

# Improving the sexual health of young people (under 25) in high-risk populations: a systematic review and meta-analysis of behavioural and psychosocial interventions.

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## Research article

**Keywords:** sexual health, high-risk populations

**Posted Date:** April 3rd, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-380373/v1>

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# Abstract

**Background** Ensuring young people experience good sexual health is a key public health concern. Yet, some vulnerable groups of young people are at higher risk of poor sexual health, and consequently require additional support to achieve good sexual health. Therefore, the aim of this systematic review was to identify and assess the evidence base for behavioural and psychosocial interventions to improve sexual health for young people with additional vulnerabilities.

**Methods** We searched for randomised controlled trials of interventions aimed at promoting sexual health, with any non-pharmacological comparator (e.g., waitlist control). Key outcomes of interest were indicators of sexual health (e.g., condom use, attitudes to contraception, knowledge of risk). Participants in eligible trials were under 25 years old and in a high-risk group (alcohol and other drug use; justice-involved; homeless; LGBTQI+; mental ill-health; ethnic minority, or out-of-home care). The final literature searches were performed on 16 September 2020, on MEDLINE, PsycINFO, EMBASE, CENTRAL, Web of Science, Scopus and clinical trial registries. Meta-analyses were conducted where possible.

**Results** Forty-seven papers from 46 trials of the 5213 identified met inclusion criteria, with all but one of the included trials conducted in North America. Three focused predominantly on AOD, six on juvenile justice, two on homelessness, five on young men who have sex with men (YMSM), 26 on ethnic minorities, two on mental ill-health, three on out-of-home care, however no trials were identified in LGBTQI+ groups outside of YMSM. The 47 included papers had a combined total of 21,543 participants. The vast majority (26/46) of trials were conducted with ethnic minority groups, with most of the interventions delivered as group therapy, and some involving parents and caregivers. Condom use was the most frequently reported outcome measure. In trials targeting ethnic minorities, the meta-analysis found a medium effect size (0.62,  $p = 0.0004$ ) of the intervention on condom use.

**Conclusions** There remains a dearth of research undertaken outside of North America, and in high-risk groups other than ethnic minorities. Future interventions should address sexual health more broadly than just the absence of negative biological outcomes with LGBTQI+, homeless and mental ill-health populations targeted for such work.

This review was registered at Prospero (ref. 149810) and at [osf.io/ukva9](https://osf.io/ukva9).

## Background

Good sexual health is broader than just being free from sexually acquired infections; rather it is defined as experiencing sexuality that is satisfying, positive, and respectful; as well as being free from exploitation and violence (1). As such, interconnecting biological and social factors play a part in how individuals experience sexual health.

The transition period between childhood and adulthood (typically considered between 10–25 years) is a time of significant biological, social, and psychological changes from the start of puberty to sexual

maturation. During this time sex hormones increase, bodily changes occur, and a sense of self as a sexual being (including sexual identity) develops. Adolescents' experience newly emerging sexual desires and encounter opportunities to experiment with sexuality (2) however, emotional maturity has often not yet fully developed. As a result, adolescents and young people are more likely to engage in what can be considered "high risk" sexual activity. By this we mean activities that could lead to unintended pregnancy and/or sexually transmitted infections (STIs) such as condomless vaginal, anal, or oral sex or sex while under the influence of drugs or alcohol (3). This increased likelihood of engaging in high-risk sexual activity makes sexual health of critical concern within this age group (under 25). Data to support this concern include around 50% of new STIs (4), and 40% of new HIV infections (5) occurred among 15–24-year-olds in the USA. Furthermore, when pregnancy occurs during adolescence rather than later in life, it is frequently associated with poor social outcomes (6).

In response to the need to address sexual health during this critical period, international agencies such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) have declared that the delivery of sex education in schools should be mandatory (7). Whilst these school-based programs ensure the delivery of sex education to many, there are several groups amongst those aged under 25 that experience additional vulnerabilities that place them at higher risk of poor sexual health and may require a tailored approach that targets their specific needs.

When discussing "risky" groups it is important to acknowledge the impact this label can have on people, especially young people and those who are already marginalised by society for reasons like ethnicity or socioeconomic status (8). In this review we have chosen to search for interventions targeting young populations (under 25 years) who are underserved by the existing standard sexual education. This includes; LGBTQI+ including young males/men who have sex with males/men (YMSM), individuals who use alcohol and other drugs (AOD) and/or experience mental ill-health, those in justice/prison or detention settings, ethnic minorities, and youth who are living in foster or out-of-home care (OOHC).

