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Interventions and Strategies to Improve Sexual and Reproductive Health Outcomes among Adolescents Living in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis

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Abstract

Adolescent's access to quality Sexual and Reproductive Health and Rights interventions has been a major issue in most of the low- to middle-income countries (LMICs) across the globe. This systematic review aims to identify the relevant community and school-based interventions that can be implemented in -LMICs to promote adolescent's sexual and reproductive health and rights outcomes. We identified 54 studies and our review findings suggest that Adolescent's Sexual and Reproductive Health and Rights (ASRHR) educational interventions, provision of financial incentives, and provision of comprehensive -post-abortion family planning services are effective in increasing adolescent's knowledge on ASRHR, attitude towards ASRHR, uptake of ASRHR services, contraception and decreased unwanted pregnancy rates among young women. However, we found inconclusive and limited evidence on the effectiveness of the interventions to improve violence prevention and adolescent behaviors towards safe sexual practices. More rigorous studies with long-term follow-ups are needed to assess the effectiveness of such interventions.

Keywords: Adolescent's Sexual and Reproductive Health and Rights (ASRHR); interventions; outcomes; ASRHR services; condom use; teenage pregnancy; contraception

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1. Background

Globally, approximately 1.2 billion people are under the age of 10-19 years [1,2], 90% of whom live in low-middle-income countries (LMICs) [1-3]. Adolescence is a critical period in life, during which people experience extensive biological, psychological, and social changes [4]. Sexual and reproductive health (SRH) and access to SRH services are basic human rights. Based on the sustainable development goals (SDG) (target 3.7), universal access to SRH services should be attained by 2030. However, the utilization of SRH knowledge and service remains limited in many LMICs particularly among the adolescent population [5]. Adolescent's Sexual and Reproductive Health and Rights (ASRHR) needs are distinct from that of adults. Neglect of specific ASRHR needs can pose serious challenges and affect their physical and mental health, future employment, economic well-being, and ability to reach their full potential [6,7]. Despite efforts to improve the uptake of SRH knowledge and services, unmet SRH needs remain high and are particularly dire for young people living in LMICs. There is also a substantial lack of research investigating the effectiveness and scale-up of community-based interventions focused on improving SRH outcomes among young people in specific cultural contexts. Further research is needed to better understand which SRH interventions have demonstrated effectiveness for improving SRH outcomes in LMICs to increase evidence-based practices and inform decisions to invest in scaling-up of effective interventions.

Presently, adolescents living in LMICs suffer disproportionately from undesirable SRH outcomes, such as early and unintended pregnancy, unsafe abortions, sexual violence, and sexually transmitted infections (STIs), including HIV [7,8]. Young women, particularly adolescent girls, from LMICs are vulnerable to poor SRH. Almost half of the women aged 20 to 24 years in Asia and Africa are married by the age of 18, which puts them at higher risk for early pregnancy, maternal and child disability, and mortality [9, 10]. The environment in which adolescents are making decisions related to their SRH is also rapidly evolving. Rates of sexual debut during early young age are growing in many LMICs [11, 12], childbearing and marriage are increasingly unlinked [13] and in many countries, high prevalence of HIV increases the risks associated with early sexual activity [14,15]. For example, in many countries in Sub-Saharan Africa, HIV/AIDS is a generalized epidemic. Young people are inexplicably affected, accounting for almost two-thirds of the people living with HIV in the region [16]. Therefore, developing, implementing, and evaluating interventions that can facilitate the development of healthy sexual behaviour patterns and relationships among adolescents is a priority. Community and school-based programs appear to be a logical choice for SRH education since most young children attain at least some education [17, 18], particularly with the international recognition of the importance of schooling. In addition, studies have also reported that community-based interventions aimed at providing SRHR information and services can help to reduce ASRHR health challenges associated with adolescent pregnancies and marriages [19-21]

A growing body of evidence emphasized the scaling up and sustainable implementation of ASRHR community-based health interventions to strengthen ASRHR and outcomes [22-28]. However, many questions remain about what interventions work? how they are designed, carried out, and evaluated? and how these interventions can be sustainable and potentially scalable? This systematic review aims to assess the range and nature of community and school-based interventions implemented to improve SRH outcomes of adolescents living in LMICs. The findings will aid in the development of a program of research to better meet the SRH needs of

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this population. The further objectives of this review were to identify and evaluate the effectiveness of different interventions employed to improve ASRHR outcomes in LMICs, understand the approaches and strategies to the successful delivery of ASRHR intervention, and identify knowledge gaps in ASRHR in those contexts.

2. Methods

This systematic review has been registered in the International Prospective Register of Systematic Reviews (PROSPERO) database with ID number CRD42019136323 and follows the recommendations established by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [29].

A systematic literature search was conducted on April 11, 2020, and re-updated in April 2021 using MEDLINE, EMBASE, PsychINFO (Psychological Abstracts), Ovid Global Health, CIHAHL (Cumulative Index to Nursing and Allied Health Literature), the Cochrane Central Register of Controlled Trials, ProQuest Sociological Abstracts, ProQuest Dissertations, and Theses Global, Scopus, Web of Science, Centre for Reviews and Dissemination Databases, and the WHO library and other relevant websites (that publish ASRHR material). To avoid publication bias, we searched grey literature, the bibliographies of all relevant papers, and conference proceedings. We contacted experts in the field to identify any missing papers/programs. (Sexual and Reproductive Health, adolescents, low- and middle-income countries, and study design). The full search strategy and terms used are available in supplementary File 1. No language restrictions were applied, however, only papers published after the year 1990 onwards were included as the Adolescent SRH agenda was formally started at that time.

