sexual health and teenage pregnancy: a qualitative synthesis

Background

Adolescence is a critical period for health. Young people experience biological, cognitive and social transitions that influence their health-related behaviors and outcomes throughout adolescence and into adulthood. (Sawyer et al., 2012) In the United States, more than 60% of teens will have sex before they graduate high school. (Centers for Disease Control and Prevention, 2014) However, rates of sexual risk behavior – including failure to use condoms or contraception, multiple or concurrent partners and concurrence with other risk behaviors, such as drugs and alcohol – are not equally distributed across the adolescent population. Sexual risk behavior and associated outcomes, such as unintended pregnancy, sexually transmitted infections (STI) and HIV/AIDS, are disproportionately represented among youth with lower socioeconomic status, youth of color and young people who live in geographically rural areas. (Hamilton, B.E., Martin, JA, Osterman, M.J.K., & Curtin, 2015; Martin, Hamilton, Osterman, Curtin, & Matthews, 2015; The National Campaign to Prevent Teen and Unplanned Pregnancy, 2013) Even with progress over the last twenty years, (Martin et al., 2015) inequities in sexual behavior and teen pregnancy call for strategies that specifically understand and address upstream determinants of health.

Next to the home, young people spend most of their time interacting with peers, teachers and other important adult figures in school (Kaftarian et al., 2004). Therefore, schools are considered high-potential environments for supporting healthy growth and development and fostering educational assets associated with healthy behavior, such as academic success and optimism for future opportunities (Viner et al., 2012; Muennig & Woolf, 2007)(Freudenberg & Ruglis, 2007). This paper outlines a protocol for exploring the role of school and educational experiences and assets on adolescent sexual decision making and teenage pregnancy through a systematic review of qualitative studies.

Several theories and frameworks present explanations for how the school might influence adolescent health (Hawkins & Weis, 1985; W. A. Markham & Aveyard, 2003). Markham and Aveyard (W. A. Markham & Aveyard, 2003) pose in their theory of human functioning and school organization that schools can promote healthy behaviors by improving students' response to the instructional (i.e., promoting knowledge and skills) and regulatory (i.e.,

promoting character and good conduct) orders of the institution. The authors propose that schools should seek to strengthen relationships between staff and students, adopt instructional and regulatory practices that are student-centered, and break down cultural boundaries between schools and the external communities to which the students belong. Similarly, the social development model states that healthy behavior is the result of bonding with pro-social institutions and peers (Hawkins & Weis, 1985). It is theorized that bonding (commitment, attachment and belief) is achieved by providing youth with opportunities for involvement, skills to engage meaningfully and reinforcement to sustain engagement. Schools may provide these opportunities directly (e.g. instruction and activities) or indirectly (e.g. school climate policies). Markham and Aveyard's theory and the social development model are echoed in the positive youth development (PYD) literature. PYD theory provides a framework for describing upstream school-related determinants that might influence sexual behavior, contraceptive use and pregnancy decision making, including supportive adult relationships, school climate and culture, engagement in learning and activities, and high educational expectations (Benson, 2007).

Existing research from the health literature supports these theories. Multiple outcome studies indicate that school-based interventions have the potential to influence teen pregnancy and associated risk behaviors by addressing school-level (Basen-Engquist et al., 2001)(Patton et al., 2006)(Flay et al., 2004) and individual-level determinants (Philliber, Williams Kaye, Herrling, & West, 2002; Flay et al., 2004; Patton et al., 2006; Allen, Philliber, Herrling, & Kuperminc, 1997) related to the school environment and educational assets. Individual-level longitudinal studies report temporal relationships of attitude to school, school engagement, school connectedness, educational expectations or aspirations with sexual initiation and activity, condom or contraceptive use, and pregnancy or birth (C. M. Markham et al., 2010; Kogan et al., 2013; Bonell et al., 2005; Rink, Tricker, & Harvey, 2007; White & Warner, 2015). However, multilevel model studies examining whether school-level factors, such as attending schools with levels of school connection and educational aspirations, impacts school population outcomes are few in number and have produced mixed results (Henderson, Butcher, Wight, Williamson, & Raab, 2008; White & Warner, 2015). This might reflect a lack of consistency in defining and operationalizing school-related exposures (Wang & Degol, 2015).

Due to the complexity of the mechanism by which school experiences or educational assets might influence sexual and reproductive decision-making, qualitative studies can make a critical contribution. Qualitative health research explores the context, meaning and processes of decisions and events leading to behaviors and outcomes through the perspectives of key stakeholders (Green & Thorogood, 2013) and can bring to light the specific values and meanings of the school environment and educational experiences for young people and,

through analysis, their interrelation with sexual decision-making. This review will use a synthesis method designed specifically for qualitative research, which 'goes beyond' aggregating original studies, to produce new theories relevant across multiple settings and populations (Noblit & Hare, 1988; Thomas & Harden, 2008). With a thematic synthesis approach, this review will consider new hypotheses about the processes by which schools might influence adolescent sexual health outcomes across a range of contexts.

Several systematic reviews have been conducted of qualitative research on sexual behavior, pregnancy, and parenthood choices in youth. Harden et al.'s review (Thomas & Harden, 2008) on pregnancy and social disadvantage was limited to studies conducted in the UK. Given the broad nature of the research aims, Jamal et al.'s mixed-methods review (Jamal et al., 2013) on school environment and student health, likely missed several sexual health-focused studies. Additional reviews examined the experiences of teen parents but did not explicitly explore school or education prior to pregnancy (Graham & McDermott, 2005; Spear & Lock, 2003) and young people's experiences of school-based sex education but not broader school experiences.(Pound, Langford, & Campbell, 2016) This review builds upon previous syntheses by: 1) focusing on evidence of young people's accounts of how *broader* school and education experiences influence sexual health decisions *prior* to pregnancy; and 2) capturing studies missed or published since the last similar review was conducted in 2012. The current review will involve a comprehensive search as well as inclusion criteria which include studies of young people (not just young parents) in any country, regardless of whether or not school experiences and educational assets are the primary focus of the study.

Further, previous studies have considered how Markham and Aveyard's theory (2003) has aligned with the health literature related to substance use (Bonell, Fletcher, Jamal, Aveyard, & Markham, 2016) and broader health outcomes (Bonell et al., 2013) and in multilevel studies on smoking, substance use, drinking and misbehavior. (Aveyard et al., 2004; Bisset, Markham, & Aveyard, 2007; Bonell et al., 2017; W. A. Markham et al., 2008; W. A. Markham, Young, Sweeting, West, & Aveyard, 2012; Tobler, Komro, Dabroski, Aveyard, & Markham, 2011) To date, there has been no comprehensive examination of the theory in relation to sexual health outcomes among adolescents. This review will examine how young people's accounts of their school and education experiences align with Markham and Aveyard's theory in relation to their sexual health decision-making. Findings from this review may identify specific aspects and processes of the school that influence young people's decisions related to sex, contraception and pregnancy and add new detail or provide alternative explanations for concepts outlined the theory of human organization and school functioning.

Study Aim & Objectives

Study Aim

The purpose of this research is to answer the question: *how are school experiences and educational assets implicated in young women's accounts of their attitudes and actions relating to sex, contraception, pregnancy and parenthood?*

Objectives

1. To conduct electronic and other searches for qualitative research with young people, aged 10-19.
2. To screen references and reports for inclusion in the review.
3. To extract data from and assess quality of included reports.
4. To synthesize data from included studies using thematic synthesis.

Methods

This review will follow PRISMA reporting guidelines.

Available Literature

A preliminary search was conducted in Web of Science Core Collection using the search terms in Appendix A.2. A total of 25,187 citations were yielded. The first 800 were screened on title, abstract and key words and included 5 citations that were very likely to meet the inclusion criteria and an additional 11 that would require full text to determine inclusion. Although this represents only one database and a sample of the total citations, preliminary screening indicates that there are a sufficient number of studies to conduct a thematic synthesis.

Eligibility criteria

An eligibility criteria tool (Appendix A.4) has been developed to guide the assessment of qualitative studies based on titles, abstracts and full text. The tool will be piloted on 50 citations to ensure the tool consistently and accurately excludes studies that are not relevant to the research question. Studies will not be excluded on the basis of quality. Instead quality will be used to inform interpretation and qualitative weighting of study findings.

Target Population: Studies where the majority of participants are female.

Study Topic: Studies will be included if they report on young women's accounts of school experiences and educational assets and how these are implicated in attitudes and actions relating to sex, contraception, pregnancy and parenthood when the women were aged 10-19 years.

Types of Studies: Studies that employ qualitative data collection and analysis methods to report on the experiences of young women. Methods must include data derived from study participant directly, such as individual or group interviews.

Date: Studies published from 1990 onwards.

Information sources

Databases: The following databases will be searched: BiblioMap, CINAHL Plus, ERIC, Medline, PsycINFO, and Web of Science Core Collection (includes Social Science Research Index, Science Citation Index, Book Citation Index – Science & Social Sciences).

Other Search Methods: In addition to database searching, the following additional search methods will be employed:

1. Reference checking of all studies that meet the inclusion criteria;
2. Citation searches of all studies that meet the inclusion criteria via Google Scholar and Web of Science Cited Reference Search;
3. Subject matter expert contact to identify unpublished or current research (Appendix A.3);
4. Google web search of search concepts; and
5. Hand search of journals identified through reference checking which are not included in searched databases.

Search

This reviews aims to capture themes in multiple media (including peer reviewed articles, books, book chapters and grey literature) that may be embedded in studies with aims broader or different than school and educational experiences and assets and sexual health and teen pregnancy. Thus, several rounds of free text and subject heading searches were piloted to assess the precision and specificity of search terms. Search terms cover three concepts: 1) school/education OR adolescent; 2) sexual behavior, pregnancy or parenthood; and 3) qualitative research designs. School/education terms were informed by Bonell et al's (Bonell et al., 2011) review on school environment interventions and qualitative research design terms were adapted from Rees et al's (Rees et al., 2010) qualitative review on young people's views about weight. Results will be filtered on date. Search terms and Boolean operators for one database (Web of Science) have been developed to determine an adequate number of qualitative studies for review. These search terms will be adapted for the databases listed above.

There are particular challenges to searching for qualitative research designs. Most databases have only recently included qualitative design indexing and index terms can vary by database (Ring, N, Ritchie, K, Mandava, L, & Jepson, R, 2010). Further, design methods or topics

might not be explicit in the title, increasing the likelihood of excluding relevant studies(Flemming & Briggs, 2007). Thus, this review will aim to increase sensitivity and specificity by: searching both free text and thesaurus terms appropriate to the databases searched; utilizing alternative search methods, including citation searches and web searches; and by assessing exclusion on both titles and abstracts. To maintain a replicable and manageable search strategy, the number of databases to be searched has been limited and all searches will be systematically documented.

Study selection

All search results will be downloaded into EPPI-Reviewer 4. Using the piloted eligibility criteria guidance tool, studies will be screened for inclusion based on titles and abstracts in the order that criteria are outlined in Appendix A.4. Studies that meet the initial screening (date, language, study design and population) or studies where exclusion cannot be determined by title/abstract will be accessed and assessed. This process is to ensure that studies where school or education is not the primary topic are fully considered for inclusion. Excluded studies will be coded with an exclusion justification code.

Data collection: extraction & management

Data will be extracted from studies that meet all of the inclusion criteria, using a data extraction form. Studies will be coded using standardized and adapted codes from the EPPI-Centre Health Promotion Keywording Strategy. The following data will be extracted from the included studies: participant characteristics (e.g. age range, race/ethnicity), geographic location, sample size and selection strategy (e.g. purposive), and study methods. Equity-related codes will be developed to ensure the systematic reporting of target or sub-population analysis of disadvantaged groups (i.e. black and Latina girls). The data extraction tool will be piloted by two reviewers then discussed to ensure sufficient detail. Reviewers will then extract data from remaining studies. Where they disagree, reviewers will meet to discuss areas of concern and consult a third reviewer if agreement cannot be reached. Where data are missing, additional information will be requested from the primary author(s) (Appendix A.5). If there is no response or the author is not reachable within 6 weeks, this will be recorded in the risk of bias assessment. Extracted information will be mapped and presented in a table.

Quality assessment & risk of bias

Included studies will be assessed on their methodological quality. Qualitative studies should account for clarity of aims, rationale, methods and findings as well as the strategies used to establish reliability and the appropriateness of analysis methods and interpretation (Thomas & Harden, 2008). A quality assessment tool adapted from Shepherd et al. (Shepherd, J et al., 2010) will be piloted by two reviewers and discussed for consistency. Studies will not be

excluded based on quality but will be assigned two sets of scores (low, medium, or high) based on reliability and usefulness (Shepherd, J et al., 2010). Reliability is defined as the extent to which the researchers employed appropriate designs and methods for their stated aims (e.g. reflexivity, participant selection, data collection and analysis). Usefulness is defined as the degree of relevance to this review's research question. Remaining studies will be assessed by the two reviewers. Any disagreements will be discussed and referred to a third reviewer where consensus cannot be reached.

Synthesis of results

While many qualitative synthesis have grown out of or borrowed from Noblit and Hare's seminal work on meta-ethnography (Noblit & Hare, 1988), there are meaningful epistemological and operational differences between methods (Barnett-Page & Thomas, 2009). This review will use thematic synthesis to code, analyze and synthesize primary studies which is rooted in qualitative principles but attempts to apply synthesis systematically (Barnett-Page & Thomas, 2009; Thomas & Harden, 2008). Based on an approach developed by Thomas and Harden (Thomas & Harden, 2008), the process begins by conducting a line-by-line coding of primary studies followed by the translation of studies between each other to produce descriptive themes. Translation between studies may produce themes that conform and extend across studies (e.g. reciprocal synthesis), build upon each other to create a logical argument (e.g. line-of-argument synthesis), or fundamentally conflict (e.g. refutational synthesis) (Noblit & Hare, 1988). Synthesis is finally achieved by applying a theoretical frame (e.g. the research question) to descriptive themes resulting in analytical themes, termed 'third-order interpretations' by Noblit and Hare (Noblit & Hare, 1988). The following three phases will be performed during synthesis stage:

1. *Coding and translating studies*. Results and discussion sections of individual studies will be read and re-read to code second order interpretations (themes and concepts identified by the original study authors) and first order interpretations (accounts of the original study participants) that support them (Britten et al., 2002). Concepts and themes related to school and educational assets and attitudes and actions relating to sex, contraception, pregnancy and parenthood will be identified by individual study through line-by-line coding (Thomas & Harden, 2008). The translation of studies between each other will develop as codes are applied to new studies. A qualitative

analysis software package, such as EPPI Reviewer 4, will be used to track and apply codes.