These groups represent populations that have poorer sexual health than their peers. For example, YMSM account for approximately one third of new HIV infections among males/men who have sex with males/men (MSM) in the US (9), with many YMSM reportedly learning about anal sex through direct experience, in the absence of any appropriate sexual education (10), including discussion about the higher risks of STIs associated with anal sex. Young sexual minority females experience higher rates of forced sex and increased reporting of multiple partners (11), and young people with mental ill-health engage in higher rates of high-risk sexual behaviour and report a greater rate of unwanted pregnancy (12) than their peers. Youth who have alcohol or other substance use problems are more likely to have multiple partners, less likely to use condoms consistently, and therefore are at greater risk for STIs (13). Compared with youth who have never been incarcerated, young people in detention settings experience poorer mental and physical health, a higher incidence of STIs, more sexual partners, and higher rates of pregnancy (14). Ethnic minority youth experience disproportionately high rates of HIV infection, with over half of all new infections among YMSM in the US occurring in African-American youth, and a quarter in Hispanic or Latinx youth (15). Youth in foster care are more likely to be sexually active, and more likely to

experience sexual debut before the age of 13 than those who have never been in foster care, with female adolescents more likely to experience earlier pregnancy (16).

Although there have been significant achievements in HIV prevention and treatment since the epidemic of the 1980s and 90s (for example Pre-exposure prophylaxis; PrEP), there has been markedly less advancement in sexual health promotion interventions for young people in vulnerable groups. In the Compendium of evidence-based and best practices for HIV prevention published by the CDC, only 10 of the included 59 interventions were developed for young people aged under 25, despite the need to promote early intervention during this critical point in life (17).

Whilst systematic reviews of interventions for adults within specific high-risk populations have been completed (e.g., mental illness (18, 19), homelessness and drug use (20) justice involved individuals (21) and MSM (22)), the same has not for young people. The aim of the current systematic review is therefore to establish what behavioural interventions have been tested to improve sexual health among young people in at-risk populations, and how effective they are.

## Methods

Before beginning the search, review databases (Cochrane, Prospero) were searched to confirm no similar reviews were already completed or in progress, and this review was registered on Prospero and at OSF (ref. 149810; osf.io/ukva9). We identified high-risk groups based on the Australian Department of Health's overview of the topic of youth at risk (23)

### Search strategy

Literature searches were performed on MEDLINE, PsycINFO, Excerpta Medica Database (EMBASE), Cochrane Central Register of Controlled Trials (CENTRAL), Web of Science, and Scopus. Ongoing and unpublished trials were searched for at ClinicalTrials.gov, Australian and New Zealand Clinical Trials Registry (ANZCTR), and the World Health Organization's ISRCTN registry. The last search being performed on 16 September, 2020. Below is an example search strategy (as used for Ovid). Boolean operators are in bold.

1 (("safe sex" **OR** "sexual health" **OR** "sexual wellbeing" **OR** "sexual health promotion" **OR** "unsafe sex" **OR** "sexual risk taking" **OR** "sex\* risk behavio\*r" **OR** STI **OR** HIV **OR** chlamydia **OR** gonorrhoea **OR** hepatitis **OR** syphilis **OR** "acquired immunodeficiency syndrome" **OR** condom\* **OR** "barrier contraception" **OR** "unwanted pregnancy" **OR** "pregnancy prevention") **AND** ("behavio\* therapy" **OR** "cognitive therapy" **OR** "psychosocial intervention" **OR** "skills training" **OR** "sex education" **OR** "motivational interview\*") **AND** (youth **OR** "young adult\*" **OR** teenage\* **OR** "high school student\*" **OR** adolescen\* **OR** "university student\*")) .ti,ab.

2 ("severe mental illness" **OR** "serious mental illness" **OR** "chronic mental illness" **OR** schizophrenia **OR** bipolar **OR** mania **OR** psychosis **OR** schizoaffective **OR** "major depressive disorder" **OR** MDD).ti,ab.

3 (alcohol\* OR binge OR ethanol OR drink\* OR "drug use" OR "recreational drug\*" OR "substance use").ti,ab.

4 ("juvenile justice" OR probation OR court\* OR "law enforcement" OR "diversion program" OR "juvenile detention").ti,ab.

5 (homeless\* OR "street youth" OR "runaway youth").ti,ab.

6 (gay OR lesbian\* OR genderqueer OR transgender\* OR homosexual\* OR bisexual OR bicurious OR "female to male" OR "male to female" OR trans OR "men who have sex with men" OR MSM OR intersex OR LGBT OR LGBTQ OR LGBTQI OR "gender transition" OR "gender dysphoria" OR "gender identity" OR "same sex attracted" OR "same sex couple" OR "same sex couples" OR "sexual and gender minorities" OR "sexual orientation" OR "sexual preference" OR "trans wom#n" OR "trans m#n" OR "trans people" OR "women loving women" OR "women who have sex with women" OR WSW).ti,ab.

7 ("foster care" OR "group home\*" OR "out of home care" OR "residential care").ti,ab.

8 ("minority group\*" OR "ethnic minorit\*" OR "ethnic group\*" OR immigrant\* OR "racial group\*" OR black OR hispanic OR latin\* OR asian OR indigenous OR "native American" OR aboriginal OR "first nations" OR african OR vietnamese OR "hawaii\* native" OR asian OR indian OR inuit OR "pacific islander\*" OR "american indian\*").ti,ab.