We included all randomized controlled trials (RCT), quasi-RCTs, and controlled before-after (CBA) studies conducted on adolescents aged 10-19 years of age living in low- and middle-income countries (LMICs) - defined by the World Bank [30]. Studies were included if they delivered interventions to improve SRH such as delaying early and forced marriage; improving or promoting family planning and contraception use and spacing of pregnancy; using safe abortion; prevention and treatment of HIV/AIDS and other STIs; intimate partner violence and sexual violence; menstruation and feminine hygiene; or any other indirect interventions such as education, economic development, and empowerment to improve SRH. We included studies that compared these interventions with no intervention or standard interventions. We also included studies with adolescents as cross-cutting age when data was separately reported for adolescents. We excluded studies with no control arm, and those conducted in high-income countries.

Primary outcomes of interest were unintended pregnancies, rate of abortion, use of family planning methods, teenage pregnancy, repeated teenage pregnancy, the incidence of STI/HIV, and rates of unprotected sex, etc. Secondary outcomes of interest were Knowledge related to ASRHR, utilization of ASRHR services, quality of life measured using any scale; and maternal/child morbidity/mortality.

Two reviewers (MR and SA) independently screened the titles and abstracts for eligibility. After the initial search, full texts of relevant articles were examined for inclusion and exclusion criteria. Primary studies that fulfilled the inclusion criteria were selected for this systematic review. Any disagreement among the authors was resolved through consensus or consulting a

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senior reviewer (SM). Two authors (MR and SA) extracted relevant information independently from included studies. The following items were extracted from each study if available: author's name, study design, country, target population, intervention, and study outcome. The methodological quality of included RCTs was assessed using the Cochrane risk of bias tool [31] and q-RCTs were assessed using EPOC criteria [32]. Two reviewers (SM, SA) independently assessed the quality of the included studies. Disagreements between reviewers were resolved by consensus or by the decision of a third independent reviewer (ZL).

Data were entered and analyzed using Review Manager (RevMan) version 5.4. Mean difference (MD) with 95% confidence intervals (CI) was used for continuous data and relative risk (RR) with 95% CI for dichotomous data. Heterogeneity between the studies was explored using the P-value of Chi^2 and I^2. Fixed-effect models were used, however, when the outcomes were heterogenous, random effect models were used. Subgroup analysis was performed based on the 1) type of strategies employed i.e. school-based interventions, community-based intervention, or a combination of these or other interventions; and 2) type of study design used.

3. Results

Study characteristics

The search strategy identified 5715 articles. After removing 122 duplicates, 5593 were screened on title abstracts and 679 were retrieved for full texts. Based on the final inclusion criteria, 54 articles were included in our systematic review. Studies excluded after full-text screening are mentioned in the PRISMA flow diagram (**Figure 1**). Of those 54 included studies, 12 were quasi-RCTs and 42 were RCTs. Three studies were entirely conducted on young people aged 10-24 years (n=5929), whereas the remaining 51 studies were conducted either with adolescents aged 10-19 years (n=69,553) or youth aged 15-24 years (n=19,348). In terms of the geographical distribution of the studies, 38 studies were conducted in African countries [33-70] whereas 9 studies were conducted in Asia [71-79]; and 7 studies in the Caribbean [80-86]. Of the included studies, 39 were meta-analyzed; however, 15 could not be pooled because either they did not report the outcome of interest or reported them differently. **Table 1** presents the characteristics of included studies. The methodological qualities of included studies are provided in **Figure 2**. Studies were not excluded based on assessment scores as the purpose was to examine and gain insight into the rigor of existing research in this field. (**Table 2** presents the findings from the meta-analysis discussed in the sections below).

[Insert Figure 1, Figure 2, Table 1 and Table 2 Here]

Summary of Adolescent's Sexual and Reproductive Health and Rights (ASRHR) interventions:

Of the 54 included studies, 48 studies focused on interventions related to ASRHR education. Of these, 33 were conducted in Africa [33-65]; eight in Asia [71-78]; seven in Caribbean [80-86]. These studies implemented ASRHR educational interventions in school and community settings in the form of community-based education programs, school, and community-based peer education programs, sports-based interventions, internet-based programs, or have used a combination of these interventions i.e. multicomponent interventions. Another three studies conducted in Africa including Kenya [34, 40, 66]; and Zimbabwe (n=1) [68] implemented interventions that focused on the provision of comprehensive school support packages to the school-going adolescents. These packages included the provision of school uniforms, tuition

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fees, and helpers to school-going students. While the remaining three studies assessed a number of cross-cutting ASRHR interventions of which one study focused on the provision of comprehensive post-abortion family planning service packages to young women in China (n=1) [79]; another one focused on evaluating the effect of providing financial incentives to the caregivers for the uptake of HIV testing and counseling services by the adolescents in Harare, Zimbabwe (n=1) [69]; and, one study focused on addressing menstrual health and hygiene by providing menstrual products to the school-going adolescents in rural Western Kenya (n=1) [70]. (**Table 2**).

ASRHR education interventions

Our pooled results suggested that ASRHR educational interventions have a significant impact on improving adolescents' knowledge on ASRHR (RR 1.16; 95% CI 1.04 to 1.29; n=6 studies;); adolescents' attitudes towards ASRHR (RR 1.29; 95% CI 1.13 to 1.47; n=5 studies); adolescents' practices related to ASRHR such as uptake of ASRHR services (RR 1.45; 95% CI 1.45 to 1.80; n=5 studies), condom use (RR 1.28; 95% CI 1.15 to 1.43; n=16 studies); reducing multiple sexual partners (RR 0.68; 95% CI 0.51 to 0.92; n=10 studies;), refusing sex (RR 1.66; 95% CI 1.22 to 2.27; n=1 study;), adopting safe sexual behaviors (RR: 1.69; 95% CI: 1.29 to 2.21; n=1 study;); and having one sexual partner (RR 20.16; 95% CI 2.83 to 143.31; n=1 study). However, the evidence for the latter three outcomes are coming from single studies. Moreover, these interventions were also effective in improving the prevalence of STIs (RR 0.86; 95% CI 0.75 to 0.99; n= 2 studies); and prevalence of HIV and STIs among adolescents (RR 0.71; 95% CI 0.62 to 0.82; n=2 studies). (**Table 2**; F**igure 3 and 4**).