2. *Develop descriptive themes*. Descriptive themes will be generated by grouping relevant codes into overarching themes that meet criteria for economy, cogency, range and credibility (Noblit & Hare, 1988). To ensure descriptive themes are representative of data from the primary studies, themes, codes and studies will be mapped and audited for appropriate fit.
3. *Create analytical themes*. In the final stage, descriptive themes will be organized to develop analytical themes that address the question of how school context and educational assets are implicated in accounts of attitudes and actions related to sexual behavior, contraception, pregnancy and parenthood. For example, studies might be organized into those referencing the school environment (e.g., relationships at school, physical space) and those concerning individual-level assets (e.g., personal aspirations, attitude to school). The synthesis created, thus, preserves the original study interpretations while producing new interpretations that facilitate greater understanding of the influences of school and school-related assets on sexual behaviors decisions of youth across of variety of contexts. The synthesis will be presented narratively and in a synthesis table.

Conclusion

This paper outlines a protocol for conducting a systematic search and synthesis of qualitative studies with the aim of understanding the processes by which schools and school-related assets influence young people's decisions around sexual behavior and pregnancy. Findings from this study will help inform the identification and development of core components for interventions that aim to reduce teen pregnancy in school settings.

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Appendix A.2 Database Search Strategy and Results

	Search Terms	*Medline (Ovid)*	*CINAHL Plus (EBSCO)*	*PsychINFO (Ovid)*	*ERIC (EBSCO)*	*ProQuest Dissertations and Theses Global*	*Web of Science Core Collection*	*British Education Index (EBSCO)*	*Australian Education Index (ProQuest)*
		1 Feb 2016	1 Feb 2016	21 Feb 2016	21 Feb 2016	25 Jan 2016	21 Feb 2016	26 Jan 2016	26 Jan 2016
S1	Educat* OR school	542,740	253,038	555,245	808,630	465,566	911,904	92,422	120,681
S2	Goal* OR likelihood OR intention* OR aspiration* OR engagement OR involvement OR commitment OR interest OR contribution OR dislike OR attainment OR asset* OR failure OR attendance OR success* OR system*	4,710,960	590,634	1,142,782	517,372	1,397,182	9,229,388	24,838	56,649
S3	**S1 AND S2**	156,100	66,938	199,444	323,228	214,493	260,687	14,860	40,872
S4	"locus of control" OR "internal poverty" OR "external poverty"	5,252	1,709	13,202	2,867	9,013	6,210	90	208
S5	**S1 OR S3 OR S4**	547,203	254,327	565,814	810,286	471,356	917,074	92,479	120,752
S6	Teen* OR adolesc* OR youth* OR pubescent OR juvenile* OR "young person" OR "young people" OR girl OR "young women" OR minor*	587,014	149,540	326,588	138,527	153,897	914,435	8,959	13,717
S7	student OR "school-aged" OR "dropout" OR "middle school" or "high school" OR pupil	98,751	86,556	181,779	626,248	304,609	431,876	35,366	69,931
S8	**S6 OR S7**	670,157	223,531	477,868	703,356	421,248	1,279,050	42,508	77,812
S9	pregnan* OR conception OR abortion OR "family planning" OR "safe* sex" OR "protected sex" OR "unsafe sex" OR "unprotected sex" OR "sexual behavio?r" OR "sexual risk" OR "sexual risk-taking" OR "sexual intercourse" OR "sexually active" OR sexuality OR (sex* ADJ2 initiation) OR (sex* ADJ2 activity) OR (sex* ADJ2 debut) OR condom OR STI OR STD OR "sexually transmitted infection" OR "sexually transmitted disease" OR	580,345	107,597	124,306	23,674	79,563	616,037	2,310	2,902

	chlamydia OR gonorrhea OR contracept* OR "birth control" OR abstinen* OR "barrier method*" OR (intrauterine ADJ1 (device OR system OR contracept*)) OR "long-acting reversible contracept*" OR LARC								
S10	**S8 AND S9**	41,571	14,976	23,851	13,094	14,959	56,768	1,099	1,650
S11	"teen* parent*" OR "young parent*" OR "teen* mother*" OR "teen* mom*" OR "young mother*" OR "early pregnan*"	16,229	2,916	2,811	1,367	2,385	18,794	34	50
S12	**S10 OR S11**	56,379	17,327	25,842	13,968	16,173	74,018	1,126	1,673
S13	**S5 AND S12**	12,054	5,546	9,041	9,173	7,742	17,318	667	1,226
S14	(interview* OR discussion*) ADJ3 (semi-structured OR unstructured OR informal OR in-depth OR face-to-face OR structured OR guide	58,605	31,185	61,447	14,916	58,361	303	1590	2,848
S15	qualitative OR "focus group*" OR interview* OR narration OR stories OR meaning* OR perspective* OR concept* OR belief* OR attitude* OR perceive* OR perception* OR fieldwork OR "field work" OR "key informant" OR "case stud*" OR ethnograph* OR "purpos* sampl*" OR "content analysis" OR "action research" OR discourse*	1,297,136	418,879	1,320,923	518,847	975,624	2,636,259	44,083	70,276
S16	Qualitative research OR interviews OR grounded theory	25,089	157,224	21,174	NA	203,177	NA	424	10,467
S17	(process OR formative OR pilot OR preliminary) ADJ2 evaluation) OR feasib* OR accept* OR delivery OR (intervention ADJ3 (implementation OR planning)	818,919	133,685	175,982	72,593	3,883	1,193,426	2733	8,146
S18	**S14 OR S15 OR S16 OR 17**	2,009,857	574,804	1,422,276	562,821	1,094,597	3,660,974	45,532	76,783
S19	**S13 AND S18**	6,062	3,251	5,282	6,183	6,551	11,173	583	1,096
S20	Limit S19 to 1990-Current	5,237	3,211	4,676	4,819	5,597	10,521	574	1,040

Appendix A.3 Subject Matter Expert Request Letter for Study Search

Dear [ENTER NAME],

I am a doctoral researcher from London School of Hygiene and Tropical Medicine. I am undertaking a systematic review of qualitative studies on *how are school experiences and educational assets implicated in young people's accounts of their attitudes and actions relating to sex, contraception, pregnancy and parenthood.* The protocol for the study is available here: [ENTER URL]

I am writing to you as a subject matter expert to request information on any studies that meet the following criteria:

- Utilizes qualitative data collection and data analysis methods
- Reports on school or education AND sexual health attitudes and behaviours (e.g. sexual activity, contraception use, pregnancy, abortion, and/or parenthood)
- Published after 1990

If you are aware of any studies that possibly meet these criteria, could you please send me citation information (e.g. author, title, journal and/or year) by [ENTER DATE]?

Please feel free to contact me with any questions about the review criteria. I would also appreciate the names and contact information of any additional subject matter experts who might have knowledge of studies that meet the review criteria. My current list of contacts is attached.

Thank you in advance for your assistance.

Best wishes,

Amy Peterson

Appendix A.4 Eligibility Criteria Tool

Criteria	Description	Guidance
Date	Exclude studies published before 1990	Filter search on date. If filter is not available, apply this criteria first.
Language	Do not exclude studies based on language.	Studies are not excluded on geographical location or language. Include all high, middle and low income countries.
Type of Studies	Exclude studies that are not qualitative OR did not collect data directly from study participants.	Exclude: • Intervention studies and outcome evaluations • Observational studies measuring quantitative associations • Methodological studies • Policy papers or articles • Opinion/think articles Qualitative studies may include participant observation or ethnography but must include individual or group interviews or other data collected in participants' own words.
Population	Exclude studies where the majority of the population are not female.	Exclude studies where more than 50% of participants are not female.
Topic	Exclude studies which do not: Report on school or education experiences and assets described to the right. OR Provide accounts or analyses on how school or education-related experiences and assets influence decisions on sexual behaviour, contraception use, pregnancy, abortion or parenthood	Exclude studies which do not report on school and education experiences and assets as they related to sexual health and pregnancy *outside* of sexual health education. Example topics might include: • Caring adult relationships at school • School climate and culture (e.g. • School safety (including physical and emotional violence) • School boundaries (e.g. clear and fair rules and consequences) • High expectations from teachers and other school staff • Adult role models at school • School connected to community • High expectations for school work • High optimism for future educational opportunities • Academic achievement and support • Engagement in learning and school • School bonding (e.g. cares about school, feels connected to school)

Appendix A.5 Data Request Email for Lead Authors of Identified Studies

Dear [ENTER NAME],

I am a doctoral researcher from London School of Hygiene and Tropical Medicine. I am undertaking a systematic review of qualitative studies on *how are school experiences and educational assets implicated in young people's accounts of their attitudes and actions relating to sex, contraception, pregnancy and parenthood.* The protocol for the study is available here: [ENTER URL]

I am writing to you to request further information about [ENTER STUDY DETAILS] that could not be obtained during the data extraction process.

If possible, could you provide data for the questions indicated in the attached form by [ENTER DATE]?

In addition, I would appreciate the titles and author names of any additional qualitative studies reporting on school and education-related experiences and sexual health attitudes and behaviours that you may be aware of.

Please feel free to contact me with any questions about the review or if there is another member of the study team whom I should contact about this information.

Thank you in advance for your assistance.

Best wishes,

Amy Peterson

Appendix A.6 Quality Assessment Tool

Criteria used for quality appraisal	Codes
1. Were steps taken to increase rigour in the sampling? Consider whether: • the sampling strategy was appropriate to the questions posed in the study (e.g. was the strategy well reasoned and justified?); • attempts were made to obtain a diverse sample of the population in question (think about who might have been excluded; who may have had a different perspective to offer); • characteristics of the sample critical to the understanding of the study context and findings were presented (i.e. do we know who the participants were in terms of, for example, basic socio-demographics, characteristics relevant to the context of the study, etc.).	Yes, a fairly thorough attempt was made Yes, several steps were taken Yes, a few steps were taken No, not at all/ Not stated/Can't tell
2. Were steps taken to increase rigour in the data collected? Consider whether: • data collection tools were piloted/(and if quantitative) validated; • (if qualitative) data collection was comprehensive, flexible and/or sensitive enough to provide a complete and/or vivid and rich description of people's perspectives and experiences (e.g. did the researchers spend sufficient time at the site/with participants? Did they keep 'following up'? Was more than one method of data collection used?); • steps were taken to ensure that all participants were able and willing to contribute (e.g. processes for consent, language barriers, power relations between adults and children/young people).	Yes, a fairly thorough attempt was made Yes, several steps were taken Yes, a few steps were taken No, not at all/ Not stated/Can't tell
3. Were steps taken to increase rigour in the analysis of the data? Consider whether: • data analysis methods were systematic (e.g. was a method described/can a method be discerned?); • diversity in perspective was explored; • (if qualitative) the analysis was balanced in the extent to which it was guided by preconceptions or by the data); • the analysis sought to rule out alternative explanations for findings (in qualitative research this could be done by, for example, searching for negative cases/exceptions, feeding back preliminary results to participants, asking a colleague to review the data, or reflexivity; in quantitative research this may be done by, for example, significance testing).	Yes, a fairly thorough attempt was made Yes, several steps were taken Yes, a few steps were taken No, not at all/ Not stated/Can't tell
4. Were the findings of the study grounded in/ supported by the data? Consider whether: • enough data are presented to show how the authors arrived at their findings; • the data presented fit the interpretation/support claims about patterns in data; • the data presented illuminate/illustrate the findings;	Good grounding/support Fair grounding/support Limited grounding/support

• (for qualitative studies) quotes are numbered or otherwise identified and the reader can see that they don't just come from one or two people.	
5. Please rate the findings of the study in terms of their breadth and depth. Consider whether: (NB: it may be helpful to consider 'breadth' as the extent of description and 'depth' as the extent to which data has been transformed/analysed) • a range of issues are covered; • the perspectives of participants are fully explored in terms of breadth (contrast of two or more perspectives) and depth (insight into a single perspective); • richness and complexity has been portrayed (e.g. variation explained, meanings illuminated); • there has been theoretical/conceptual development.	Good/fair breadth and depth Good/fair breadth but very little depth Good /fair depth but very little breadth Limited breadth or depth
6. To what extent does the study privilege the perspectives and experiences of children? Consider: • whether there was a balance between open-ended and fixed response options; • whether children were involved in designing the research; • whether there was a balance between the use of an a priori coding framework and induction in the analysis; • the position of the researchers (did they consider it important to listen to the perspectives of children?); • whether steps were taken to assure confidentiality and put young people at ease.	Not at all A little Somewhat A lot
7. Overall, what weight would you assign to this study in terms of the reliability/trustworthiness of its findings? Guidance: Think about the answers you have given to questions 1 to 4 above. Score low if the study provided little to no detail on three out of the four reliability criteria. Score high if study provided detail on at least three out of the four reliability criteria.	Low Medium High
8. What weight would you assign to this study in terms of the usefulness of its findings for this review? Guidance: Think (mainly) about the answers you have given to questions 5 and 6 above and consider: • the match between the study aims and findings and the aims and purpose of the synthesis; • its conceptual depth/explanatory power. Score high if study provided both good depth and breadth and if the perspectives of participants were at least somewhat privileged.	Low Medium High
Based on guidance from: *Rees R, Oliver K, Woodman J, Thomas J (2009) Children's views about obesity, body size, shape and weight: a systematic review. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.*	