11 1 AND (2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8)

### **Inclusion criteria**

Articles were included for review if they:

i. Included the following participant groups:

- Under 25 years old, any gender AND

- In a high-risk group

Alcohol and Other Drug (AOD) use

Justice involved youth

Homeless

LGBTQI

Mental ill-health

Ethnic minority

Out-of-home care (OOHC)

- ii. Were a randomised controlled trial whose arms ( $\geq 2$ ) are non-pharmacological interventions aimed at promoting sexual safety-taking behaviours and any non-pharmacological comparator (e.g., waitlist control)
- iii. Reported sufficient data to satisfy PRISMA and Cochrane guidelines for inclusion in the review
- iv. Were published in English.

A study was ineligible if:

- it included participants older than 25 at the beginning of the trial
- the primary aim of the study was not to address sexual health
- it includes pharmacological treatment as a comparison arm
- there was a later publication of results from the same trial – the paper reporting the longest follow-up data was chosen
- if the intervention was focussed on abstinence, or purely targeted parents rather than the young person themselves.

### **Data retrieval**

Data retrieved were uploaded to the referencing manager Mendeley. Mendeley was then used to remove duplicates from the review's sample.

### **Data screening**

Titles and abstracts of papers were screened independently by two reviewers (S.L. and E.B.) following the eligibility criteria, using Covidence online review software. Papers that met eligibility criteria then had full articles screened. Discrepancies between the two reviewers were resolved by a third reviewer (R.G.).

### **Data extraction**

A standardised form was used to extract data from the eligible trials and included: study citation, place of origin, setting, sample size, intervention type, dose, control, and findings. We noted in the table whether outcomes reported were based on participant knowledge and attitudes (**K + A**), their self-reported behaviour (**B**), was an outcome that was biologically verified, i.e., STI infection or pregnancy (**Bio**), or related to sexual wellbeing, i.e., communication skills or relationship satisfaction (**SW**).

### **Meta-analysis**

Where possible, data were combined from included trials using random effects meta-analysis. Specifically, for binary outcomes (e.g., STI incidence), data were pooled using odds ratios (ORs) and their associated 95% confidence intervals (CIs).

For outcomes measured on a continuous scale (e.g., attitudes and knowledge of STI/HIV), we used the mean difference (MD) or standardised mean difference (SMD) and their associated 95% CIs as

appropriate. Specifically, where all trials included in a meta-analysis used the same measure, we used the MD. Where trials used different measures for the same outcome, we used the SMD.

Data from included trials were only combined where the population (e.g., the high-risk grouping) and outcome assessed (e.g., STI or pregnancy incidence, condom use, knowledge, or attitudes scales) were sufficiently similar. Where data from included trials could not be incorporated into a meta-analysis, we instead presented a narrative summary of the findings.

### **Quality assessment of interventions**

All articles reviewed were subject to quality assessment using the Cochrane Risk of Bias tool. Assessments were performed independently by two reviewers (S.L. and E.B.) and with discrepancies being resolved by a third party where required.

## **Results**

### **Search results**

The final searches were performed on 16 September 2020, and 5213 papers were identified in total. The removal of 3490 duplicates left 1723 papers to be reviewed for eligibility, 1539 papers were removed following title and abstract screening, with 137 removed following full text screening. In total, 47 papers from 46 trials met our inclusion criteria with the PRISMA flow diagram (Fig. 1) showing details of reasons for exclusions, mainly being the wrong age range (for example, an age range that went above 25). The 47 included papers were spread over the high-risk groups as follows: three focused predominantly on AOD, six on juvenile justice, two on homelessness, five on YMSM, 26 on ethnic minorities, two on mental ill-health, three on out of home care, and finally no trials were identified in LGBTQI+ groups outside of YMSM. The 46 included trials had a combined total of 21,543 participants and results are detailed in Table 1.

Nearly all (45/46) trials took place in the USA and tested interventions that were delivered in group settings, ranging from 60 minutes to eight hours, over one week to seven months. Six of the interventions were delivered at one time only. Some included trials had intersectional populations; where this was the case they are grouped according to the primary target population as stated by the authors, with secondary groups noted in relevant sections.

### **Included trials**

#### **Alcohol and other drug (AOD) use**

Our review identified three papers describing interventions for youth with AOD-related issues. One was conducted inside a residential treatment facility (24), one in outpatient clinics (25), and one via text message (26) Only Letourneau (25) reported longer-term outcome data (over 12 months), focusing purely on behavioural outcomes. Their group intervention focused on reducing substance use and sexual risk-behaviours for young people who had been referred to a juvenile drug court. It incorporated caregiver

involvement in a contingency management program, including elements of cognitive-behavioural therapy to help teens identify the antecedents of their risk behaviours. This intervention had no significant impact on sexual risk behaviours, with the authors highlighting the challenge of addressing common co-occurring 'problem behaviours' with one broad approach.

Five other papers identified in this review included young people with substance use problems as secondary groupings, given the commonality of comorbidities between these at-risk groups (Juvenile Justice and Homelessness groups) (27–31). These will be discussed under their primary grouping.