[Insert Figure 3 and 4 Here]

Subgroup analysis based on the type of ASRHR educational interventions revealed that sports-based interventions in schools, community-based peer-group interventions, and multicomponent interventions were effective in improving adolescent's knowledge of ASRHR. The multicomponent interventions included a range of interventions that aimed to increase ASRHR knowledge of the adolescents via mass media campaigns, peer education, and adolescents' targeted condom distribution in the communities. Whereas interventions including counseling based on cognitive behavioral therapy, school-based programs, and communication campaign interventions were effective in improving the uptake of ASRHR services, contraceptive methods, and condom use among adolescents. The communication campaign intervention incorporated various communication strategies to reach out to different audiences and reinforce the ASRHR messages. This included the wide distribution of the posters in the community with key messages around sexual responsibility, peer pressure, AIDS, drugs, and alcohol; wide distribution of 5 different leaflets regarding saying no to sex, postponing sex, delaying parenthood, and STI's; wide distribution of newsletters by peer educators and schools on reproductive health issues; peer education; launch and implementation of radio campaigns, community theatres, community events and hotline to provide ASRHR support to the adolescents (**Table 2**).

It is significant to note that ASRHR education interventions like internet-based programs and text messaging (unidirectional or interactive) were not found effective in improving ASRHR outcomes related to the use of family planning methods (internet-based programs RR 1.01; 95% CI 0.90 to 1.13; n=1 study); and pregnancy rates (pregnancy rates via unidirectional text

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messaging RR 0.57; 95% CI 0.17 to 1.93, n=1 study; pregnancy rates via interactive text messaging intervention RR 0.86; 95% CI 0.27 to 2.75; n=1 study). Similarly, interventions such as community-based behavioral interventions with teenage girls and community-based interventions including group sessions and provision of health and legal services to the adolescents were not found effective in decreasing the rates of violence among adolescents (RR 1.10; 95% CI 1.01 to 1.19; n=4 studies). (**Table 2; Supplementary File 2**-Figures 5, 6 & 7)

Provision of financial incentives to improve the uptake of HIV testing and Counseling Services

One study conducted in Harare, Zimbabwe examined the effect of providing fixed or lottery-based financial incentives to the caregivers of children and adolescents for seeking HIV testing and counseling services [69]. Findings from the meta-analysis revelated that such interventions are significantly effective in improving the uptake of HIV testing and counseling services among children and adolescents (fixed incentive RR 2.43; 95% CI 1.86 to 3.17, and lottery-based incentive RR 2.04; 95% CI 1.54 to 2.69). (**Table 2)**.

Comprehensive Post Abortion Family Planning Services

We identified one study that found significant intervention effects on the outcomes related to family planning. Zhu et al. [79] examined the impact of the provision of comprehensive post-abortion family planning service packages to young women in three different cities of China. The service package included services such as training of abortion service providers, group education and individual counseling of women on contraceptive methods, male involvement in education and counseling sessions, and referral of women to existing family planning services. Interestingly, our meta-analysis of this intervention revealed significant improvement in the uptake of any contraceptive method (RR 1.01; 95% CI 0.98 to 1.03); condom use (RR 1.97; 95% CI 1.45 to 2.66); unwanted pregnancy rates (RR 0.33; 95% CI 0.17 to 0.72); and induced abortion rates (RR 0.36; 95% CI 0.15 to 0.87) among young women. (**Table 2)**.

Comprehensive School Support to Adolescents in Schools

We identified one study that did not find any significant intervention effects on the teenage pregnancy rates among adolescents. Hallfors et al. examined the effect of providing comprehensive school support to school-going adolescents on rates of teenage pregnancy in Zimbabwe [68]. The school support package included the provision of tuition fees, uniforms, and helpers to the adolescents. However, findings from the meta-analysis indicated that the intervention was not effective in improving teenage pregnancy rates among adolescents (RR 0.16; 95% CI 0.01 to 3.26). **Table 2**.

Provision of menstrual products to the school-going adolescents

While one study conducted by Phillips-Howard et al. in rural western Kenya explored if the provision of menstrual products including menstrual cups and pads to adolescents in schools can decrease the rates of STIs and Reproductive Tract infections (RTIs) [70]. Findings from the analysis revealed that such interventions may not be effective in improving STIs and RTIs rates among adolescents (RR 0.79; 95% CI 0.34 to 1.79). **Table 2**.

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4. Discussion

Our systematic review aimed to evaluate the effectiveness of community and school-based ASRHR interventions that have been implemented in LMICs to improve the ASRHR of young people. The review also aimed to understand the approaches and strategies taken to successfully implement the ASRHR interventions in these limited-resource settings. Findings of our review suggest that ASRHR education interventions including school and community-based interventions, sports-based interventions, counseling based on cognitive behavioral therapy, multi-component interventions, and communication campaigns, are effective in improving young people's knowledge, attitude, and practices towards ASRHR. The ASRHR outcomes that were significantly improved among young people through these educational interventions include increased use of contraceptive methods, reduced sexual partners, adopting safe sexual behaviors, decreased rates of STIs and HIV among adolescents, and increased uptake of ASRHR services by the adolescents. Whereas technology-based ASRHR interventions were not found effective in improving ASRHR practices such as protected sex and reduced unwanted pregnancy among young people. Our finding is significant with the existing studies related to digital-based ASRHR interventions for young people. A systematic review conducted regarding the interventions using digital media to improve adolescent's sexual health found statistically significant impacts mostly on the knowledge-based outcomes [87]. However, these knowledge-based outcomes may not essentially translate to meaningful reductions in sexually risky behaviors among adolescents [87]. A very limited RCTs or qRCTs studies were conducted to evaluate the effectiveness of digital or mHealth interventions on ASRHR outcomes. More RCTs research studies are needed to understand the effectiveness, replicability, and scalability of new digital/mHealth-based ASRHR interventions to improve ASRH outcomes in LMICs [88].