Appendix A.7 Study Quality

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Agogbuo 2006	Rating	Several Steps	A thorough attempt	Not stated	Fair grounding	Good breadth, limited depth	Somewhat	Medium/Low
	Rationale	Recruited from survey participants in multiple settings in Champaign-Urbana, IL. Selected based on availability and willingness to participate, attendance at secondary school in sub-Saharan country and length of stay in the U.S. Consent acquired at start of interview	Interview questions based on pre-interviews and included forced choice and open-end questions. 60-90 minute semi-structured interviews, some questions added over course of interviews. Interviews recorded and transcribed.	Analysis not reported.	Most themes grounded in participant quotes. Data comes from a range of participants. Enough data is provided to link to interpretations.	Analysis favours longer quotes that are not fully flushed out. Focus of analysis on linking education with use of health care system and not very relevant to review research question.	Provided options for not answering questions, provided breaks and created "frank and open atmosphere."	
Algert 2000	Rating	Several steps	A few steps	Several steps	Good grounding	Limited breadth but little depth	Somewhat	Medium/Low
	Rationale	Recruited from alternative schools and medical center in San Diego area. Worked with teachers and counselors to screen all students for eligibility. Selected based on pregnant/parenting status and racial/ethnic identity as Mexican-American or Anglo-American. Consent from participants and parents/guardians.	One hour interviews conducted during school hours in private room. Interviews tape-recorded or recorded via note-taking. Participants follow-up in a second interview or focus group. Not all questions asked of every participant. Protocols and interview guides not described	Used qualitative content analysis. Read through transcribed interview several times and coded by four pre-determined areas with some themes emerged inductively. Used teacher and counselor data to corroborate 'accuracy' of girls' reports.	Individual stories used as examples of themes. Major themes and most minor themes are linked to quoted data.	Interpretation is not extended well beyond summaries of individual young people's stories. Themes are not fully explored in depth.	Reflexivity not addressed. Incentives ($12/interview) provided. Interviews conducted in English with some Spanish 'interspersed'.	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Arai 2003	Rating	Several steps	Several steps	Several steps	Good grounding	Good depth and breadth	Somewhat	High/High
	Rationale	Recruited using snowballing techniques after recruitment by advertising had limited response. Selected based on parental status before age 20. Consent procedures not stated.	In-depth, face-to-face semi structured 45-60 minute interviews using lifecourse perspectives. Transcribed.	Thematic analysis based on Aronson 2004 and Rice and Ezzy 2000. Process not fully described in text.	Balance of quotes and linking themes. Each major theme is grounded in multiple quotes.	Goes beyond paraphrasing and discusses the disconnect between teen mothers accounts and government policy.	Provided incentives, discussed confidentiality and allowed children to be present at interviews.	
Bayer 2010	Rating	Several steps	Several steps	Several steps	Limited grounding	Limited breadth or depth	A lot	Medium/Low
	Rationale	Non-probabilistic sample recruited from community-based organizations. Selected based on age and residence in low-income areas. Consent/assent obtained from adolescent and parent/guardian.	Open-ended guide used with life history map. Facilitators prompted items if they did not emerge from participants. Two interviews conducted for each participant.	Analyzed using holistic content analysis to draw major life themes and patterns (Lieblich 1998). Interviews then analyzed using grounded theory to identify categories and relationships which developed into codes.	Multiple quotes possibly by same three or four participants. Interpretation stretches beyond data.	Two themes considered without much axial coding. Pathways model limited in grounding from data.	Matched gender of facilitator to participant. Allowed participant to direct course of interview before intervening with specific questions to protocol.	
Bettie 2014	Rating	Not stated	A few steps	Not stated	Good grounding	Good depth and breadth	Somewhat	Low/High
	Rationale	Ethnographic study at one school in U.S. Midwest. Recruitment, selection and consent procedures not stated.	Primarily enthnographic: "hanging out" with girls in and around school during school hours and after school.	Not stated	Each theme provides thorough summary of interactions with participants and provides a range of direct quotes, with multiple per theme.	Author explores several participant experiences in depth, as well providing summaries of range of experiences represented. Thorough focus on education/ pregnancy.	Indicated confidentiality and reflexivity	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Biggs 2013	Rating	Several steps	Thorough attempt	Thorough attempt	Good grounding	Good depth and breadth	Somewhat	High/High
	Rationale	Convenience sample recruited from clinics and health programs serving low-income clients. Selected based on birth in foreign country, parenting status and residence. Consent procedures not stated.	Structured interview guides were double translated for accuracy and piloted in 16 interviews. Interviews audiotaped, conducted in language of participant's choice. Lasted 2 hours.	Tapes transcribed and translated to English. Analyzed by two researchers according to structural codes from interview guides. Synthesis conducted via regular discussion. Differences resolved through consensus.	Good balance of data with development of themes. Themes are supported by one or multiple quotes from different participants.	Authors contrast and compare experiences across participants. Themes are explored in depth and extended into theory building in discussion.	All interviewers were bilingual, Latina and bicultural. Participants received $50 incentive. Interview guides extensively piloted.	
Charm-araman 2011	Rating	Thorough attempt	Thorough attempt	Thorough attempt	Good grounding	Fair depth and breadth	A lot	High/Medium
	Rationale	Recruited from 24 school sites participating in impact evaluation. Selected based on enrolment in 6th grade, baseline survey participation and first to return consent forms from parent/guardian.	Weekly 1-hour focus group sessions over 4-5 weeks (one pilot group). Students given cameras to take photos used for prompting discussions. Sessions audiotaped then transcribed, photos catalogued and field notes taken.	Transcriptions reviewed, verified and coded by two authors. Created common coding system from preliminary analysis. First author searched for key relationships, returning to original transcripts when necessary.	Combination of summaries over the course of several sessions and direct quotes. Clear distinction between author and participant.	Relevant section is short but overall themes are developed thoroughly. Multiple experiences and topics represented. Synthesized in discussion.	Used repeated focus group sessions to establish trust and safe space at start of process. Piloted process. Authors reflexive.	
Childs 2014	Rating	Thorough attempt	Thorough attempt	Thorough attempt	Good grounding	Fair breadth not depth	A little	High/Medium
	Rationale	Recruited through community-based agencies with sports, after school and summer programs and word of mouth. Selected based on identifying as female, African American, between 12-14, and never	Semi-structured 1-hour interviews conducted by trained research assistant in private room at accessible location. Three focus groups conducted using guide based on	Used content analysis: line-by-line coding, categories from statement/ stories, categories provided description of phenomenon. Coding done independently then	Clear distinction between author and research interpretation. Quotes from multiple	Discussion has some rounded explanations but does not move very far beyond of summary.	Many attempts to make participants comfortable: incentives, accessible location, focus group guide based on interview themes. Analysis seems to favor Sexual Decision Making conceptual	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Childs, cont.		pregnant. Consent/assent obtained.	themes from interviews. Both digitally recorded.	final codes agreed by 2-3 researchers, substantiated by focus group data.	participants, not delineated by identifying information.		framework that the interview guide was based on.	
Coleman 2006	Rating	Thorough attempt	Several steps	Thorough attempt	Good grounding	Good breadth and depth	Somewhat	High/High
	Rationale	Recruited purposively through 'young mums' support groups from researchers' contacts. Attempted geographic diversity. Selected based on scoring 8 or higher on measure of unplanned pregnancy. Consent acquired.	Semi structured 45-minute interviews. Tape recorded when consent given (3 opted out). Conducted in participant homes and community centres.	Transcribed, coded and entered QSR. Used thematic analysis. A master themes list was derived from first transcripts and compared to remaining transcripts.	Good balance of theme building and grounding in data from participants. Participant quotes explicitly linked to themes.	Multiple relevant themes discussed, through synthesis of findings and linking to other findings from other qualitative studies.	Provided incentives, emphasized confidentiality, provided option to interview in homes.	
Davidson 2015	Rating	A few steps	A few steps	Not stated	Fairly well grounded	Fair depth and breadth	Not at all	Low/Low
	Rationale	Recruited participants from two schools in Silicon Valley, including students and staff. How participants selected was not stated. Consent procedures not stated.	Employed ethnographic methods, including observations, participant observation and in-depth interviews.	Analysis methods not described.	Ethnographic style lends to fewer quotes. Several examples provided.	Comparison between two schools and their students. Multiple themes developed throughout findings	Unclear	
Dawson 2005	Rating	A thorough attempt	A thorough attempt	A thorough attempt	Fair grounding	Good breadth, limited depth	Somewhat	High/High
	Rationale	Recruited purposively from school districts based on deprivation and teenage conceptions. Selected based on conceiving while compulsory school age. Consent acquired.	Conducted pilot interviews. Participants interviewed 3 times in semi-structured, 30-80 minute interviews in home or school settings. Recorded and transcribed.	Two researchers coded random selection before single researcher undertook coding. First round of coding rechecked by second researcher.	Analysis grounded in counting experience, though multiple direct quotes stated by multiple	Analysis relies a lot of counting. Theme development compares experiences of a large number of participants but does not	Transport and childcare costs for interviews covered and in some districts, a gratuity was provided. Setting selected by participants. Confidentiality considered and ensured.	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Dawson, cont.					participants in most themes.	thoroughly explore meaning. Very specific to education experiences.		
Elley 2011	Rating	A thorough attempt	A few steps	Not stated	Good grounding	Good breadth and depth	Not at all	Low/High
	Rationale	Recruited via opportunistic methods at start then recruited to ensure diversity of background. Analysis is subset of young women who represented gender/ class patterns in larger sample. Consent procedures not stated	Semi-structured interviews and focus groups from 20 -90 minutes.	Discourse analysis, otherwise unstated.	Themes linked to data from multiple participants. Balance of interpretation and data throughout.	Compare experiences of multiple participants. In depth experiences of individuals explored. Explicitly explores education/sexual behaviour themes thoroughly.	Not stated	
Erdmans 2012	Rating	A thorough attempt	A thorough attempt	A thorough attempt	Good grounding	Good depth and breadth	Somewhat	High/High
	Rationale	Recruited through their home visitors who explained project and collected signed consent forms. Selected based on young motherhood status and having attended public high school when they became pregnant.	Two 1.5-2 hour, life story interviews per participant conducted. Started with major question then series of follow-ups. Interviewers matched based on race/ethnicity.	Interview tapes transcribed/ translated. First 40 interviews line-coded by two researchers who then met to resolve discrepancies. Remaining each coded by one of three researchers.	All themes linked to specific stories of participants with a mix of shorter and longer quotes to support.	Mix of in depth stories of individual participants and comparisons between experiences. Additional theory development in discussion.	Reflexivity at start of article. Interviewers matched by race and ethnicity. Multiple interviews took place in participants home. Incentives provided.	
Erdmans 2015	Rating	A thorough attempt	A thorough attempt	A thorough attempt	Good grounding	Good breadth and depth	A lot	High/High
	Rationale	Recruited through their home visitors who explained project and approached after assent indicated. Selected based	Two life story interviews (1-2 hours), conducted at homes or at local restaurant. Researchers recorded	Interviews transcribed/translated. Three researchers coded independently then met as group to discuss and	Multiple quotes provided together to support	Descriptions and categorizing of participant perspectives are provided at length.	Recruited through trusted sources. Interviewers trained to collect stories, be reflexive and fill in gaps	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Erdmans 2015, cont.		on having child before age 20. Written and verbal consent explained and acquired.	observations about living arrangements, appearance, others present and interview. Missing information assessed for between interviews. Quality issues discussed between meetings.	resolve discrepancies. Four researchers reread all transcripts to develop summaries. Then interpreted based on 'critical paradigm that examined inequality.'	themes. A range of quotes across class identities presented.	Comparisons of within and between class identities. Synthesized meanings illuminated at end of chapter.	in interviews. Interviewers matched on race/ethnicity and language to decrease cultural distance.	
Gilbert 2012	Rating	A thorough attempt	A thorough attempt	Several steps	Good grounding	Good breadth, limited depth	Somewhat	High/Medium
	Rationale	Recruited via school-based health center and school cafeteria. Screened for eligibility then followed up. Selected based on Puerto Rican heritage, attending Holyhoke high school and willingness to participant. Consent/assent obtained from parents/teens.	Pilot focus group conducted to finalize guide. Moderated by two researchers in semi-structured format for 60-90 minutes. Held at school's Teen Clinic. Team held debriefing after each focus group and kept researcher's journal.	Tapes transcribed and checked against recordings by researcher. Familiarized with data, developed codes using inductive and deductive processes, indexed and charted codes, interpreted codes. Analysis began during data collection and conducted by one researcher.	Analysis includes extensive direct data from participants. Interpretations linked to quotes.	Discussion does provide in-depth analysis of themes brought up by participants. Some synthesis in discussion but does not explore alternative explanations or theories.	Held in private room on school grounds. Incentive provided. Used journal to address reflexivity in analysis. Had bicultural team moderate focus groups.	
Hoskins 2001	Rating	A few steps	A few steps	A few steps	Fair grounding	Good breadth and depth	A little	Low/Medium
	Rationale	Recruited through teachers and other contacts from researcher's role as youth worker. Selected participants who were 16-19 years at five 'troubled', 'working-class' schools in 3 London areas. Consent procedures not stated.	Interviews conducted in empty classrooms, youth centre or participants' home for about 30 minutes. Guide developed from literature and personal experience. Interviews tape recorded.	Analysis process was not systematic but developed through transcribing, re-reading and exploring shared knowledges in text. In later stages, explored similarities and differences in current literature.	Themes based on research-created identities. One or two participants linked to identities. Extensive number of direct quotes.	Provides accounts of individual participants in some depth. After establishing identity types, explores data for conflicts with identity scripts.	Interviews were short and took place in public areas with no indication of privacy described. Reflexivity used in analysis.	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Jones 2007	Rating	Not stated	Several steps	Not stated	Fair grounding	Fair breadth and depth	Not at all	Low/Medium
	Rationale	Recruitment and consent procedures not described. Participants were secondary school girls in Senior Four level in one school in Uganda.	Used ethnographic methods: interviews, journals, observations, questionnaires, and document analysis. Participants given art and music projects intended to investigate gender roles.	Analysis methods not stated.	Mostly rooted in counting experiences. A few but not extensive quoting of participants.	Counted experiences (i.e. 7 of 9 girls said) and developed themes. Offers unique setting perspective from other studies but not fully flushed out.	Analysis fairly grounded in theoretical framework on health literacy.	
Kaplan 1997	Rating	Several steps	Several steps	Several steps	Fair grounding	Good depth, limited breadth	A little	Medium/ Medium
	Rationale	Recruited from counseling center in Richmond and community worker contacts. Selected based on teen parenthood status and identifying as African American. Consent procedures not described.	Interviewed and spent time with core group of participants. Participants completed 126 item questionnaire. Audiotaped and 'transcribed material verbatim' (except for identifying markers).	Used informal research group to discuss material in context of feminist and critical race theory. Coded each participants background and read field notes and support documents. Categories devised on observations on teens' descriptions.	Some quotes, mostly narrative summary; interpretations align. One participant was focus of report.	Chapters focused on single participant as representative; some higher-level engagement with story.	Some reflexivity in assumptions about particular topics described. Consent, confidentiality not stated. Used her own experience as teen mom to gain their trust.	
Martyn 2001	Rating	Several steps	A thorough attempt	A thorough attempt	Good grounding	Fair depth, good breadth	A little	High/High
	Rationale	Recruited via flyers at public health department, public university and private college. Selected based on low income background, identifying as African American and having not become pregnant prior to 19. Sample size dictated by saturation. Consent procedures not described.	Five 1-3 hour focus groups, followed up by additional focus group and individual interviews. Researcher transcribed tapes within 48 hours of interviews. Researchers debriefed impressions and observations in recorded memos.	Used grounded theory and constant comparative analysis with three levels of coding: open coding, category assignment, theoretical code assignment. Analysis and data collection were simultaneous to increase validity.	Many quotes from multiple participants provided to develop major and minor themes.	Multiple themes explored through participants own perspectives. Provides unique perspective on girls who have been pregnant. Not extensive synthesis of themes.	Facilitator of focus group appeared to match race/ethnicity of participants.	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Minnis 2013	Rating	Several steps	A thorough attempt	A thorough attempt	Good grounding	Fair breadth, limited depth	Somewhat	High/Medium
	Rationale	Recruited at community-based clinics or health education programs. Selected based on being in 2nd or 3rd trimester with first child and who were foreign-born or identified as Latina. Consent procedures not described.	Semi-structured, 2 hour interviews conducted by trained bilingual, bicultural interviewers. Open ended questions preceded by demographic survey. Interviews recorded.	Interviews transcribed/translated. Organized by interview guide, then list of themes identified and refined through iterative reviews by research team.	Summaries based on quotes from multiple participants, linked to interpretations.	Two of four major themes relevant. None of the themes are extensively developed. Some additional development in discussion.	Used bilingual interviewers, paid incentives.	
Noone 2014	Rating	Several steps	Several steps	A thorough attempt	Good grounding	Fair breadth, limited depth	A lot	High/Medium
	Rationale	Recruited youth who had previously applied to youth coalition and were nominated by community members. Selected based on identifying as Latino, ages 15-21, and living within target community. Consent/assent was obtained.	Participants spent 20-30 hours on research study over 3 month period, including four photovoice sessions. At second session, answers to question related to research aim were discussed, recorded and transcribed.	Used thematic analysis: familiarized with data, generated initial codes using comparative method, grouped themes and presented to research team and participants, reviewing theme, defined themes with participants and verified final themes.	Themes from single session presented based on photovoice. Data included photos and direct quotes from participant discussion.	Surface development of themes based on single session. Multiple perspectives of youth provided but themes are not explored in any depth.	Participants involved in analysis of themes, were provide incentives, consent acquired.	
Smith 2011	Rating	A thorough attempt	Several steps	A thorough attempt	Good grounding	Good breadth, fair depth	A lot	High/High
	Rationale	Recruited via snowballing techniques via teen pregnancy coordinators. Selected based on parenting or pregnancy status, living within identified local authorities, and low-income status. Consent not stated.	Semi-structured paired or single interviews lasting 25-100 minutes. Audio taped and transcribed verbatim.	Used thematic analysis, explore themes inductively. Themes extracted individually then comparisons made across SES groups. To ensure reliability interview scripts and themes discussed between two authors.	Themes are developed through reference to direct data from participants.	Differences between SES of participants explored throughout. Discussion synthesizes themes through some theory development.	Balance of prior framework and inductive themes. Reflexivity. Mix of interview styles to adjust for comfort of participants. Built rapport prior to asking youth to participate in research.	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Tabi 1999	Rating	A thorough attempt	Several steps	Several steps	Limited grounding	Limited breadth and depth	A little	Medium/Low
	Rationale	Recruited from two public high school sites via hallways. Added second site to increase pregnant/ parenting females in study. Selected based on identifying as African American, 13-29 years old, attending primary or secondary study site. Consent acquired from youth an parents.	Conducted 30-45 minute interviews and four 60 minute focus groups using semi-structured interview guides, modified for secondary site. Tap recorded with participant permission. Researcher kept observational and post-interview notes.	Transcripts initially read to identify themes. Categories initially based on interview guide. Themes compared and tested across analysis. Linked data to theory by noting patterns, clustering, contrasting and comparing.	Quotes difficult to attribute to multiple sources, youth or adult participants. Themes not fully connected to data or discussion. Attempted to draw conclusions not suited to qualitative data.	Explore multiple themes related to education-career development in context of pregnancy prevention, including conflicts between different group perspectives. None of the themes are explored with much complexity.	Incentives provided, issues with student participation due to time of day and setting.	
Trusty Smith 2013	Rating	Several steps	Several steps	Several steps	Good grounding	Good breadth, not depth	A little	Medium/Low
	Rationale	Participants recruited via Facebook and Twitter and via snowball sampling from initial participants. Selected based on identifying as African American, birthing child between ages 13-19 and having gained a college degree. Consent not fully described.	Three pilot interview conducted and informed interview guide. Interviews conducted for 2 hours and audiotaped.	Interviews transcribed by researcher or transcriber. Coded transcripts to identify themes and deviations. Read at least twice. Data coded deductively with room for inductive themes.	Multiple, delineated quotes	On topic related to this review, analysis was limited to summary of school experience prior to pregnancy	Incentives provided. Not clear indication of setting for interviews. Researchers was reflexive of position.	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Vetter 2011	Rating	Not stated	A thorough attempt	A thorough attempt	Good grounding	Good depth, not breadth	Somewhat	High/Medium
	Rationale	Part of a larger ethnographic study of 4 girls at a high school in U.S. Recruitment, selection and consent procedures not described.	Longitudinal collection across 7 years, including shadowing 13 times in junior and senior year, 3 formal and multiple informal interviews. Data sources included observations, field notes and interviews with participant and her mother.	Researchers independently coded data by topic/event. Used triangulation of methods (field notes, interviews and informal chat) to identify patterns and inconsistencies. Charted examples from data sources. Analysis occurred during and after data collection.	Example quotes and paraphrasing throughout study as evidence of interpretations	Focus on only one participant and their experiences. Good theory development around identity.	Reflexivity of researchers	
Walker-dine 1997	Rating	Not stated	A thorough attempt	A thorough attempt	Good grounding	Good depth and breadth	A lot	Medium/High
	Rationale	Recruitment, selection and consent procedures not described. Participants were described as working class or middle class, interviewed at separate stages.	Longitudinal collection at 4, 10 and 21 years old (or 6 and 16 years old). Interviews and video diaries were primary methods. Also interviewed parents. Semi-structured interviews conducted twice at least a year a part for 1-3 hours and recorded. Interviewers recorded observations post-interview.	Initial analysis conducted by interview of each participant. Further analysis carried out by research team over several months: mapping each subject's narrative, exploring contradictions, and reflexivity by researcher.	Balance of data and interpretation; findings supported by examples from multiple, identified participants.	New concepts developed; range of issues and participant perspectives explored	Used same interviewer for both interviews, highly reflexive, used first interview to inform second interview, primarily inductive. Three participants dropped out because felt video diary did not protect anonymity.	