### **Justice-involved youth**

We identified six papers reporting trials that targeted justice-involved youth (27, 28, 31–34). Four of the six trials took place in detention centres or prisons, while one (32) was conducted in foster care homes adolescents had been placed in as part of their 'treatment'. Two of the trials were single gender only (one each for males (33) and females (32)), and two others also included content aimed at reducing drug and alcohol consumption (27, 28). The papers mostly reported behavioural outcomes such as condom use, pregnancy and STI incidence. One study (27) reported the reduction in STI incidence as a result of their sexual risk reduction group with additional content on alcohol and cannabis use. Kerr and colleagues (32), in a trial with girls aged 13–17, found multidimensional treatment foster care reduced the odds of pregnancy over the subsequent 24 months. The two other trials (28, 33) did not have a significant long-term impact on risky sexual behaviours despite post intervention effects on knowledge, attitudes and condom skills. No data were available to extract for meta-analyses within this high-risk group.

Four additional papers described three trials where some of the participants were involved with the justice system (25, 35–37).

### **Homelessness**

Two papers focusing on homeless youth are included in this review; both were conducted at drop-in centres providing other services for homeless youth, and also included content to reduce AOD use (29, 30). Both trials reported significant findings when an unplanned post-hoc analysis was conducted. Slesnick et al. (29) found their intervention only had a significant impact on condom usage when age was factored into the analysis: intervention group participants aged 14–18 used condoms more frequently at follow up than control group youths aged 19–22. While the intervention used by Tucker and colleagues (30) failed to have an impact on knowledge and attitudes, it did decrease unprotected sexual acts for participants with multiple sexual partners.

### **LGBTIQ+ (including YMSM)**

Five papers focused on YMSM (38–42). Two trials were conducted remotely, one of them online (40) and one via text message (41) as novel approaches to engaging this potentially hard to reach population. The remaining trials occurred in HIV clinics and LGBTIQ + community health centres. One occurred in Thailand (42). All five trials reported behavioural outcomes, typically rates of engagement in protected sex and the

number of sexual partners. Overall, results were mixed with some, but not all, trials reporting a significant improvement in sexual health behaviours for participants who took part in an intervention. For example, Chen et al.'s (38) intervention increased participant's likelihood of using condoms ( $p < .001$ ) and Rongkavilit et al.'s (42) intervention reduced frequency of engaging in anal sex ( $p = .04$ ) but did not significantly improve condom use. Two of the five trials (39, 40) also reported knowledge and attitude outcomes, however neither intervention produced significant changes in these outcomes.

### **Mental ill-health**

Two papers targeting young people with mental illness were identified; one recruited from mental health outpatient clinics (43), and the other (44) recruited high school students with "emotional or behavioural problems". Both were three-arm trials and produced mixed results. In Brown et al 2017 (44), the HIV prevention plus affect management (AM) intervention appeared to have more of an effect on sexual behaviours than a skills-based HIV prevention (SB), although both active interventions significantly improved HIV knowledge and condom attitudes at six months follow-up ( $p < .05$ ). There was no impact on engaging in sexual intercourse with concurrent substance use in either arm of the trial. Brown et al.'s (2014) (43) family-based HIV prevention and adolescent-only HIV prevention interventions both improved sexual behaviours at three months compared to control ( $p < .05$ ), but the family-based intervention also improved HIV knowledge and parent-teen sexual communication ( $p < .01$ ).

Two papers included in other high-risk groups also address youth with a history of abuse and/or mental ill-health (36, 45).

### **Ethnic minorities**

There were 26 trials identified that tested a sexual health intervention targeting young people who were considered to be an ethnic minority. All were undertaken in the USA across a variety of settings, from sexual health clinics (46, 47) to community-based youth organisations (48–50), and one provided in the context of a summer basketball camp for American Indian adolescents (51). Most (19/26) were delivered as group-based interventions, two as one-off interventions (47, 52), three interventions were delivered as one-to-one case management support (53–55) and one was a mass media intervention across different cities (56).

Fourteen of the interventions focused specifically on HIV prevention, four on HIV/STI prevention, two focused on preventing pregnancy, three had a focus on intervening at the family level, and the final three focused more broadly on reducing unprotected sex. Newer trials were less likely to focus specifically on HIV prevention, often recognising the need to address and measure sexual health more broadly than the prevention of one disease.

Two papers from other high-risk groups also included ethnic minorities, one targeting homelessness (30), and one for YMSM (40).

### **Out of Home Care**

Three papers were identified from two trials that focused on delivering an intervention to young people in out of home care (35–37), with both recruiting a sample that were also involved in the juvenile justice system. The two trials tested intensive (at least twice weekly) group-based interventions delivered within the out of home care setting. Whilst the older trial (36) focused on HIV/AIDS prevention, (35)'s trial focused on pregnancy as well as HIV and STI prevention. Both trials found long-term (up to 12 months post intervention) significant change in knowledge and attitudes, but non-significant changes in sexual behaviours. (35) also assessed the sexual wellbeing concept of 'ability to communicate with partner' with the intervention group reporting a significantly higher ability over the 12 months follow up period.

## **Meta-analysis**

Data were only available to undertake meta-analyses within one high-risk population; ethnic minorities. Data were pooled when available resulting in meta-analyses being completed on the following outcomes; STI/HIV/AIDS knowledge, condom use, frequency of unprotected sex and STI incidence).