Our review also found that non-drug interventions such as the provision of financial incentives can be effective in improving the uptake of ASRHR services such as HIV testing and counseling services. This finding is consistent with another systematic review conducted by Wekesah et al. to evaluate the impact of the provision of non-drug interventions on maternal health outcomes [89]. Financial incentives such as cost-sharing programs between public and health care facilities and output-based approach vouchers (OBA) for covering costs of certain maternal health services, including antenatal visits and facility-based deliveries, have the potential to increase access to maternal health services among the poor and reduce maternal mortality [89]. Similarly, our findings also suggest that the uptake of contraceptive methods can be increased among sexually active young people through comprehensive post-abortion family planning services. Comprehensive training of abortion service providers and counseling of both partners on contraceptive methods can be effective in reducing unwanted pregnancy rates and unsafe abortion. Globally, comprehensive post-abortion family planning services have been endorsed as a high-impact practice in family planning service delivery [90]. Several studies have found that the provision of family planning services as part of postabortion care can increase contraceptive use and reduce repeat abortions [90, 91].

Interestingly, our review suggested that comprehensive school support programs (provision of tuition fees, uniforms, and helpers to adolescents) to decrease school dropouts, are not effective in reducing teenage pregnancy rates. However, our findings are insignificant with the existing evidence available on the effectiveness of comprehensive school support programs. According to Ferre (as cited in guidance document by UNFPA, 2015), World Bank estimates that the risk of

pregnancy declines every year when a young girl remains in school after age 11 [92]. Whereas a systematic literature review conducted to evaluate the influence of educational attainment on teenage pregnancy in low-income countries, suggests that teenage girls who remained longer in schools, had delayed pregnancy longer in contrast to girls who had little or no education at all or have been out of school [93]. Moreover, the study suggested that social workers should focus on interventions that ensure enrollment of girls in schools in LMICs and provide opportunities to them to be able to attend school [93]. Such interventions can facilitate decreasing the burden of teenage pregnancy [93]. Similarly, our review findings suggested that the provision of free menstrual cups and sanitary pads in schools may not decrease the rates of STIs and RTIs among adolescents. However, this finding is inconsistent with the evidence available on the effectiveness of menstrual cups and sanitary pads on STIs and RTIs. According to the scientific review of menstrual cups conducted by Van Eijk et al., menstrual cups are safe to use for menstruation management [94]. Furthermore, the review found that there was no increased risk of infection associated with the use of menstrual cups among women and girls.

5. Limitations

There are certain limitations to this study. We restricted our search strategy to RCTs, quasi-RCTs, and CBA studies only, as we aimed to gather evidence of those ASRHR interventions that have been evaluated via rigorous scientific methods in LMICs settings. We also excluded those studies that were evaluated via pre/post-test evaluation strategies. This eventually led to the exclusion of many studies such as studies on female genital mutilation/cutting and digital/mHealth interventions to improve ASRHR outcomes. Many of the evidence is coming from single studies. Heterogeneity was higher for most of the outcomes that suggest more robust trials should be conducted to overcome these. In addition, many studies failed to utilize allocation concealment, blinding, and randomization to optimize their outcomes. Hence, most of the outcomes were rated as low or moderate in methodological quality. Moreover, we restricted our inclusion criteria to LMICs only therefore, the findings of this study cannot be generalized to high-income countries.

6. Conclusion

This systematic review provides a comprehensive summary of ASRHR interventions that are effective and can be implemented to improve the ARSHR, in LMICs. This review provides some potentially useful insights for the adaptation of evidence-based interventions to prevent and control the adverse ASRHR outcomes. However, more rigorous studies with long-term follow-ups are needed to assess the effectiveness of such interventions. The findings of this review can be helpful for various key stakeholders including the public health practitioners, program managers, policymakers, and donors, to make evidence-based decisions regarding the replicability and scalability of the ASRHR interventions in LMICs.

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Declarations

Ethics approval and consent to participate
Not applicable.
Consent for publication
Not applicable.
Availability of data and materials
All data generated or analyzed during this study are included in this published article.
Declaration of interests
The authors declare that they have no competing interests**.**
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SM, and ZL, participated in the study design. SM, ZL, MR participated in analyses. SA and MR performed the quality assessment. SM and MR wrote a first draft of the manuscript. ZL commented on this draft and performed critical revisions. All authors have read and approved the manuscript.
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Table 1: Characteristics of included studies