		Sampling	*Data collection*	*Data analysis*	*Grounding in data*	*Breadth and depth*	*Participant voices*	*Reliability/ Usefulness*
Willem-sen 2015	Rating	A few steps	A thorough attempt	A few steps	Fair grounding	Good breadth, fair depth	A little	Medium/High
	Rationale	Recruited from faculty at school in Tanzania. Selected based on enrolment as Level 2 and 3 students. Consent procedures not described.	Conducted in Kiswahili by Tanzanian female researcher, lasting 1-1.5 hours. Additional interviews conducted with school counsellor and teacher. Also conducted observations of classes, field trip and schools.	Transcribed interviews translated into English by interviewer and research team. Codebook was created using inductive and deductive reasoning.	Quote are not identifiable and may come from same or just a few participants. Detailed examples link participant perspectives to school actions.	Extensive development of themes of education and sexual behaviour. Provides complex exploration of unique setting.	Interview guides and settings not described. Interviews were conducted by native language researcher from Tanzania.	
Zachry 2005	Rating	A few steps	Several steps	A thorough attempt	Fair grounding	Good breadth and depth	A little	Medium/ Medium
	Rationale	Purposively sampled from larger volunteer group at a nonprofit in Boston. Selected based on enrolment in young parents program. Consent procedures not described.	Conducted in-depth interviews and observed class lessons. Interviews were semi-structured, lasted 40-60 minutes and were audio-taped. Only 5 of 9 participants who completed pre-surveys sat for interviews.	Used grounded theory approach. Interviews, notes and survey were coded to develop initial bank of themes. Interviews, field notes and surveys were reviewed again. Themes clustered into three axial codes to which open codes were linked.	Identifies multiple participants noted school-related experiences but only uses quotes from two participants.	Provides in depth analysis of two participants in particular. Other participants provide some comparison. Use counting to show agreement across participants.	Reflexive, open ended questions.	

Appendix A.8 Contributions of Studies Table

Coding Order	1	2	3	4	5	6	7
Author	Martyn 2001	Arai 2003	Dawson 2005	Coleman 2006	Smith 2011	Erdmans 2012	Biggs 2013
Reliability/Usefulness	H/H	H/H	H/H	H/H	H/H	H/H	H/H
Study Themes							
Parenthood disrupts Education	+				+		
Goal setting	+				+		
Sexual behaviors align with trajectory	+						
Education as adulthood							
Disliked school		+	+	+		+	
Weak attachment to school prior to pregnancy		+	+			+	+
Perceived limited career options		+		+	+		+
Transition from MS to HS			+			+	
Barriers to parenthood removed		+					
Parenthood is meaningful route to adulthood		+		+	+		+
Adult responsibilities		+		+			
Education is fragile							
Sexual behaviors align with ambiguity on parenthood		+					
Positive school experience among teen parents with degrees						+	
Academics and attendance cycles						+	
Disconnection among immigrant teens						+	+
Rejection of limitations to education	+						
Rejection of institutional values			+	+		+	+
Physical and psychological safety			+	+		+	
Teacher-student relationships			+			+	
Lowered expectations by teachers						+	
Strong relationships with teachers							
School boring and irrelevant				+		+	
School activities	+		+				
Service to others	+						
Total Contributions	6	7	7	7	4	11	6

Coding Order	8	9	10	11	12	13	14
Author	Erdmans 2013	Walkerdine 2001	Willemsen 2015	Elley 2011	Bettie 2003	Charmar-aman 2011	Vetter 2011
Reliability/Usefulness	H/H	M/H	M/H	L/H	L/H	H/M	H/M
Study Themes							
Parenthood disrupts Education		+	+				
Goal setting		+	+				
Sexual behaviors align with trajectory			+	+			
Education as adulthood	+	+		+	+		
Disliked school							
Weak attachment to school prior to pregnancy	+						
Perceived limited career options		+		+	+		
Transition from MS to HS	+						
Barriers to parenthood removed				+			
Parenthood is meaningful route to adulthood	+				+		
Adult responsibilities	+						+
Education is fragile		+					+
Sexual behaviors align with ambiguity on parenthood		+		+	+		
Positive school experience among teen parents with degrees							
Academics and attendance cycles	+						+
Disconnection among immigrant teens	+						
Rejection of limitations to education				+			+
Rejection of institutional values	+				+		+
Physical and psychological safety	+	+					+
Teacher-student relationships	+		+				+
Lowered expectations by teachers	+				+	+	+
Strong relationships with teachers						+	
School boring and irrelevant	+				+		
School activities	+						
Service to others							
Total Contributions	13	7	4	6	7	2	8

Coding Order	15	16	17	18	19	20	21
Author	Gilbert 2011	Minnis 2013	Childs 2015	Noone 2014	Kaplan 1997	Zachry 20015	Hoskins 2001
Reliability/Usefulness	H/M	H/M	H/M	H/M	M/M	M/M	L/M
Study Themes							
Parenthood disrupts Education	+		+	+			
Goal setting	+		+	+			
Sexual behaviors align with trajectory							
Education as adulthood	+						
Disliked school							+
Weak attachment to school prior to pregnancy		+		+	+	+	+
Perceived limited career options		+			+		
Transition from MS to HS					+	+	
Barriers to parenthood removed							
Parenthood is meaningful route to adulthood		+					
Adult responsibilities		+					
Education is fragile							
Sexual behaviors align with ambiguity on parenthood					+		
Positive school experience among teen parents with degrees							
Academics and attendance cycles		+			+		
Disconnection among immigrant teens		+					
Rejection of limitations to education							
Rejection of institutional values							
Physical and psychological safety		+			+	+	
Teacher-student relationships	+				+	+	
Lowered expectations by teachers					+		
Strong relationships with teachers	+						
School boring and irrelevant					+	+	
School activities	+		+	+	+		
Service to others				+			
Total Contributions	6	7	3	5	10	5	2

Coding Order	22	23	24	25	26	27	28
Author	Jones 2007	Algert 2000	Agogbuo 2006	Bayer 2010	Trusty-Smith 2013	Tabi 1999	Davidson 2015
Reliability/Usefulness	L/M	M/L	M/L	M/L	M/L	M/L	L/L
Study Themes							
Parenthood disrupts Education		+		+		+	
Goal setting		+		+		+	
Sexual behaviors align with trajectory				+			
Education as adulthood							
Disliked school							
Weak attachment to school prior to pregnancy		+					
Perceived limited career options		+	+				
Transition from MS to HS					+		
Barriers to parenthood removed							
Parenthood is meaningful route to adulthood							+
Adult responsibilities							
Education is fragile							
Sexual behaviors align with ambiguity on parenthood							
Positive school experience among teen parents with degrees					+		
Academics and attendance cycles							
Disconnection among immigrant teens							
Rejection of limitations to education							
Rejection of institutional values						+	
Physical and psychological safety	+	+					
Teacher-student relationships	+		+				+
Lowered expectations by teachers							+
Strong relationships with teachers		+					
School boring and irrelevant					+		
School activities					+		
Service to others						+	+
Total Contributions	2	6	2	3	4	4	4

Appendix B.1 Observational Systematic Review Protocol

Protocol for a systematic review of observational studies examining associations of school-related determinants and adolescent sexual health outcomes

Background

The theory of human functioning and school organization proposes that the school environment – above and beyond health education – can promote young people's health. (W. A. Markham & Aveyard, 2003) Markham and Aveyard have suggested how various school processes may improve young people's commitment to school and the capacity for practical reasoning and affiliation. While Markham and Aveyard did not specify adolescent sexual health behaviour in their theory, observational literature suggests that school is an important factor for young people's sexual health.

Several previous reviews have aimed to identify and synthesise observational research on school-related influences on sexual health. (Chung, Kim, & Lee, 2018; House, Bates, Markham, & Lesesne, 2010; Kassa, Arowojolu, Odukogbe, & Yalew, 2018; W. A. Markham & Aveyard, 2003) However, these reviews did not account for the quality of included studies in their syntheses, (Chung et al., 2018; House et al., 2010; C. M. Markham et al., 2010) and were restricted to particular settings (Chung et al., 2018; House et al., 2010; Kassa et al., 2018; C. M. Markham et al., 2010) or exposures. (House et al., 2010; Kassa et al., 2018) None of these reviews considered the role of school-level studies in describing relevant risk or protective factors of the school.

Building on past reviews, this review will examine observational studies which explore the associations of school- or education-related factors with sexual behaviour or sexual health outcome globally. The review will include individual-level longitudinal studies that examine the temporal associations between students' experience with school or education and their subsequent health behaviours and outcomes. In addition, this review will include school-level studies which explore how aspects of the institutional and organisational features of school may influence student behaviour.