### **Knowledge of STI/HIV/AIDS**

Five papers provided sufficient data to produce a forest plot showing effect sizes for each study individually and pooled as an aggregate for the impact of a sexual health intervention on participants knowledge of STI/HIV/AIDS (Fig. 2). Standard mean differences are presented given inconsistency in outcome measure and end time points across trials. The pooled effect size of the five included trials was  $-0.34$  (95% CI:  $-0.45$  to  $-0.24$ ), suggesting a small effect size in favour of interventions.  $I^2$  was 62%, ( $p = 0.03$ ).

### **Condom use**

Data were available from a total of 12 trials to produce forest plots showing effect sizes for each study individually and pooled as aggregates for the impact of intervention on condom use (Figs. 3 and 4). Standard mean differences are presented for continuous data in Fig. 3, whilst odds ratios are presented in Fig. 4 for dichotomised data. Presentation of data on condom use was inconsistently presented, for example DiClemente et al (2004) (57) presented these data as the number of episodes of unprotected sex in last six months at 12 month follow up, whilst Jemmott et al (2005) (58) reported at the number of days of sex without condom in last three months and at 12 month follow up.

Pooled effect size for the trials that presented data as continuous variables was  $-0.05$  (95% CI:  $-0.13$  to  $0.02$ ), representing no effect ( $I^2 = 0\%$ ,  $p = 0.53$ ). In contrast, the pooled odds ratio for trials presenting data as dichotomised variables was  $0.62$  (95% CI:  $0.52$  to  $0.74$ ); this suggests a medium size effect in favour of interventions ( $I^2 = 74\%$ ,  $p = 0.0004$ ).

### **Frequency of unprotected sex**

Data were available for a meta-analysis for a second behavioural outcome for ethnic minority groups; frequency of unprotected sex. Continuous data from four trials produced a pooled effect size of  $0.19$  (95% CI:  $0.10$  to  $0.28$ ); suggesting no effect ( $I^2 = 0\%$ ,  $p = 0.61$ ), Fig. 5.

## STI incidence

The biological outcome with data available for meta-analysis was STI incidence. The pooled odds ratio across six trials was 1.32 (95% CI: 1.07–1.64), representing a smaller likelihood of being diagnosed with an STI for participants in intervention conditions than those in controls (Fig. 6).

## Quality assessment of included trials

The Cochrane risk of bias tool was used to assess the quality of all included papers, see Figs. 7 and 8. Figure 7 shows that there was a high or unclear risk of bias for nearly all trials in the blinding of participants or personnel domain. The only domains where over half of the included trials were at a low risk of bias were incomplete outcome data and selective reporting.

## Discussion

This systematic review of behavioural and psychosocial interventions to improve the sexual health of young people in high-risk groups identified a total of 47 trials reported between 1992 and 2018. Meta-analysis data suggest modest support for the efficacy of some interventions in increasing knowledge of HIV/AIDS, and decreasing incidence of STIs, although data were only available for interventions tailored to ethnic minority groups, which notably made up over half of the trials in this review. The large representation of ethnic minority samples is likely to be a reflection of the high rates at which the HIV pandemic continues to affect vulnerable groups in the USA (the target of this review), relative to the historically white majority (15). This is particularly evident within states exhibiting more pronounced racial health inequality, such as Mississippi, Louisiana, and Georgia. Therefore there is a need to test these interventions in other countries with different health systems and cultures, especially targeting less researched groups, for example homeless youth, those in OOHC, and non-YMSM LGBTQI+ youth.

The most frequent outcomes reported in the included papers related to self-reported measures of behaviours that lowered risk of HIV and other STIs, such as frequency of unprotected sex, consistent condom use, and number of sexual partners. Change in knowledge and attitudes as a result of the intervention was also frequently measured. Most of the interventions were based on a model of health behaviour change, such as the Information-Motivation-Behaviour skills model (59, 60), which implies that whilst information is important for health behaviour change (i.e., knowledge), an individual's own motivation to change is also critical (i.e., attitudes). This review identified a number of trials (33, 35, 36, 61, 62) that demonstrated that knowledge and attitudes toward sexual health and risk taking could be significantly improved in the intervention arm, but this did not translate into self-reported changes in behaviour. This was frequently attributed to the complex presentations of the participants that the interventions targeted, making the translation of knowledge into behaviour change an even greater challenge than it can typically be in public health interventions. Sexual health behaviour change requires assertiveness, planning, access to resources such as condoms and contraception, and engaging with partners that are non-coercive. For some groups this can be especially challenging when they face isolation, stigma, exploitation and abuse. Sexual health promotion interventions should take into account the need for empowerment, communication and social skills training, and access to appropriate

resources and support. A minority (8/47) of the papers assessed outcomes relating to 'sexual wellbeing' such as communication skills with partners or parents. Doing so again recognises the need for sexual health promotion interventions for young people in high-risk groups to encompass healthy relationships, without solely focussing on the prevention of negative outcomes. The abilities to communicate needs and boundaries, and negotiate contraceptive use, are equally important in fostering long-term sexual health (63).