S #	First Author, Year	Country & Setting	Study design	Target population / sex	Total participants	Intervention	Control group	Outcome(s)
Comparison Group 1: SRHR Information Vs No Information or Standard Intervention								
1	Cowan 2010 and Yu 2020	Zimbabwe Community setting	RCT	12-24 years	Intervention: 2319 Control: 2353 Total: 4672	Community-based multi component HIV and reproductive health intervention (youth program for in and out of school youth, community-based program for parents & community stakeholders and training program for nurses & other staff in rural clinics) (n age 18-20 = 1557)	No intervention	Knowledge, attitude and behavior of young men and women towards SRHR, Prevalence of HIV, HSV2 and pregnancy
2	Dancy 2014	Malawi Community setting	qRCT	Males and females between 13 and 19 years old	Intervention:384 Control:393 Total:777	HIV risk reduction community-based peer group intervention	No intervention	HIV knowledge and attitude, HIV risk reduction behaviors, self-efficacy for condom use and safer sex
3	Kaufman 2012	Dominican Republic community	qRCT	Adolescents	Intervention:99 Control:41 Total:140	Sports-based HIV prevention intervention	No intervention	HIV-related knowledge, attitudes, and communication
4	Meekers 2000	Soweto and Umlazi districts, South African community setting	qRCT	Adolescents aged between 17 to 20 years	Intervention: 219 Control: 211 Total: 420	Targeted social marketing program on reproductive health beliefs and behaviors via radio, TV, information booklet on adolescent reproductive health	No intervention	Knowledge of risk of pregnancy, condom use, HIV/AIDS prevention
5	Ross 2007	Tanzania community setting	RCT	Primary school	Intervention: 2607 Control: 2496 Total: 9645	Multi component intervention (community activities, teacher-led, peer assisted sexual health education, training & supervision of health workers to provide YFHS, peer-based condom social marketing)	Standard activities	Knowledge and reported attitudes towards SRHR, reported STIs and pregnancy rates
6	Walker 2006	Morelos, Mexico school setting	RCT	Students aged 15 to 18 years)	Intervention: 5617 Control:1867 Total:7484	School based HIV prevention programme	Biology based sex education course	Condom use, knowledge and attitude towards HIV and emergency contraception
7	Kinsler 2004	Belize City, school setting	qRCT	adolescents (aged 13–17)	Intervention:75 Control:75 Total:150	Cognitive behavioral peer-facilitated school-based HIV/AIDS education program	HIV/AIDS educational Handbook	HIV knowledge, Condom use, condom attitudes, condom intentions, condom self-efficacy
8	Brieger 2011	Nigeria and Ghana, School setting	qRCT	Male and Female adolescents	Intervention:908 Control:893 Total:1801	Adolescent reproductive health peer education program	No intervention	Reproductive health knowledge, contraceptive use, willingness to buy contraceptives, self-efficacy in contraceptive use

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S #	First Author, Year	Country & Setting	Study design	Target population / sex	Total participants	Intervention	Control group	Outcome(s)
9	Darabi 2017	Iran, school setting	RCT	First Year High School girls (12-16 years)	Intervention:289 Control:289 Total:578	Theory of Planned Behaviour (TPB) school-based educational intervention on sexual and reproductive health with adolescents and parents	No intervention	SRHR behavior and attitude, subjective norms, perceived parental control and perceived behavioral control
10	Gong, 2009	Bahamas, School and Community	qRCT	preadolescents (10 -14 years)	Intervention Group 1:436 Intervention Group 2: 427 Control Group :497 Total:1360	HIV/AIDS Prevention Intervention program based on Protection Motivation Theory (Intervention Group 1: Youth HIV intervention + Parental HIV education intervention; Intervention Group 2: Youth HIV intervention + parental goal setting intervention	Youth environmental protection intervention + parental goal setting intervention	HIV/AIDS knowledge, sexual perception and condom use intention
11	Mon, 2017	Myanmar community setting	RCT	Adolescents aged 10–16 years with HIV-infected parent(s)	Intervention:72 Control:72 Total:144	Mindfulness integrated reproductive health intervention	Group activities conducted including playing Games, preparing food and eating together at the office of people living with HIV network	Reproductive health knowledge
12	Parwej 2005	Chandigarh, India; school setting	RCT	15-19 years.	Intervention Group 1 – Peer education: 84 Intervention Group 2 – Conventional education by nurses: 95 Control Group: 94 Total:273	Reproductive Health Education via peer education and conventional education in schools	No intervention	Reproductive health knowledge
13	Kim, 2001	Zimbabwe, community setting	qRCT	10- 24 years male and female	Intervention: 1000 Control:400 Total:1400	Multimedia campaign (posters, leaflets, newsletters, radio program, launch events, theatre programs, peer education and hot line) with youth to promote SRHR	No intervention	Knowledge of family planning methods, adoption of safe sexual behaviors and uptake of sexual health services
14	Shuey 1999	Soroti, Uganda; school setting	RCT	13 to 14 years male and female students	Intervention:567 Control:233 Total:800	School health education programme on AIDS prevention	Standard school health AIDS education program of Uganda	Sexual abstinence, safe sexual behaviors and communication regarding sexual matters with teachers and peers
15	Njue 2015	Kenya Community and school settings	RCT	10 to 19 years old	Community Intervention Group 1: 1232 Community + school-based intervention Group 2: 1279 Control: 1247 Total: 3758	Community and school-based reproductive health HIV program	No intervention	Knowledge, attitude and behavior towards SRHR