Review aim

Following PRISMA reporting guidelines, this protocol outlines the methods to answer the question: *What do existing observational studies suggest about the associations between*

school-related factors at the individual- and school-levels and subsequent sexual health outcomes?

Methods

Eligibility Criteria

Population

Studies will be included if the target population were adolescents, defined as ages 10-19. (World Health Organization, 2014)

Exposure

Studies will be included if the study measured a school-related exposure variable, such as school enrolment, truancy or attendance, academic performance, expectations or plans for future education, and attitudes or connectedness towards school. Measures can be self-reported, assessed by a parent or teacher, reported via administrative data or collected via researcher observation. Exposure variables were included in the synthesis if they were hypothesized to be a predictor of a sexual health outcome, and not just as a potential confounder.

Outcome

Studies will be included if they reported at least one sexual health outcome (e.g. adolescent pregnancy, STIs or HIV) or sexual behaviour (e.g. age of sexual initiation, frequency of sex, use of condoms or contraception, or number of sexual partners).

Study type

Studies will be included if they are longitudinal designs measuring individual-level and/or school-level exposure variables at a time point prior to measured sexual health outcomes. Because school-level variables are less likely to reasonably be affected by reverse causality, cross-sectional studies examining school-level exposure variables will also be included.

Language and date

Studies will not be excluded based on language or date.

Search Strategy and Selection

Three bibliographic databases will be searched, including CINAHL Plus (EBSCO), PubMed and Social Sciences Citation Index (Web of Science). In addition to database searching, the reference lists of studies meeting inclusion criteria and of identified published reviews will be checked for potentially relevant studies.

Search terms link three concepts: 1) school or education; 2) sexual health and behaviour outcomes; and 3) observational studies. School/education terms are informed by Bonell et al.

(2011) and Peterson et al. (2019) Several rounds of free text and subject heading searches were pilot tested to determine a balanced level of precision and specificity in search terms. Search terms and Boolean operators for one database (PubMed) have been developed to determine an adequate number of studies for review inclusion and will be adapted for the remaining databases.

All searches will be managed in EPPI-Reviewer 4. (Thomas, J, Brunton, J., & Graziosi S, 2010) Studies will first be screened on title and abstract then screened on full text where inclusion or exclusion cannot be determined by title/abstract. Each excluded study will be coded with a primary exclusion justification code based on the above eligibility criteria. Where possible, studies will be screened by multiple reviewers.

Data extraction

A standardized data extraction form will be used to record study information from included studies. Study information includes: study location, study design (e.g. longitudinal, cross-sectional), study population, sample size, response rates, approach to analysis (e.g. multi-level analysis, adjustment for clustering), measures for exposure and outcome variables, covariates or confounding variables, and effect sizes, standard errors or confidence intervals, and/or p-values. Where studies employing data from the same dataset (e.g. secondary analyses) have distinct study aims or methods to address study aims, information for each study will be extracted and reported separately. Where possible, data extraction will be completed by multiple reviewers. Where data are missing or insufficient for meta-analysis, additional information will be requested from the author(s). No response will be recorded in the quality assessment.

Quality Assessment

Studies will be assessed for quality based on the criteria in the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (NIH National Heart, Lung and Blood Institute, n.d.) and several addition criteria relevant for school-level studies. (Aveyard, Markham, & Cheng, 2004; Bonell et al., 2013) Risk of bias of domains include: definition of study population, response rates, sampling design, sample size justification, measurement of exposure and outcome variables, adjustment for key potential confounding variables, adjustment for clustering (school-level designs) and over-adjustment of factors that are potential mediators of school-level variables and outcomes (school-level designs). Based on these domains, each study will be given a score of high, medium or low. The review will seek to minimize location bias by searching multiple databases and will not exclude studies based on language to avoid language bias.

Data Synthesis

Findings of included studies will be synthesised narratively and meta-analytically. Study information and outcomes, including all significant and nonsignificant associations, will be reported in 'Summary of Findings' tables. (Higgins, JPT & Green, S, 2011) Narrative synthesis will report study findings by study type (e.g. individual- or multi-level), then by school-related exposure (e.g. academic performance, school enrolment), outcome (e.g. sexual debut, adolescent pregnancy), population, and quality (e.g. high and medium quality then low quality).

Separate forest plots will be developed for relevant categories of interest, including intervention type, outcomes, and follow-up times. Effect estimates and standard errors for each study will be reported in the forest plots. Meta-analysis will be conducted and reported by exposure/outcome combinations (i.e. attitude of school and early sexual debut). A common summary estimate for pooled effect sizes will be determined based on best fit for reported outcomes (e.g., odds ratios for dichotomous measures) and calculated using EPPI-Reviewer 4's meta-analysis function based on the Metafor package in R. Heterogeneity will be conducted via Chi-squared and I^2 tests according to guidance in the Cochrane Handbook (Higgins and Green, 2011). Heterogeneity (i.e. I^2 value of 50% or higher) will be explored using analysis of subgroups, such as by gender or race/ethnicity, and sensitivity testing by including/excluding studies of differing quality in the pooled analysis. Where meta-analysis cannot be conducted, narrative summaries of effects will be reported.

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Appendix B.2 Database Search Strategy and Results

	Search Terms	*PubMed*	*CINAHL Plus*	*Social Science Citation Index (Web of Science)*
		26 Mar 2019	27 Mar 2019	20 May 2019
S1	Educat* OR school	727,627	747,918	591,554
S2	Goal* OR likelihood OR intention* OR aspiration* OR engagement OR involvement OR commitment OR interest OR contribution OR dislike OR attainment OR asset* OR failure OR attendance OR success* OR system*	6,216,845	1,291,231	1,475,914
S3	S1 AND S2	226,315	180,202	232,404
S4	wide OR ethos OR climate OR environment OR culture OR manag* OR organization OR aggregat* OR governance OR context OR effects OR difference* or inequalit* OR variation OR influence* OR factor*	10,335,877	2,985,515	2,505,731
S5	S1 NEAR/AND S4	385,609	21	75,065
S6	S3 OR S5	467,088	180,223	283,254
S7	pregnancy OR pregnancies OR conception OR abortion OR "family planning" OR "safe sex" OR "safer sex" OR "protected sex" OR "unsafe sex" OR "unprotected sex" OR "sexual behavior" OR "sexual behaviour" OR "sexual risk" OR "sexual risk-taking" OR "sexual intercourse" OR "sexually active" OR sexuality OR (sex n2 initiation) OR (sexual n2 initiation) OR "sexual activity" OR (sex n2 debut) OR "sexual debut" OR condom OR STI OR STD OR "sexually transmitted infection" OR "sexually transmitted disease" OR chlamydia OR gonorrhea OR contraception OR contraceptive OR contraceptives OR "birth control" OR abstinence OR "barrier method" OR "long-acting reversible contraception" OR "long-acting reversible contraceptive" OR LARC OR condom	150,724	285,255	157,069
S8	S6 AND S7	13,329	11,710	14,839
S9	observational OR longitudinal OR analysis OR "cross-sectional" OR "multi-level" OR "school-level"	4,211,869	1,451,212	1,126,999
S10	S8 AND S9	4,331	5,979	8,644

Appendix B.2 Eligibility Criteria Tool

Criteria	Description	Guidance
Language	Do not exclude studies based on language.	Studies are not excluded on geographical location or language. Include all high, middle and low income countries.
Type of Studies	Exclude studies that are not: • Longitudinal if individual-level • Longitudinal or cross-sectional studies if school-level	Exclude: • Individual-level studies which use a cross-sectional design • Individual-level studies in which measurement of the exposure does not precede measurement of the outcome • Intervention studies • Qualitative studies • Policy papers or articles • Opinion/think articles
Population	Exclude studies where the majority of the population is not between the ages of 10 and 19.	Exclude studies where participants are not overwhelmingly adolescent (10-19 years old).
Outcome	Exclude studies that do not include at least one sexual and reproductive health outcome.	Exclude studies that do not include at least one sexual behaviour or sexual health outcome. Outcomes might include: • Unintended pregnancy • STDs, including HIV • Age of sexual initiation • Frequency of sex/sex in recent past • Contraception use, including condoms or other forms of birth control • Number of sexual partners Exclude studies which include sexual health related outcomes that are not behavioural or health. For example: • Sexual health knowledge • Attitudes towards sex • Intentions to engage in sexual activity • Willingness to engage in sexual activity • Skills related to sexual health (i.e. refusal skills)
Exposure	Exclude studies that do not measure school-related variables or do not assess school-level measures.	Exclude studies that do not report on exposure measures of school-related variables. School-related variables may include: • Academic achievement (e.g. grades, test scores) • Expectations for academic achievement or failure • Attitudes towards school or learning • Confidence in ability to succeed in school • Participation in school activities • Sense of belonging or attachment to school, teachers or peers • Plans or expectations for secondary and higher education • Enrolment or dropping out of school • Truancy or other school behaviours • Perceptions of school safety or physical environment

		Studies that examine school-related measures might include: • Aggregated school-related variables or other compositional features of student, such as sociodemographic factors • School-level features from administrative records or observations or administrator-reported, such as type of school, policies, climate or safety ratings, physical layout, available activities, etc. • Assessment of between-school variance

Protocol for a systematic review and meta-analysis examining effects of school-based interventions addressing the school environment and educational assets on sexual health outcomes

Background

While the national teen pregnancy rate, along with birth and abortion rates, in the United States has been declining steadily since 1990 (Kost & Henshaw, 2010; Martin, Hamilton, Osterman, Curtin, & Matthews, 2015), disparities between adolescent populations remain. Black and Latino teens are more than twice as likely as white teens to become pregnant, give birth or terminate a pregnancy (Kost & Henshaw, 2010) and low socioeconomic or educational status further increases the risk of teen births among all racial and ethnic groups (Penman-Aguilar, Carter, Snead, & Kourtis, 2013). These disparities are amplified depending on the community and state where a young person resides. For example, where pregnancy rates are highest among white teens in Southern states (ranging from 51 to 54 per 1000), rates for black adolescents are highest in New York followed by mainly Mid-Western states (ranging 101 to 114 pregnancies per 1000) (Kost & Henshaw, 2010). Despite progress, a clear need in the field remains for strategies that specifically reduce inequity in rates of unintended teen pregnancy.

Limitations to Current Approaches

Next to the home, young people spend most of their time interacting with peers, teachers and other important adult figures in school (Kaftarian et al., 2004). For these reasons, schools are considered ideal settings for interventions to improve adolescent health and social outcomes. Current government strategies focus on the implementation of 'evidence-based programs' (Koh, 2014), most of which are group-based and aim to impact sexual behaviour by increasing knowledge and modifying attitudes. While sexual health education is necessary for providing the knowledge and skills young people need to achieve good health, traditional curriculum-based programs may not be sufficient to influence sexual behaviour change in the long term (Kirby, 2002). One explanation is that many interventions do not effectively influence upstream determinants at the individual-, community- and societal-level and thus fail to correct inequities experienced by socially disadvantaged youth populations (Rose, 1992; Viner et al., 2012). Further, curriculum-based interventions are becoming increasingly difficult to execute with fidelity given the demand on schools to adopt federally-mandated core subject standards (Centers for Disease Control and Prevention, 2015; Dusenbury,

Brannigan, Falco, & Hansen, 2003; Forman, Olin, Hoagwood, Crowe, & Saka, 2009) and may be particularly challenging to sustain in areas with conservative sex education policies where teen pregnancy and birth rates are the highest (Guttmacher Institute, 2015; Power to Decide, 2013; Landry, Darroch, Singh, & Higgins, 2003). Thus, interventions that aim to influence upstream determinants may be most effective in preventing teen pregnancy when they are delivered through school-wide interventions and address other outcomes fundamental to school operation, such as academic achievement.

Evidence for an upstream, school-based approach

A number of observational studies support the influence of related upstream school and educational factors on sexual decision making. In longitudinal analyses, youth who reported caring adult relationships at school (McNeely & Falci, 2004), attachment to school (Baumer & South, 2001; McBride et al., 1995; Paul, Fitzjohn, Herbison, & Dickson, 2000; Rink, Tricker, & Harvey, 2007; South & Baumer, 2000), school involvement (Lauritsen, 1994; Miller, Sabo, Farrell, Barnes, & Melnick, 1998; Sabo, Miller, Farrell, Melnick, & Barnes, 1999), positive attitude to school (Bonell et al., 2005; Kogan et al., 2013), and high educational expectations and aspirations (Henderson, Butcher, Wight, Williamson, & Raab, 2008; Lauritsen, 1994; Paul et al., 2000; South & Baumer, 2000) also reported lower rates of sexual risk behaviour, including early sexual initiation, frequency, unprotected sex and pregnancy or birth. Though observational data cannot provide evidence for causation, these findings suggest that early school experiences are important factors for later sexual decision-making at the individual-level.

Sexual health programming has been traditionally been designed to influence individual-level factors, typically delivered in class- or group-based settings. Yet, individual risk factors for teen pregnancy may be too variable to produce targeted interventions that are consistently effective when replicated with different student populations (Kneale, Fletcher, Wiggins, & Bonell, 2013). Universal interventions designed to modify school-level processes may be more likely to shift teen pregnancy rates. Observational evidence for school-level effects, however, is less consistent than studies exploring individual associations.

Only a few multi-level studies have examined the relationships between school-level factors and sexual behaviour. McBride et al (McBride et al., 1995) found that school-level bonding -- measured by using aggregated 12th grade bonding as a proxy – was associated with a change in recent sexual activity in 9th grade boys. A recent analysis of Add Health on Wave I school-level variables and age of sexual initiation by Wave IV concluded that school-level means of more favourable adolescent attitudes towards sex, lower likelihood of going on to higher education, and lower parental educational level were associated with earlier age of onset (White & Warner, 2015). Both of these studies used compositional measures, indicating that

the characteristics of a school's student population are important for sexual health outcomes. However, these data were not collected for the purpose of studying school effects and may not effectively capture important school processes. This was also the case with a multilevel analysis using a randomized control trial which attributed weak relationship of sexual initiation with school-level variations in attitude to school to differences in neighbourhood-level deprivation (Henderson et al., 2008). In order to study the true value-added effects of school on teen pregnancy, school environment constructs need to be more clearly operationalized, identified a priori and measured through both contextual and compositional variables.