This review identified a substantial number (26) of trials that have been undertaken with young people of ethnic minorities in the USA. In contrast, only two trials were identified for three of the other populations: homelessness, OOHC, and mental ill-health, and only three trials in AOD populations; highlighting the areas where considerable work is still required. Whilst five trials of YMSM were identified, none were found that focused on other LGBTQI+ groups. There is a notable dearth of interventions for this group (excluding YMSM/MSM), particularly for trans youth (64).

The frequent intersectionality of trial populations – as evidenced by the multiple interventions addressing, for example, substance use in the context of homeless, justice-involved, or ethnic minority youth – could mean that young people struggle to access the support they need. When an individual is a member of several vulnerable groups, they are at risk of slipping through the cracks due to a lack of 'ownership' for the issue of their sexual health. Breaking down the siloed nature of physical health, mental health and social care services for these vulnerable individuals remains a key task at a clinical and policy level. In Australia, there has been an emphasis on the concept of a 'one stop shop' for youth mental health (65), although this model has faced criticism (66). Finding novel, effective ways to engage these groups, and supporting them to consider and address their sexual health at the critical period of adolescence needs to remain a priority of government, health and social services. Early, effective intervention for vulnerable youth could prevent the exacerbation of problematic economic and health disparities. In the UK, considerable success has been seen in public health interventions that target teen pregnancy, however there are still large disparities between certain groups (67).

## **Limitations**

The results of this systematic review need to be considered in light of several limitations. Firstly, we excluded trials that utilised an age range of up to 29 years old, meaning we may have missed key interventions due to differences in definitions of 'young people'. Additionally, we used meta-analyses to compare trial data that often varied greatly in methodology. While we ensured all analysed variables were comparable, and used odds ratios to mitigate risk, the findings in favour of interventions need to be viewed with caution. In addition, raw data for use in meta-analyses were unavailable for several of the trials due to the way authors had chosen to present their data.

Ethnic minorities were only those from North America, suggesting that we cannot reliably extrapolate to other minority groupings such as Culturally and Linguistically Diverse (CALD) in Australia, or Black, Asian and Minority Ethnicities (BAME) in the UK. Many of these interventions were found acceptable by participants due to the tailoring of content to specific cultural groups. While this was effective to varying

degrees for those included trials, it means that even the most promising interventions are likely needing cultural adaptation, co-produced with those who represent the voice of those cultures, before they could be tested in other settings and groups.

## **Conclusions**

This systematic review found some support for sexual health promotion interventions that were tailored to specific high-risk populations of young people. Our challenge with being unable to perform meta-analyses across most of the data suggests that the field remains underdeveloped, and more randomised trials are required. Tackling the comorbidities commonly encountered by these populations is a challenge that requires consideration when developing or modifying interventions for these vulnerable populations. Attention should be paid not just to the health behaviour outcomes such as condomless sex, but also to the quality of the sexual relationships that young vulnerable people engage in, as well as the contexts in which sex occurs. This includes non-consensual sex and assault, exploitation, coercive controlling behaviours, lack of self-esteem and lack of social skills such as assertiveness, condom refusal in partners, and intimate partner violence.

Vulnerable young people experience significant challenges in their sexual health and wellbeing. As we have seen through teenage pregnancy interventions (67), it is likely that a good understanding of the specific issues faced must be factored into tailored and co-produced interventions that recognise the holistic nature of sexual wellbeing. Sexual wellbeing is not merely the prevention of disease, but also the empowerment of disenfranchised young people by focusing on building knowledge, a sense of self-worth, and promoting positive, rewarding sexual relationships that are free from abuse or coercion.

## **Abbreviations**

AIDS	Acquired ImmunoDeficiency Syndrome
AM	Affect Management
AOD	Alcohol and Other Drugs
ANZCTR	Australian and New Zealand Clinical Trials Registry
BAME	Asian and Minority Ethnicities
CALD	Culturally and Linguistically Diverse Black
CENTRAL	Cochrane Central Register of Controlled Trials
CDC	Centre for Disease Control
EMBASE	Excerpta Medica Database
HIV	Human Immunodeficiency Virus
ISRCTN	International Standard Randomised Controlled Trial Number
LGBTQI	Lesbian, Gay, Bisexual, Transgender, Queer, Intersex
MD	Mean Difference
MSM	Men who have Sex with Men
OOHC	Out Of Home Care
PReP	PRe-exposure Prophylaxis
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SMD	Standardised Mean Difference
STI	Sexually Transmitted Infections
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WHO	World Health Organisation
YMSM	Young Men who have Sex with Men

## Declarations

*Ethics approval and consent to participate*

Not applicable.

### *Consent for publication*

Not applicable.

### *Availability of data and materials*

All data used in this review, including meta-analysis data, are available upon request from the corresponding author.

### *Competing interests*

There are no competing interests to declare.

### *Funding*

There was no funding associated with this systematic review.