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S #	First Author, Year	Country & Setting	Study design	Target population / sex	Total participants	Intervention	Control group	Outcome(s)
16	Chen 2009	Bahamas, School setting	RCT	Sixth grade youth (10–11 years of age	Intervention:863 Control:497 Total: 1360	School based adolescent HIV prevention program	Wondrous Wetlands Conservation program focusing on water conservation, wildlife and other natural resources	Sexual behavior
17	Jewkes 2006	Eastern cape, South Africa; community setting	RCT	Young people aged 16 to 23.	Intervention: 1409 Control:1367 Total: 2776	17 community-based behavioral intervention sessions aimed at reducing HIV incidence were conducted	1 community- based session on HIV and safer sex was conducted	HIV incidences, knowledge and attitude towards SRHR, HIV related sexual behavior risk factors
18	Naved 2018	Bangladesh; community setting	RCT	Women aged 15–29	Intervention: 2670 Control:1026 Total:3696	Multisectoral, multi-tier 20-month SAFE program (interactive sessions on gender health, rights and life skills; community campaign; health and legal services and referrals)	Community campaign and SAFE health and legal services	Physical, sexual, economic and emotional intimate partner violence
19	Stark 2018	Ethiopia, community setting	RCT	Refugee adolescent girls ages 13–19 years.	Intervention:457 Control:462 Total:919	Life skills and safe spaces program	No intervention	Sexual violence, physical violence, emotional violence, transactional sex and child marriage
20	Dunbar 2014	Ghana Community	RCT	Female adolescents and maternal orphans aged 16 to 19 years (out of school)	Intervention:158 Control:157 Total:315	Shaping the Health of Adolescents in Zimbabwe – SHAZ program focusing on HIV and SRH services, life skills-based HIV education, vocational training and provision of micro grant to improve economic outcomes and integrated social support.	Life skills-based HIV education, reproductive health services and home-based care training	Economic and social empowerment, sexual risk behaviors, HIV/STI prevalence and unintended pregnancy
21	Erulkar 2004	Nairobi, Kenya; community setting	qRCT	Unmarried young people aged 10–24 years	Intervention: 1408 Control:457 Total:1865	Life skills-based curriculum was implemented by training health educators who conducted door to door visits in the community	No intervention	Reproductive health–related behaviors, condom use & communication between adolescents and parents/adult on SRHR
22	Lou 2004	Shanghai, China; community setting	RCT	Unmarried youth aged 15–24 years	Intervention: 1220 Control: 1007 Total: 2227	Community-based interventions to promote contraceptive use (dissemination of educational materials, videos and lectures, provision of FP counseling at youth health centre and provision to access to FP services at FP unit)	No intervention	Contraceptive use
23	Lightfoot 2007	Uganda, Africa; Community setting	RCT	Youth aged 14 to 21 years	Intervention: 50 Control: 50 Total:100	Culturally adopted HIV prevention program	No intervention	Condom use, number of sexual partners
24	Ybarra 2013	Uganda, secondary schools setting	RCT	Youth aged 12 years and older	Intervention:183 Control:183 Total:366	Cyber Senga - An internet-based HIV prevention program	School-based sexuality education program	Abstinence, sexual behavior and unprotected vaginal sex

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S #	First Author, Year	Country & Setting	Study design	Target population / sex	Total participants	Intervention	Control group	Outcome(s)
25	Agha 2004	Zambia, school setting	RCT	Male & female adolescents in grades 10 and 11 aged 14-23years	Intervention:254 Control:162 Total:416	School-based peer sexual health intervention	Peer education session on water purification	Knowledge and normative beliefs about abstinence, condom use, HIV risk perception and sexual behaviors
26	Aderibigbe 2008	Nigeria, public secondary schools setting	qRCT	Adolescents aged 10-19 years	Intervention:262 Control:259 Total:521	Health Education Session on risky sexual behaviour	No intervention	Condom use, sexual partners and frequency of sexual intercourse
27	Mathew 2012	Cape Town, Mankweng and Dar es Salaam; school setting	RCT	Adolescents aged 12 to 14 years	Intervention: 6801 Control:5338 Total:12139	Teacher-led school HIV prevention programmes	No intervention	Delayed sexual debut and condom use
28	Okonofua 2003	Nigeria; School settings	RCT	Youth aged 14-20 years	Intervention: 643 Control: 1253 Total: 1896	Creation of reproductive health clubs in schools to conduct health awareness campaigns on STD, training of club members as peer educators on STD prevention and treatment and training of health care professionals on STD	No intervention	STD symptoms, condom use, treatment seeking behavior and notification of partners by adolescents on STD symptoms
29	Mason-Jones 2011	Western Cape of South Africa, school setting	qRCT	Grade 10 students (aged 15/16 years)	Intervention: 2049 Control:1885 Total:3934	Peer education program on relationships, sexual health and well-being and confidence building	Usual life orientation program	Age of sexual debut and condom use
30	Wang 2014	Bahamas, school setting	RCT	Grade 10 students aged 13-17years	Intervention Group 1 – Bahamian Focus on Older Youth (BFOOY) + Caribbean Informed Parents & Children Together – CiMPACT): 664 youth and 505 parents Intervention Group 2 – BFOOY + Goal Focused Intervention: 559 youth and 387 parents Intervention Group 3 – BFOOY only: 569 youth and 389 parents Control Group – Healthy Family Life Education: 772 youth and 552 parents Total: 2564 youth and 1833 parents	Parental involvement in an effective risk reduction intervention program (BFOOY + CiMPACT)	Existing Bahamian Healthy Family Life Education program (HFLE)	Sexual Debut Condom use
31	Rokicki 2017	Ghana, Community setting	RCT	Adolescents aged14 to 24 years	Intervention Group 1 – Unidirectional: 239	Intervention Group 1: Text- messages with reproductive health information	Placebo messages with information about malaria	Reproductive health knowledge, pregnancy risk and use of contraceptive methods