A new theoretical approach for school-related factors of sexual behaviour

Several theoretical models have theorised the influential role of school on sexual health behaviour, including the social development model (Hawkins & Weis, 1985) and positive youth development (Benson, 2007). However, these frameworks have not fully theorised how processes within schools work to promote student health (Bonell, Fletcher, et al., 2013). The theory of human functioning and school organization (W. A. Markham & Aveyard, 2003) specifically outlines how institutional features facilitate student commitment to the school's instructional (i.e. learning of knowledge and skills) and regulatory (i.e. learning of social behaviour) orders. Student commitment is thought be protective of student health because it facilitates the development of practical reasoning (the ability to critically understand and resolve problems) and affiliation (the ability to build reciprocal, supportive relationships). Schools are theorised to improve student commitment by 1) making educational decisions and approaches student-centred and 2) weakening boundaries between the school, teachers and academics and the students and broader community.

Previous studies have considered how Markham and Aveyard's theory has aligned with the health literature related to substance use (Bonell, Fletcher, Jamal, Aveyard, & Markham, 2016) and broader health outcomes (Bonell, Jamal, et al., 2013) and in multilevel studies examining Markham and Aveyard's construct 'value-added education' on smoking, substance use, drinking and misbehavior (Aveyard, Markham, Lancashire, et al., 2004; Bisset, Markham, & Aveyard, 2007; Bonell et al., 2017; W. A. Markham et al., 2008; W. A. Markham, Young, Sweeting, West, & Aveyard, 2012; Tobler, Komro, Dabroski, Aveyard, & Markham, 2011). To date, there has been no comprehensive examination of the theory in relation to sexual health outcomes among adolescents.

Outcome evaluations of interventions provide the most rigorous evidence for establishing causal relationships and testing theory. Previous reviews have included school-based interventions with a focus on school environment or education-related assets but have not conducted any quantitative synthesis for interventions reporting sexual health outcomes

(Bonell, Wells, et al., 2013; Gavin, Catalano, David-Ferdon, Gloppen, & Markham, 2010; Langford et al., 2014); and these reviews are now several years old. This review will build on past reviews by synthesizing randomised control trials (RCTs) and quasi-experimental studies on interventions that address school and/or education-related factors on sexual behaviour outcomes. Synthesis of intervention studies will explore the plausibility (through narrative synthesis) and the probability (through meta-analysis) that interventions addressing the school environment improve sexual health outcomes.

Review aim

Following PRISMA reporting guidelines, this protocol outlines the methods to answer the question: *What are the effects of interventions that aim to modify the environment of schools and/or increase educational assets on the sexual health outcomes of students ages 10-19?*

Methods

A previous version of this protocol included the synthesis of process evaluations which was removed on the advice of the review's advisory committee.

Eligibility Criteria

An eligibility criteria tool and guidance (Appendix C.3) will be used to assess studies for inclusion in the review based on titles, abstracts and full text.

Types of Studies: Studies must be empirical outcome evaluations of interventions that aim to change pregnancy prevention behaviours by modifying the school environment or educational assets of students ages 10-19. Outcome evaluations will be included if they employ a RCT or quasi-experimental design, where control groups receive standard treatment.

Population: Studies will be included only if the overwhelming majority of the target population are adolescent, defined as ages 10-19 by the World Health Organization.

Intervention: Studies will be included if they report on school-based interventions that change aspects of the school environment or aim to improve educational assets in order to change sexual health outcomes. School environment interventions might include improving school climate or culture, increasing safety, changing policies, improving access and connection to caring adults and providing opportunities for student engagement in school and community. Interventions that address educational assets might seek to modify individual academic goal setting, attendance, attainment, interest in school and school work, relationships with teachers and staff and engagement with school. Studies will be excluded if they report on interventions aiming *solely* to improve knowledge, attitudes, skills or services related to sexual health, and not academic assets or school experiences described above. Appendix C.2 outlines subsidiary guidance on intervention eligibility criteria.

Setting: Studies will be included if the intervention was implemented in a school setting, either before, during or after school hours.

Outcomes Studies will be included if they report at least one sexual health primary outcome. Outcome measures might include pregnancy, STIs or HIV, as well as sexual behaviours, such as age of sexual initiation, frequency of sex, use of condoms or contraception, or number of sexual partners.

Date: Studies will be included if they were published from 1990 onwards.

Information Sources

Databases: The following databases will be searched: BiblioMap, CINAHL Plus, ERIC, IBSS, OpenGrey, ProQuest Dissertations & Theses, PsycINFO, Medline and Web of Science Core Collection.

Other Search Methods: In addition to database searching, the following additional search methods will be employed:

1. Reference checks of all studies that meet the inclusion criteria;
2. Subject matter expert contacts to identify unpublished or current research (Appendix C.6); and
3. Google web searches of search concepts.

Search Strategy

Search terms cover three concepts: 1) school/education (population/setting); 2) sexual behaviour, pregnancy or parenthood (outcome); and 3) intervention studies (study type). School/education terms were informed by Bonell et al. (Bonell et al., 2011) and study type search string was adapted from the Cochrane Highly Sensitive Search Strategy for RCTs (Higgins, JPT & Green, S, 2011). Several rounds of free text and subject heading searches were pilot tested to determine a balanced level of precision and specificity in search terms. Search terms and Boolean operators for one database (Medline) have been developed to determine an adequate number of studies for review inclusion and will be adapted for the databases listed above.

Study Selection

Search results will be managed in EPPI-Reviewer. Studies will be screened for inclusion based on titles and abstracts using the eligibility criteria tool. Full text will be accessed and assessed for studies that meet the initial screening criteria for inclusion or where exclusion cannot be determined by title/abstract alone. All excluded studies will be coded with an exclusion justification code.

Data extraction

A data extraction form will be used to guide the extraction of data from studies that meet all the inclusion criteria. The following data will be extracted from the included studies and coded using standardized codes: study information (including study location, target population and timing), study design (including design, allocation, sample size, data collection, and accounts for confounding and clustering), intervention information (including description of components and inputs, facilitator characteristics, theoretical base, control group intervention), outcomes measures necessary for meta-analysis and quality assessment (including effect sizes, standard errors, intra-cluster correlation coefficients, response rates and timing of follow-ups). Multiple reports identified to be from the same study will be coded into a single entry. Equity-related codes will be used to ensure the systematic reporting of target or sub-population effect sizes of disadvantaged groups (i.e., black and Latina girls, low SES or educational status).

A data extraction tool will be piloted by two reviewers then discussed to ensure sufficient detail. Where they disagree, reviewers will meet to discuss areas of concern and consult a third reviewer if agreement cannot be reached. Both reviewers will extract data from the remaining studies. Where data are missing or insufficient for synthesis, additional information will be requested from the primary author(s) (Appendix C.7). No response will be recorded in the risk of bias assessment and used to determine eligibility for inclusion in the meta-analysis.

Quality Assessment & Risk of Bias

Outcomes studies will be assessed for risk of bias based on the criteria outlined in the Cochrane Handbook for Systematic Reviews of Interventions for randomised control trials (Higgins, JPT & Green, S, 2011) and the EPPI Tool for quasi-experimental trials. (Shepherd, J et al., 2010) Domains of bias include: selection bias (including random sequence generation and allocation concealment); blinding of participants, personnel and outcome assessors; incomplete outcome data, selective reporting, and other sources of bias. Two reviewers will independently assess studies and assign domain scores (low risk, high risk or unclear risk) to each study. Where the two reviewers cannot come to a consensus, a third reviewer will be consulted.

The review will seek to minimize location bias by searching multiple databases and will not exclude studies based on language to avoid language bias. Where one study is reported in multiple publications, outcome data will be extracted only once.

Data Synthesis

Studies reporting on outcomes of experimental and quasi-experimental studies will be synthesized narratively and meta-analytically. Narrative summaries will be reported by intervention (e.g., school environment vs. educational assets) then by study type, outcome and

follow-up time. Study design and results of included studies will be described in accordance with Cochrane reporting guidelines in a 'Summary of Findings' table, including all sexual health and behaviour outcomes, absolute and relative effects, sample size, and quality of evidence as indicated by the GRADE criteria (Higgins, JPT & Green, S, 2011). All significant and nonsignificant outcomes will be reported.

Separate forest plots will be developed for relevant categories of interest, including intervention type, outcomes, and follow-up times. Effect estimates and standard errors for each study will be reported in the forest plots. The common summary estimate will be determined based on best fit for outcome measures (e.g., risk ratios for dichotomous outcome measures and standardized mean differences for continuous). Heterogeneity tests will be conducted and reported using Chi-squared and I^2 tests and interpreted to determine the possibility of calculating a pooled effect size according to guidance in the Cochrane Handbook (Higgins, JPT & Green, S, 2011). Before producing the pooled effect size, original study analyses will be assessed for appropriately correcting for clustering; proper adjustment will be made where cluster effects were not taken into account or done inappropriately. Where proper adjustment is not possible through author contact or imputation, these studies will be excluded from the analysis.

If an I^2 value of 50% or higher is reached, heterogeneity will be explored using subgroup analysis and sensitivity testing. Sensitivity testing will be conducted by adding studies that meet high or unclear risk of bias standards – such as selection, performance and attrition bias – to determine the possible effects of bias on the meta-analysis. Where possible, meta-regression and subgroup analysis will be conducted to explore differences by target population level (e.g., school-level, group-level) and equity-related subgroups indicated by the PROGRESS (place, race, occupation, gender, religion, education, SES, social status) framework (Welch et al., 2012). If sufficient studies are surfaced, a funnel plot will be created to assess possible publication bias.

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Appendix C.2 Subsidiary Guidance on Eligibility Criteria

Intervention

Studies will be included if they report on school-based interventions that change aspects of the school environment or aim to improve educational assets in order to change sexual health outcomes.

School-level interventions

School environment interventions might include improving school climate or culture, increasing safety, changing policies, improving access and connection to caring adults and providing opportunities for student engagement in school and community. Interventions may be delivered: directly to students (by other students or school staff) through school-wide activities that increase engagement in school or improve relationships between students, teachers and staff; or indirectly through policies or staff training delivered by the school that aim to improve student engagement, attainment, interest in school work or activities or relationships with teachers and staff. Interventions with community activities will be included if community activities are available to all students within the school.

Individual-level interventions

Interventions that address educational assets might seek to modify individual academic goal setting, attendance, attainment, interest in school and school work, relationships with teachers and staff and engagement with school. Interventions may include: counselling or case management services aiming to improve a student's engagement in school, academic skills or attainment delivered directly to; financial support to students through fees, subsidies or other resources (e.g. school supplies, uniforms) that aim to improve attendance and engagement in school.

Studies will be excluded if they report on interventions aiming solely to improve knowledge, attitudes, skills or services related to sexual health, and not academic assets or school experiences described above. Interventions will be excluded if they only: deliver education or information solely focused on improving sexual health knowledge or skills whether facilitated by a teacher, educator or peers; provide sexual health services; train teachers on the delivery of a sexual health intervention; or deliver broad social and emotional skills education that does not focus on academics or relationships with teachers.

No changes have been made to the protocol for remaining eligibility criteria, including types of studies, outcomes, population, setting and date.

Appendix C.3 Database Search Strategy and Results

	Search Terms	*Medline (Ovid)*	*CINAHL Plus (EBSCO)*	*PsychINFO (Ovid)*	*ERIC (EBSCO)*	*ProQuest Dissertations and Theses Global*	*Web of Science Core Collection*	*Open Grey*	*IBSS (ProQuest)*
		5 July 2017	7 July 2017	6 July 2017	13 July 2017	23 July 2017	13 July 2017	12 July 2017	13 July 2017
S1	Educat* OR school	553,564	304,858	602,896	844,138	522,955	1,121,934	28958	202,562
S2	Goal* OR likelihood OR probability OR intention* OR aspiration* OR engagement OR involvement OR commitment OR interest OR contribution OR dislike OR attainment OR asset* OR failure OR attendance OR success* OR system*	4,754,599	794,947	1,279,497	547,280	1,705,851	12,506,823	185,335	759,466
S3	**S1 AND S2**	164,580	86,594	222,617	341,982	251,364	389,418	5197	66,237
S4	wide OR ethos OR climate OR environment OR culture OR manag* OR organization OR randomize* OR governance OR context OR effects OR difference* or randomized* OR variation OR influence* OR factor*	8,091,877	1,416,518	2,211,590	709,141	2,344,436	18,940,190	290,707	1,289,615
S5	**S1 AND S4**	26,946	150,369	48,811	391,918	4945	598,431	4	104,130
S6	"locus of control" OR "internal poverty" OR "external poverty" OR "positive youth development" or "youth development" OR "interschool variation"	6,262	2,586	16,385	4,500	10,227	9,116	51	1,579
S7	**S3 OR S5 OR S6**	187,238	182,342	264,041	710,780	261,746	730,076	4,134	127,766
S8	pregnan* OR conception OR abortion OR "family planning" OR "safe* sex" OR "protected sex" OR "unsafe sex" OR "unprotected sex" OR "sexual randomiz?r" OR "sexual risk" OR "sexual risk-taking" OR "sexual intercourse" OR "sexually active" OR sexuality OR (sex* ADJ2 initiation) OR (sex* ADJ2 activity) OR (sex* ADJ2 debut) OR condom OR STI OR STD OR "sexually transmitted infection"	595,332	134,258	133,550	25,258	89,951	682,900	14,755	64,318

	OR “sexually transmitted disease” OR chlamydia OR gonorrhea OR contracept* OR “birth control” OR abstinen* OR “barrier method*” OR (intrauterine ADJ1 (device OR system OR contracept*)) OR “long-acting reversible contracept*” OR LARC								
S9	**S7 AND S8**	14,346	11,820	23,851	13,247	9,120	36,551	14,752	5,724
S10	evaluat* OR assess* OR intervention OR “randomized control trial” OR randomized OR controlled OR trial OR “quasi experimental” OR “control arm” OR “control group” OR “quasi randomized”	4,530,184	180,030	1,100,057	75,873	251,714	7,026,998	50,679	148
S11	(process OR formative OR pilot OR preliminary) ADJ2 evaluation) OR feasib* OR accept* OR delivery OR (intervention ADJ3 (implementation OR planning)	832,521	1,023,287	193,998	390,315	102,395	1,602,892	13,727	77.193
S12	*Subject headings related to: program evaluation, experimental studies, quasi-experimental studies*	473,913	54,409	11,695	NA	NA	NA	NA	NA
S13	**S10 OR S11 OR S12**	5,243,120	1,132,070	1,218,247	432,679	342,782	8,113,057	81,119	77,323
S14	**S9 AND S13**	7,766	6,960	3,713	4,224	1,410	19,550	91	539
S15	Limit S19 to 1990-Current	6,778	6,904	3,459	3,229	1,175	18,565	89	521
Bibliomap was searched on 14 July 2017 on subject heading and free text terms: “intervention OR outcome OR process evaluation” (5124) AND “children OR young people” (9035) AND “pregnancy OR sexual behaviour” (606) AND exclude on date (>1990) = 99 citations									