### *Authors' contributions*

This review was conceived by EB and SL, with searches performed by SL and papers screened by SL, EB and RG. The paper was written by EB and SL, with contributions from BOD, EH, MG, MS, and RG. All authors read and approved the final manuscript.

### *Acknowledgements*

Not applicable

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## Table 1

Due to technical limitations Table 1 is available as a download in the Supplementary Files.

## Figures

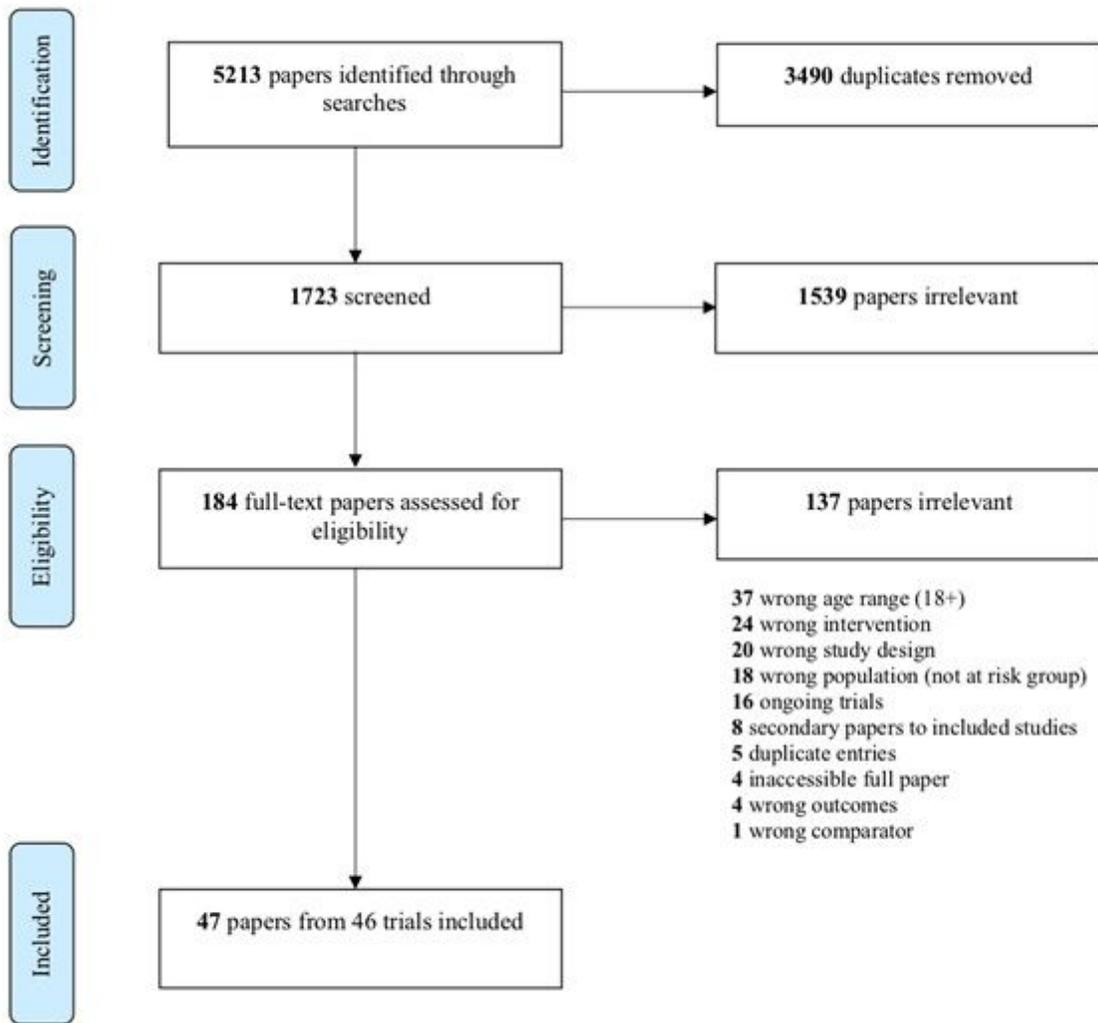


Figure 1

PRISMA flow diagram



Figure 2

Forest plot of STI/HIV/AIDS knowledge in youth ethnic minorities.

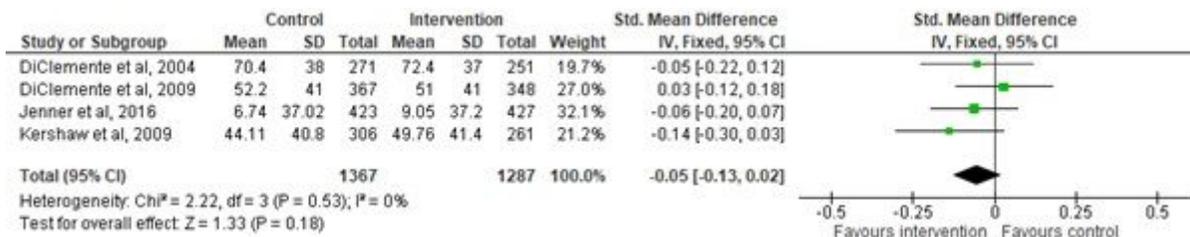


Figure 3

Forest plot of condom use measured using continuous variables in youth ethnic minorities