S #	First Author, Year	Country & Setting	Study design	Target population / sex	Total participants	Intervention	Control group	Outcome(s)
					Intervention Group 2 – Interactive: 196 Control Group: 273 Total: 708	Intervention Group 2: Engaging adolescents in text-messaging reproductive health quizzes		
32	Jemmott 2010	Eastern Cape Province, South Africa; primary schools setting	RCT	Grade 6 learners	Intervention:545 Control:477 Total:1022	School-based HIV/STD risk-reduction intervention	Health promotion intervention focusing on Non-communicable diseases	Unprotected vaginal intercourse, anal intercourse, sexually inexperienced and multiple sexual partners
33	Speizer 2001	Cameroon, community setting	qRCT	Adolescents aged12 to 25 Years	Intervention: 403 Control: 413 Total: 815	Peer-based adolescent reproductive health intervention	No intervention	Contraceptive prevalence, prevalence of STI/HIV and unintended pregnancy
34	Dupas 2011	Kenya, community setting	RCT	Teenagers	Intervention Group 1: 164 schools Intervention Group 2: 71 schools Control Group: 93 schools Total: 328	Intervention 1: The Teacher Training (TT) Program on National HIV Prevention Curriculum Intervention 2: TT program + The Relative Risk Information Campaign – information on distribution of HIV information by age and gender	No intervention	Teen childbearing, pregnancies and self reported sexual behavior
35	Maro 2007	Dar es Salaam, Tanzania, in and out of school settings	qRCT	Adolescents aged 12 to 15 years	Intervention Group 1: 200 Intervention Group 2: 200 Control Group 1:200 Control Group 2: 200 Total: 800	Intervention Group 1: Using peer coaches and sports to promote HIV/AIDS education with mastery coaching strategies Intervention Group 2: Using peer coaches and sports to promote HIV/AIDS education without mastery coaching strategies	Control Group 1: In-school children received traditional AIDS program Control Group 2: Out-of-school children received no education	HIV / AIDS knowledge
36	Deveaux 2007	Bahamas, school setting	RCT	Sixth-grade students	Intervention Group 1 – FOYC or CiMPACT: 822 youth and 238 parents Control Group 1 – WW or GFI: 460 youth and 528 parents Intervention Group 2a- FOYC + CiMPACT: 417 youth and 238 parents Intervention Group 2b- FOYC + GFI: 405 youth and 222 parents Control Group 2 – WW + GFI: 460 youth and 306 parents Total:4096	Intervention Group 1- FOYC or CiMPACT Intervention Group – 2a: FOYC + CiMPACT Intervention Group 2b: FOYC + GFI	Control Group 1: WW or GFI Control Group 2: WW + GFI	HIV risk and protective knowledge, condom use skills, perceptions, interventions and self-reported behaviors

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S #	First Author, Year	Country & Setting	Study design	Target population / sex	Total participants	Intervention	Control group	Outcome(s)
37	Acharya 2017	Nepal, School setting	RCT	Secondary school children aged 14 to 18 years	Intervention:201 Control:247 Total:448	School based sex education intervention programme using participatory based approach	Conventional teacher-led sex education program	Knowledge and understanding of sexual health
38	Agha 2002	Zambia, School setting	RCT	Male & female adolescents in grades 10, 11, 12	Intervention:421 Control:338 Total:759	School-based peer sexual health intervention (education session about HIV/AIDS)	1-hour long session on water purification with the students	Knowledge and positive normative beliefs about abstinence and condoms perception of acquiring HIV
39	Aplasca 1995	Philippines, school setting	RCT	Adolescents in high schools	Intervention:420 Control:384 Total:804	Development and implementation of AIDS prevention program for high school students	No intervention	AIDS related knowledge, attitudes, and preventive behaviours and intended onset of sexual activity
40	Burnett 2011	Swaziland, school setting	RCT	Youth	Intervention:69 Control:66 Total:135	Life skills-based education program	No intervention	HIV knowledge, self-efficacy for abstinence and condom use
41	Cartagena 2006	Mongolia School	RCT	Secondary School Students	Intervention:320 Control:327 Total:647	Sexual health peer education program focusing on life skills for HIV awareness and prevention, computer technology, job readiness, community outreach and a mobile HIV testing unit	No intervention	HIV knowledge, self-efficacy for abstinence, condom use and HIV tests
42	Esere 2008	Nigeria, school setting	qRCT	School-going adolescents aged 13-19 years	Intervention:12 Control:12 Total:24	Sex education programme	No intervention	STDs, multiple sexual partners, anal sex, oral sex and non-use of condom
43	Aninanya 2015	Ghana, community setting	RCT	Adolescents aged 10-24years	Intervention:1288 Control:1376 Total: 2664	Adolescents school-based curriculum and peer outreach activities	Community mobilization and Youth Friendly Health Services (YFHS) provider training	Uptake of ASRH services for STI management, HIV counselling and testing, antenatal and peri/postnatal services
44	Ybarra 2015	Uganda, School setting	RCT	Students aged 13–18 years	366 participants were randomly assigned to the intervention and control group	Internet-based HIV prevention program	School-based sexuality education program	HIV information, condom use and abstinence
45	Bell 2008	South Africa, School setting	RCT	Youth aged 9-13 years	Intervention:245 Control:233 Total:475	Collaborative HIV Adolescent Mental Health Program South Africa (CHAMPSA)	Existing school-based HIV prevention curriculum	HIV transmission knowledge HIV stigma
46	Mmbaga 2017	Dar es Salaam, Tanzania; school setting	RCT	Adolescents aged 12–14.	Intervention: 2503 Control:2588 Total:5091	PREPARE – an educational program consisted of 3 components: teachers, peer educators and health care providers at youth friendly health clinics, aiming to address adolescents	No intervention	Sexual Debut Condom Use