Appendix C.5 Eligibility Criteria Tool

Criteria	Description	Guidance
Date	Exclude studies published before 1990	Filter search on date. If filter is not available, apply this criteria first.
Language	Do not exclude studies based on language.	Studies are not excluded on geographical location or language. Include all high, middle and low income countries.
Type of Studies	Exclude studies that are not outcome evaluations using RCT or quasi-experimental designs. Exclude studies that are not process evaluations.	Exclude: • Intervention studies that do not use experimental designs • Qualitative studies • Observational studies measuring quantitative associations • Methodological studies • Policy papers or articles • Opinion/think articles
Population	Exclude studies where the majority of the population is not between the ages of 10 and 19.	Exclude studies where participants are not overwhelmingly adolescent (10-19 years old).
Setting	Exclude studies of interventions that are not implemented in school during or after school hours.	Exclude studies which take place at community-based settings even if students are recruited from schools
Outcome	Exclude studies that do not include at least one primary sexual and reproductive health outcome.	Exclude studies where one of the primary outcomes is not a sexual behaviour or sexual health outcomes. Outcomes might include: • Teen pregnancy • STDs, including HIV • Age of sexual initiation • Frequency of sex/sex in recent past • Contraception use, including condoms or other forms of birth control • Number of sexual partners
Intervention	Exclude studies of interventions that do not aim to modify: • School environment OR • School-related determinants of sexual behaviour, teen pregnancy, STDs or HIV/AIDS	Exclude studies that do not report on interventions designed to modify the school or individual-level determinants related to school in order to change sexual behaviour, teen pregnancy, STDs or HIV/AIDS outcomes. School environment interventions might include: • Improving caring adult relationships and increasing the number of adult role models at school • School climate and culture • Improving school safety (including physical and emotional violence) • Changing school policies • Providing opportunities for student engagement in school and community Education-related interventions might include: • Increasing students' expectations for their own school work • Increasing students' desire and confidence in obtaining higher education • Increasing academic achievement and support • Increasing interest in learning and school • Improving students' connectedness to school

Appendix C.6 Subject Matter Expert Request Letter for Study Search

Dear [NAME],

I am a doctoral researcher from London School of Hygiene and Tropical Medicine. I am undertaking a systematic review of outcome and process evaluation studies on *interventions aiming to promote pregnancy prevention behaviours by modifying the environment of secondary schools and/or increasing educational assets of students ages 10-19 in school.* The protocol for the study is available here: [ENTER URL]

I am writing to you as a subject matter expert to request information on any outcome or process evaluation studies that meet the following criteria:

- Evaluates an intervention that modifies the school environment OR education-related assets, sometimes referred to as Positive Youth Development curricula.
- School environment interventions might include improving caring adult relationships, addressing school climate and culture, improving school safety, changing school policies, or providing opportunities for student engagement in school and community
- Education-related interventions might include increasing students' desire and confidence in obtaining higher education, increasing academic achievement, increasing interest in learning and school, or improving students' connectedness to school
- Reports on at least one primary outcome related to sexual health and behaviours (e.g. sexual activity, contraception use, pregnancy, abortion, and/or parenthood) OR provides process data about the implementation of the intervention
- Published after 1990

If you are aware of any studies that possibly meet these criteria, could you please send me citation information (e.g. author, title, journal and/or year) by [ENTER DATE]?

Please feel free to contact me with any questions about the review criteria. I would also appreciate the names and contact information of any additional subject matter experts who might have knowledge of studies that meet the review criteria. My current list of contacts is attached.

Thank you in advance for your assistance.

Best wishes,

Amy Peterson

Appendix C.7 Data Request Email for Lead Authors of Identified Studies

Dear [NAME],

I am a doctoral researcher from London School of Hygiene and Tropical Medicine. I am undertaking a systematic review of outcome evaluation studies on *interventions aiming to promote pregnancy prevention behaviours by modifying the school environment and/or increasing educational assets of students ages 10-19 in school.* The protocol for the study is available here: [ENTER URL]

I am writing to you to request further information about [ENTER STUDY DETAILS] that could not be obtained during the data extraction process.

If possible, could you provide data for the questions indicated in the attached form by [ENTER DATE]?

In addition, I would appreciate the titles and author names of any additional outcome studies on interventions aiming to modify the school environment or improve educational assets that you may be aware of.

Please feel free to contact me with any questions about the review or if there is another member of the study team whom I should contact about this information.

Thank you in advance for your assistance.

Best wishes,

Amy Peterson

Appendix C.8 Characteristics of Studies and Risk of Bias Tables

Aban Aya Project (Flay 2004)		
Study Characteristics		
Methods	Unit of randomisation:	School
Participant Details	Country:	United States
	Sample number:	Intervention group: 4 schools, 366 students Control group: 4 schools, 372 students
	Age:	10.8 years (5th grade)
	Sex:	50.5% female; 49.5% male
	Race/ethnicity:	Schools 91% African-American, <10% Latino
	SES:	77% received federally subsidized school meals
Intervention Details	Description:	An intervention consisting of a social development curriculum and a school/community intervention aiming to reduce high risk behaviors.
	Target population:	Inner-city African American youth
	Theory:	Theory of triadic influence
	Content:	The School-Community Intervention (SCI) included a classroom-based social-emotional curriculum plus parental support, school climate, and community components. The parent support program reinforced skills and promoted child-parent communication. The school staff and school-wide youth support programs integrated skills into the school environment. The community program forged linkages among parents, schools, and local businesses. Each SCI school formed a local school task force consisting of school personnel, students, parents, community advocates, and project staff to implement the program components, propose changes in school policy, develop other school-community liaisons supportive of school-based efforts, and solicit community organizations to conduct activities to support the SCI efforts.
	Length:	3 years
	Control:	A health education curriculum with a focus on promoting nutrition, physical activity and general health.
Risk of Bias		
Item	*Reviewer's Judgment*	*Description*
Sequence generation	Unclear	Not enough information provided.
Allocation concealment	Unclear	Not enough information to assess.
Blinding	Unclear	Not enough information to assess, some avoidance of contamination by assigning health educators to same school across conditions and to develop continuity of relationships with schools and students.
Complete outcome data	Unclear	An average of 20% turnover occurred each year, resulting in an average sample of 644 students (range, 597-674) at each wave, with 339 (51%) of the 668 original grade 5 students still present at the end of grade 8 and a total analysis sample (students with one or more waves of data) of 1153. Intention to treat

		analysis not stated. Hierarchical modeling accounted for missing data.
Selective outcome reporting	Unclear	Not enough information to assess.
Key confounders	Not applicable	Randomised trial.
Clustering	Yes	Used hierarchical statistical models that accommodate nested observations (times within subjects, subjects within schools) and missing data
Other sources of bias	Yes	After randomisation, one inner-city school refused to participate and was replaced with one from the same risk level.
Gatehouse Project (Patton 2006)		
Study Characteristics		
Methods	Unit of randomisation:	School
Participant Details	Country:	Australia
	Sample number:	Intervention Group (IG): 11 schools; 1343 students (1997), 1158 students (1999), 966 students (2001)* Control Group (CG): 14 schools; 1342 students (1997), 1428 students (1999), 1497 students (2001)* **Cross-sectional samples*
	Age:	13-14 years old (8th grade)
	Sex:	Female: 52% (1997 IG), 54% (1997 CG); 55% (1999 IG), 55% (1999 CG); 53% (2001 IG); 54% (2001 CG)
	Race/ethnicity:	Not stated
	SES:	Not stated
Intervention Details	Description:	Intervention to promote social inclusion and commitment to education to reduce health risk behaviors and improve emotional well-being.
	Target population:	Students in 8th grade at 26 schools across metropolitan Melbourne, Australia.
	Theory:	Based on principles of the Health Promoting School Project
	Content:	The intervention consisted of four components: (1) feedback from a student survey about security (a student's personal sense of safety), communication with teachers, and broader participation in school life; (2) within each school, recruitment of staff involved in administration, student welfare, curriculum, or all 3 to a coordinating action team with a focus on school policies and professional practice of teachers; (3) consultation and training regarding specific intervention strategies; and (4) a ten week curriculum element that focused on problem-solving in situations in which young people commonly experience emotional difficulties. This strategy typically included the following sequence: (1) conduct a survey of the students, social profile, based on the student survey, to the school-based action team, (3) consult with the school team regarding intervention priorities, and (4) train teachers in the selected strategies. Strategies varied between schools according to students' perceptions of need; but, the implementation of school policy and curriculum elements that

		focused on social and emotional skills and strategies to promote inclusive relationships within the classroom were always addressed.
	Length:	2 years
	Control:	Usual treatment with assignment
Risk of Bias		
Item	*Reviewer's Judgment*	*Description*
Sequence generation	Unclear	No information provided
Allocation concealment	Unclear	No information provided
Blinding	Unclear	Not enough information to assess.
Complete outcome data	Unclear	No attrition rate as design was three cross sectional surveys over 3 years. Analysis was intention to treat. Response rates ranged from 66% to 81% over the three timepoints. One school in the intervention group failed to provide complete behavioral outcome data in the 1999 and 2001 surveys and so was not included in the analysis.
Selective outcome reporting	Unclear	Not enough information to assess.
Key confounders	Not applicable	Randomised trial
Clustering	Yes	All estimates included adjustment for school clustering.
Other sources of bias	No	
Kenyan Education Subsidy Program (Duflo 2015)		
Study Characteristics		
Methods	Unit of randomisation:	School
Participant Details	Country:	Kenya
	Sample number:	Intervention group: 83 schools Control group: 82 schools 19,289 students (across arms)
	Age:	13 years
	Sex:	49.2% female; 50.8% male
	Race/ethnicity:	Not stated
	SES:	Not stated
Intervention Details	Description:	An education subsidy intervention to reduce adolescent girls' dropout, pregnancy and marriage rates.
	Target population:	Students attending primary schools in Butere-Mumias and Bungoma, Western Kenya
	Theory:	Not stated
	Content:	Education Subsidy program subsidized the cost of education for upper primary school students by providing two free school uniforms over the last three years of primary school. Free school uniforms were distributed to boys and girls enrolled in grade 6 at the onset of the school year; 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, amounted to around $12 per student.
	Length:	2 years
	Control:	Control received no subsidies.
Risk of Bias		
Item	*Reviewer's Judgment*	*Description*

Sequence generation	Yes	Random number generator.
Allocation concealment	Unclear	Not enough information to assess.
Blinding	Unclear	Not enough information to assess.
Complete outcome data	No	More than 30% attrition by 7 years, intention-to-treat analysis not stated. Sample that could be followed up after 7 years over-represents males and participants receiving either treatment condition over control. Attrition analysis using subsample of 7-year responses reports similar findings to full sample.
Selective outcome reporting	Unclear	Not enough information to assess.
Key confounders	Not applicable	Randomised trial.
Clustering	Yes	Standard errors clustered at the school-level.
Other sources of bias	Yes	Childbearing is assessed by asking students present in classroom whether absent participant has children and if so, how many. A random subsample of 1,420 girls were visited to determine if method was accurate; 83% were verified as not having started childbearing, and 79 % were verified as having started childbearing by their former schoolmates.
Kenya School Support Programme (Cho 2011; Hallfors 2012)		
Study Characteristics		
Methods	Unit of randomisation:	Households
Participant Details	Country:	Kenya
	Sample number:	Intervention group: 53 participants Control group: 52 participants
	Age:	12.9 (12-14 years old)
	Sex:	59% female; 41% male
	Race/ethnicity:	100% Luo
	SES:	Not stated
Intervention Details	Description:	An intervention providing young orphan adolescents with uniforms, school fees and community visitors to improve school retention and reduce HIV risk factors.
	Target population:	Children ages 11-14 years with one or both parents deceased from any cause living near Kisumu.
	Theory:	Social development model
	Content:	Intervention group participants received school uniforms, school fees, sanitary pads and underpants for girls who had started menses, and monitoring and assistance from a community visitor. Intervention students could attend the Reach Out High School on partial scholarships provided by a US foundation supporting orphan students. All study households, regardless of condition, were given twice monthly food supplements (modest amounts of maize, sugar, cooking oil, and water guard) and mosquito nets and blankets for the children in the home.
	Length:	2 years
	Control:	Household provided food supplements (modest amounts of maize, sugar, cooking oil, and water guard) and mosquito nets and blankets for children in home.

Risk of Bias		
Item	*Reviewer's Judgment*	*Description*
Sequence generation	Yes	"Generated" random numbers for random assignment.
Allocation concealment	Unclear	Not enough information to assess.
Blinding	Unclear	Not enough information to assess. Households in close proximity were assigned same condition to avoid perception of relative deprivation among participants.
Complete outcome data	Yes	Less than 2% attrition. Intention-to-treat analysis not stated. Differences in participants who stayed and dropped out not reported.
Selective outcome reporting	Unclear	Not enough information to assess.
Key confounders	Not applicable	Randomised trial.
Clustering	Unclear	Used general estimating equations to account for lack of independence. Does not indicate if clustering of households was accounted for in addition to follow-up times.
Other sources of bias	Yes	Pilot study with small sample size. Baseline differences reported between treatment and control are in favor of control group.
Positive Action (Beets 2009; Snyder 2013)		
Study Characteristics		
Methods	Unit of randomisation:	School
Participant Details	Country:	United States
	Sample number:	Intervention group: 10 schools, 976 students Control group: 10 schools, 738 students
	Age:	10-11 years old (5th grade)
	Sex:	50% female; 50% male
	Race/ethnicity:	Hawaiian: 26.1%; Multiple ethnic backgrounds: 22.6%; NonHispanic White: 8.6%; African American: 1.6%; American Indian: 1.7%; Other Pacific Islander: 4.7%; Japanese: 4.6%; Other Asian: 20.6%; Other: 7.8%; Unknown: 1.6%
	SES:	Not stated
Intervention Details	Description:	The Positive Action program is a multicomponent school-based social and character development program designed to improve academics, student behaviors, and character.
	Target population:	Kindergarten to 12th Grade
	Theory:	Theory of Self-Concept, Theory of Triadic Influence
	Content:	The Positive Action program is a multicomponent school-based social and character development program designed to improve academics, student behaviors, and character. The full program consists of kindergarten through 12th grade classroom curricula, schoolwide climate changes undertaken by the principal and a Positive Action coordinator or committee, and family and community involvement components. Principals at each participating school received a school-climate kit providing directions for a schoolwide climate program to promote the core elements of the Positive Action classroom

		curriculum and to encourage and reinforce positive actions throughout the entire school.
	Length:	2001-2006 (at time of analysis)
	Control:	Usual treatment
Risk of Bias		
Item	*Reviewer's Judgment*	*Description*
Sequence generation	Unclear	Not enough information provided.
Allocation concealment	Unclear	Not enough information provided.
Blinding	Unclear	Not enough information to assess.
Complete outcome data	Unclear	Attrition rates nor baseline samples reported.
Selective outcome reporting	Unclear	Not enough information to assess.
Key confounders	Not applicable	Randomised trial
Clustering	Yes	Adjusted for clustering within schools.
Other sources of bias	No	None indicated
PREPARE (Mathews 2016)		
Study Characteristics		
Methods	Unit of randomisation:	School
Participant Details	Country:	South Africa
	Sample number:	Intervention group (IG): 20 schools, 1748 students Control group (CG): 22 schools, 1703 students
	Age:	13.7 years
	Sex:	41.5% male (IG); 37.9% male (CG)
	Race/ethnicity:	Not stated
	SES:	Undefined SES Index: 5.98 (SD 1.68) (); 5.99 (SD 1.65) (CG)
Intervention Details	Description:	A multi-component, school-based HIV prevention intervention to reduce sexual risk behaviors and intimate partner violence.
	Target population:	Student in Grade 8 in public high school in the Western Cape, South Africa at baseline.
	Theory:	Reasoned Action Framework, I-Change theoretical model
	Content:	The intervention was multi-component, comprising an educational programme, a school health service and a school safety programme. The educational programme consisted of 21 sessions delivered once a week, immediately after school ended. A nurse from the public clinic nearest to the school delivered the sexual health service in the school premises, once a week immediately after school ended. The school safety programme comprised two initiatives. School safety teams were invited to a two-day training at a central venue, conducted by the PREPARE team with the Centre for Justice and Crime Prevention (a nongovernment organisation).
	Length:	Not stated
	Control:	Control schools received school as usual, which excluded after-school programme, the school health service and the safety programme.
Risk of Bias		
Item	*Reviewer's Judgment*	*Description*