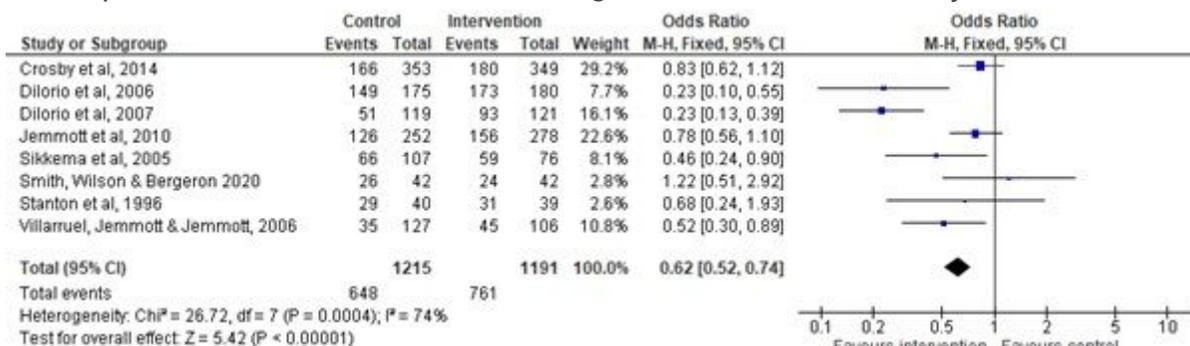


Figure 4

Forest plot of condom use measured using dichotomised variables in youth ethnic minorities

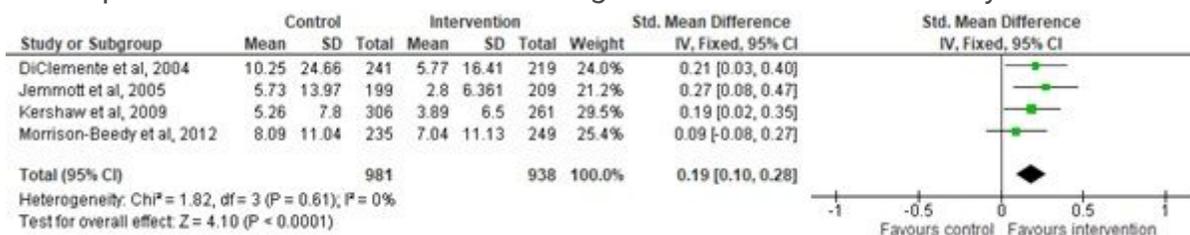


Figure 5

Forest plot of frequency of unprotected sex in youth ethnic minorities

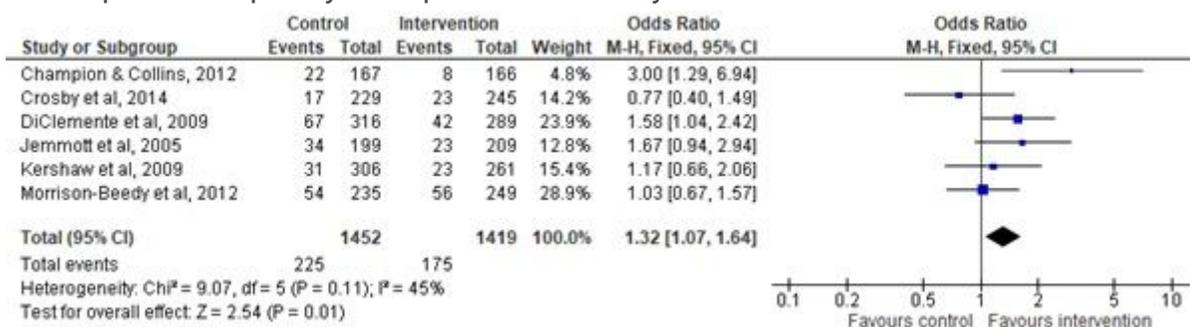
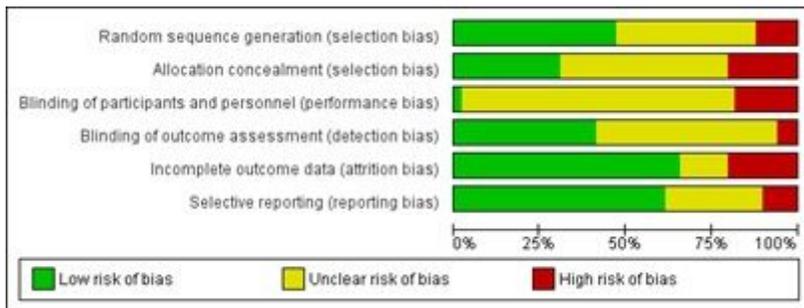


Figure 6

Forest plot of STI incidence in youth ethnic minorities.



**Figure 7**

Summary of risk of bias assessments of included trials.



Figure 8

Detailed risk of bias assessments for each paper.

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [PRISMA2009checklist30.12.20.docx](#)