Sequence generation	Yes	Computer-generated randomization was used.
Allocation concealment	Yes	A statistician who did not have any knowledge of the schools, allocated them within each stratum to intervention and control arms of the study.
Blinding	No	Not able to mask intervention assignment.
Complete outcome data	Unclear	Attrition between 6% and 12%. Unclear if analysis was conducted as intention-to-treat, some indication that it was not.
Selective outcome reporting	Unclear	Not enough information to assess.
Key confounders	Not applicable	Randomised trial.
Clustering	Yes	Accounted for clustering, unclear if at school level
Other sources of bias	Yes	After allocation assignment, three schools were requested to be removed from study due to another intervention study. Schools were replaced randomly using schools from database. One control arm school dropped out prior to baseline and was not replaced.
Promise Place Program (Tolma 2014)		
Study Characteristics		
Methods	Unit of randomisation:	School
Participant Details	Country:	United States
	Sample number:	Intervention Group (IG): 1 school; 64 pregnant students; 76 parenting students Control Group (CG): 1 school; 47 pregnant students; 16 parenting
	Age:	13 years: 4% (IG); 0 (CG) 14 years: 7% (IG); 5% (CG) 15 years: 13% (IG); 16% (CG) 16 years: 17% (IG); 29% (CG) 17 years: 38% (IG); 37% (CG) 18 years: 16% (IG); 11% (CG) 19 years or older: 4% (IG); 3% (CG)
	Sex:	100% female
	Race/ethnicity:	Hispanic: 46% (IG); 70% (CG) Black: 34% (IG); 13% (CG) White: 8% (IG); 8% (CG) American Indian/Alaska Native: 1% (IG); 2% (CG) Other: 11% (IG); 8% (CG)
	SES:	64% (IG), 65% (CG) enrolment in Medicaid
Intervention Details	Description:	School-based case management intervention to reduce teen pregnancy.
	Target population:	Pregnant or parenting teens between 13 and 19 years old at study schools.
	Theory:	Not stated
	Content:	Within 3 weeks of enrollment, Family Advocates met with their students to complete an intake assessment, including enrollment information, Resources Checklist, Counseling information, and a Family Partnership Plan to identify family, personal, and graduation goals. After initial intake, the FA and the student collaboratively set up future goals, conducted prioritization of needs, and identified needed resources. FAs were expected to spend a minimum of 2 hours per month with each

		student. FAs conducted home visits (especially for those on maternity leave, with failing attendance, or any other special circumstances) and weekly individual counseling. The FAs used an empowerment approach to help the student achieve their goal through a "self-directed" decision-making process. The student would continue to receive the core services though case management, as long as they were enrolled in the program. Should a student transition out of the program due to graduation, drop-out, or return to their home-school, they were considered to be in after-care treatment. Follow-up care provided support to the students in their search for community resources and promoted continuity of care.
	Length:	Average 9 months
	Control:	Comparison school received standard care for pregnant and parenting teens
Risk of Bias		
Item	*Reviewer's Judgment*	*Description*
Sequence generation	Not applicable	Non randomised design.
Allocation concealment	Not applicable	Non randomised design.
Blinding	Unclear	Not enough information to assess.
Complete outcome data	No	Retention rates across follow-up years were 56% (intervention) and 54% (intervention). Primary analyses were based on an intent-to-treat paradigm.
Selective outcome reporting	Unclear	Not enough information to assess.
Key confounders	Unclear	Stratification was used as an exploratory tool to investigate potential confounding and modifying factors. Whether they were controlled for is not stated.
Clustering	No	Author confirmed analysis did not adjust for clustering given the small number of schools.
Other sources of bias	Yes	Only two schools included in design. Differences in recruitment methods between the two schools may have introduced selection bias.
Seattle Social Development Project (Hawkins 1999, Hill 2014, Lonczak 2000, Lonczak 2002)		
Study Characteristics		
Methods	Unit of randomisation:	School
Participant Details	Country:	USA
	Sample number:	Intervention group (full and late IG): 12 schools, 156 students (full); 267 students (late) Control group (CG): 5 schools, 220 students
	Age:	11.3 years (5th grade) at first survey
	Sex:	Male: 50.6% (Full IG); 48.7% (Late IG); 53.6% (CG)
	Race/ethnicity:	47% Caucasian American; 26% African American; 21% Asian American; 7% Other racial or ethnic groups
	SES:	Enrolled in National School Lunch/School Breakfast Program: 55.8% (Full IG); 58.8% (Late IG); 56.8% (CG)
Intervention Details	Description:	An intervention combining teacher training, parent education and social competence

		training for children during elementary schools to reduce adolescent health risk behaviors.
	Target population:	Fifth grade students at baseline in 18 public schools serving high-crime areas of Seattle, Wash.
	Theory:	Social development model
	Content:	Teachers in intervention classrooms received 5 days of inservice training in a package of instructional methods with three major components: proactive classroom engagement, interactive teaching and cooperative learning. First grade teachers received training on and delivered a cognitive and social skills training curriculum. Parent training classes were offered on voluntary basis; classes were different based on grade of child. "Full" intervention group consists of all students who were randomly assigned to intervention classrooms in grades 1 through 4, and who remained in schools assigned to the intervention condition in grades 5 or 6. The "late" intervention group consists of students in intervention schools who were in intervention classrooms in grades 5 and 6 only.
	Length:	5 years (Full) or 2 years (Late)
	Control:	Matched with “no intervention” assignment
Risk of Bias		
Item	*Reviewer’s Judgment*	*Description*
Sequence generation	Not applicable	Non randomised trial.
Allocation concealment	Not applicable	Non randomised trial.
Blinding	Unclear	Non randomised trial. As a part of teacher training component, evaluators observing classrooms were uninformed abou the condition of classrooms they observed.
Complete outcome data	Unclear	Estimated 6-7% attrition across studies. Analysis indicated that attrition was random across three conditions with respect to condition, gender, SES or race. Intention to treat analysis not stated. Some attempt to impute missing data in one analysis (Hill 2014). Intention to treat analysis not stated.
Selective outcome reporting	Unclear	Not enough information to assess.
Key confounders	No	One analysis (Hill) controlled all models for gender (male), childhood low income status, whether an individual was the child of a teen mother. Hawkins et al. (1999) explored by SES and gender but did not adjust for confounders in overall analysis. Lonczak et al. (2002) controlled for eligibility for free lunch in 5th, 6th or 7th grade only when testing interaction effects of race.
Clustering	Unclear	One analysis (Hill et al 2014) controlled for potential classroom/school clustering effects.
Other sources of bias	No	

South Africa Cash Transfer Programme (Pettifor 2016)		
Study Characteristics		
Methods	Unit of randomisation:	Individual
Participant Details	Country:	South Africa
	Sample number:	Intervention group (IG): 1225 participants Control group (CG): 1223 participants (CG)
	Age:	Grade 8 (13–15 years): 26% (IG); 25% (CG) Grade 9 (14–16 years): 26% (IG); 28% (CG) Grade 10 (16–17 years): 28% (IG); 27% (CG) Grade 11 (17–18 years): 21% (IG); 20% (CG)
	Sex:	100% female
	Race/ethnicity:	Not stated
	SES:	33% (IG); 35% (CG) with food insecurity
Intervention Details	Description:	A conditional cash transfer program to reduce HIV incidence among young women in South Africa.
	Target population:	Girls aged 13-20 enrolled in grades 8-11 in Bushbuckridge subdistrict, South Africa
	Theory:	Not stated
	Content:	Young women randomly assigned to the intervention group received 100 rands (R), and their parent or guardian received R200 every month, conditional on the young woman 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.
	Length:	Not stated
	Control:	Usual treatment with assignment
Risk of Bias		
Item	*Reviewer's Judgment*	*Description*
Sequence generation	Unclear	Assignments numerically ordered using block randomization but sequence generation not indicated.
Allocation concealment	Yes	Numbered sealed envelopes containing a randomization assignment card were numerically ordered using block randomization. Teachers and administrators were masked to study enrolment; rosters were collected for the participant's entire class to avoid disclosure of study group or participation.
Blinding	Unclear	Participants and parents or guardians were not masked to assignment. Teachers and administrators were masked to study enrolment; rosters were collected for the participant's entire class to avoid disclosure of study group or participation.
Complete outcome data	Unclear	Follow-up attrition rates 13% for control and 5% for intervention. Exploration of attrition differences not reported. Analysis using intention to treat on only one variable (HIV).
Selective outcome reporting	No	Outcomes indicated in trial protocol (NCT01233531) are reported.
Key confounders	Not applicable	Randomised trial.

Clustering	NA	Randomisation was at individual-level. No indication of clustering at school or household level is indicated.
Other sources of bias	Yes .	Used individual-level randomisation which may have led to spill-over effects
Zimbabwe School Support Programme (Hallfors 2011)		
Study Characteristics		
Methods	Unit of randomisation:	School
Participant Details	Country:	Zimbabwe
	Sample number:	Intervention group (IG):13 schools, 184 students Control group (CG) 12 schools, 145 students
	Age:	12.2 years (IG); 12.3 years (CG)
	Sex:	100% female
	Race/ethnicity:	Not stated
	SES:	3.22 (IG), 3.28 (CG) (number of assets in home, 0-12)
Intervention Details	Description:	A comprehensive support program to keep orphan adolescent girls in school to reduce HIV risk.
	Target population:	Girls with one or both parents deceased in 25 primary schools in Manicaland, Zimbabwe.
	Theory:	Social development model, social control theory
	Content:	Intervention students received school support, including fees, exercise books, uniforms, and other school supplies (e.g., pens, soap, underpants, and sanitary napkins). Female teachers at each intervention primary school were selected and trained by research personnel as helpers. Helpers were trained to monitor participants' school attendance and to assist with absenteeism problems as they arose, but were not to provide special HIV information or life skills training. A small fund was available to helpers for addressing attendance problems. After grade 7, the girls matriculated to high school and new helpers were selected and trained in the new schools.
	Length:	2 years
	Control:	Control group received a universal primary school feeding program.
Risk of Bias		
Item	*Reviewer's Judgment*	*Description*
Sequence generation	Unclear	Not enough information provided.
Allocation concealment	Unclear	Not enough information to assess.
Blinding	Unclear	Not enough information to assess.
Complete outcome data	Unclear	Intention to treat analysis not stated. Between 3% and 12% attrition for follow-ups 1 and 2.
Selective outcome reporting	Unclear	Not enough information to assess.
Key confounders	Not applicable	Randomised trial.
Clustering	Yes	Used general estimating equations to account for clustering

Other sources of bias	Yes	Pregnancy data collected from secondary sources, no other details provided about validity of data collection on pregnancy. One control school was dropped after randomization when all participants assigned were discovered to have two living parents, making them ineligible for the study.
Zomba Cash Transfer Programme (Baird 2010, Baird 2012)		
Study Characteristics		
Methods	Unit of randomisation:	Enumeration Area
Participant Details	Country:	Malawi
	Sample number:	Intervention group (IG): 88 enumeration areas, 727 participants Control group (CG): 88 enumeration areas, 1050 participants
	Age:	15.6 (ages 12-22)
	Sex:	100% female
	Race/ethnicity:	Not stated
	SES:	Not stated
Intervention Details	Description:	This intervention provided monthly cash transfers to participants and their guardians to reduce risk of sexually transmitted infections.
	Target population:	Girls aged 12-22 who were not married at baseline. Subgroups included schoolgirls at baseline and dropouts at baseline.
	Theory:	Not stated
	Content:	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 girl and varied randomly by enumeration area and by individual. School fees were paid directly to school for recipients eligible to attend secondary school.
	Length:	January 2008-December 2009
	Control:	Subsample of girls who were not randomised to receive treatment.
Risk of Bias		
Item	*Reviewer's Judgment*	*Description*
Sequence generation	Yes	Enumeration areas were assigned conditions from a computer-generated list of random numbers
Allocation concealment	Unclear	Codes for randomisation were written by one of the study investigators and run by the programme field manager. The resultant enumeration area identification numbers and basic information about individuals selected to participate in the cash transfer programme in each intervention enumeration area were then provided to study staff, who enrolled participants.
Blinding	Unclear	Study participants were not masked to their assignment, but did not know what the comparison groups were because they were assigned at the enumeration area level. Trained counsellors who did home-based counselling and rapid testing for HIV, HSV-2, and syphilis were masked to the participant's group. Statistical analyses were done by the

		investigators who were not masked to the treatment status of the participants.
Complete outcome data	Yes	Intention-to-treat and less than 10% attrition. Only a subsample were biologically tested (1777 of 3796).
Selective outcome reporting	No	Outcomes match trial protocol (NCT01333826).
Key confounders	Not applicable	Randomised trial
Clustering	Yes	Standard errors were clustered at the Enumeration Area (village) level.
Other sources of bias	No	None indicated.

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