S #	First Author, Year	Country & Setting	Study design	Target population / sex	Total participants	Intervention	Control group	Outcome(s)
						risky sexual and reproductive health behaviors		
47	Klepp 1997	Tanzania, school setting	RCT	Sixth Grade Students (Average age 13.6 years)	Intervention:258 Control:556 Total:814	Local HIV/AIDS education program	No intervention	HIV/AIDS related information, knowledge, communication attitudes and behavioral intentions
48	Austrian 2020	Zambia, community	cRCT	Adolescents 10-19 years girls	Interventions: 3978 Control: 1326 Total: 5304	Adolescent Girls Empowerment program on mentor-led, girls group meetings on health, life skills and financial education	No intervention	Condom use Knowledge on reproductive health
Comparison Group 2: Financial Incentive vs No Intervention								
1	Kranzer 2018	Zimbabwe, Primary health center	RCT	Children and adolescents 8–17 years	Intervention Group 1- USD 2: 654 Intervention Group 2 – Fixed incentive or lottery: 562 Control group: 472 Total:1688	Financial incentive for HIV testing and counseling	No incentive	Uptake of HIV testing
Comparison Group 3: Comprehensive School Support vs No Intervention								
1	Hallfors 2011	Zimbabwe, school setting	RCT	Orphan girls aged 10 to 16 years	Intervention: 184 Control:145 Total:329	Comprehensive school support (universal daily feeding program + provision of fees, uniforms, school supplies, helper)	Universal daily feeding program	HIV risk school dropout, marriage and pregnancy
2	Cho 2011	Kenya, school setting	RCT	Adolescent orphans aged 12–14 years	Intervention:53 Control:52 Total:105	Comprehensive School Support Program to prevent HIV (school uniform, tuition fees and a community visitor) and household support (mosquito nets and food supplements)	Received household support only (mosquito nets and food supplements)	School dropout, sexual debut and gender equity
3	Hallfors, 2017	Kenya, school setting	RCT	Adolescents orphans in grades 7 and 8	Intervention: 412 Control:425 Total:837	Comprehensive school support as an HIV prevention strategy (school uniform, tuition fees and	No intervention	HIV/HSV2 prevention
Comparison Group 4: Comprehensive Post Abortion Family Planning Services Vs Standard Intervention								
1	Zhu 2009	China, hospital setting – abortion clinics	RCT	Young women aged 15-24 years	Intervention: 592 Control: 555 Total: 1147	Comprehensive post abortion family planning services: (i) training of abortion service providers, provision of service guidelines as per standard training schedule and module (two days) (ii) group education (iii) individual counseling of women on	Standard post abortion family planning services (i) training of abortion services providers and provision of service guidelines as	Use of contraceptive methods, rate of pregnancy, unwanted pregnancy, and induced abortion

S #	First Author, Year	Country & Setting	Study design	Target population / sex	Total participants	Intervention	Control group	Outcome(s)
						contraceptive methods (iv) free provision of contraceptives (v) male involvement in group and individual counseling (vi) referral of women to existing FP services	per standard training schedule and module (one day) (ii) group education and (iii) referral of women to FP services	
Comparison Group 4: Provision of Menstrual Products Vs Standard Intervention								
1.	Phillips-Howard 2016	Western Kenya, school setting	RCT	Primary schoolgirls 14–16 years experienced 3 menses	Intervention:444 Control:200 Total:644	Puberty and hygiene training, provision of menstrual cups, sanitary pads, and hand washing soap	Continued usual practice + provision of pubertal education & hand washing soap	STI, RTI, school dropout, adverse events (e.g. toxic shock etc.)

Abbreviations:
HIV: Human Immunodeficiency Virus
AIDS: Acquired Immunodeficiency Syndrome
HSV2: Herpes Simplex Virus 2
STI: Sexually Transmitted Infections
SRHR: Sexual Reproductive Health and Rights
RCT: Randomized Controlled Trial
qRct: Quasi Randomized Controlled Trials

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Table 2: SRHR Interventions and Outcomes

Outcomes	No of Studies; and Participants	Risk Ratio/Mean Difference (95% CI)	Heterogeneity Chi^2 P Value; I^2 (%)
Intervention 1: SRHR Information Vs No Information/Standard Intervention			
Knowledge of Reproductive Health: HIV, STI, Pregnancy, Emergency Contraception	6; 20,437	**1.16 (1.04, 1.29)**	(P < 0.001); I^2 = 94%
• HIV acquisition knowledge	5; 7,526	1.17 (0.99, 1.38)	(P < 0.001); I^2 = 92%
• STI knowledge	2; 2,396	1.10 (0.91, 1.33)	(P = 0.05); I^2 = 66%
• Risk of pregnancy knowledge	1; 65	1.10 (0.96, 1.27)	Not applicable
• Pregnancy prevention knowledge	1; 3,520	**1.63 (1.55, 1.72)**	Not applicable
• Emergency contraception knowledge	1; 6,930	1.11 (0.94, 1.32)	(P < 0.001); I^2 = 94%
Knowledge of Reproductive Health - Overall - End of Intervention	8; 7,328	0.80 (0.44, 1.16)	(P < 0.001); I^2 = 98%
• HIV prevention	1; 7,77	0.28 (0.14, 0.43)	Not applicable
• HIV acquisition and prevention	2; 2,625	0.16 (-0.22, 0.55)	(P 0.02); I^2 = 80%
• Overall SRHR knowledge	5; 3,926	1.11 (0.54, 1.67)	(P < 0.001); I^2 = 98%
Improved SRHR Behavior	2; 1,338	1.61 (0.89, 2.92)	(P < 0.001); I^2 = 89%
• Refused sex	1; 4,21	1.66 (1.22, 2.27)	Not applicable
• Sexually active adolescents	1; 63	0.83 (0.60, 1.14)	Not applicable
• Adopted safe sexual behavior	1; 421	1.69 (1.29, 2.21)	Not applicable
• Stuck to one sexual partner	1; 433	20.16 (2.83, 143.31)	Not applicable
Improved Attitude towards SRHR	5; 9,324	**1.29 (1.13, 1.47)**	(P < 0.001); I^2 = 86%
• Approved use of condoms	2; 1,335	1.20 (1.03, 1.40)	(P = 0.03); I^2 = 70%
• Intentions to have sex	1; 1,358	0.97 (0.71, 1.32)	(P = 0.34); I^2 = 0%
• Approved use of contraception	2; 1,335	1.41 (1.12, 1.77)	(P = 0.02); I^2 = 76%
• Attitude towards HIV	1; 682	1.95 (1.66, 2.30)	Not applicable
• Condom self-efficacy	1; 4,614	1.12 (1.03, 1.23)	(P = 0.25); I^2 = 24%
Overall attitude towards SRHR	1; 556	**16.70 (15.19, 18.21)**	Not applicable
Any Violence	4; 8,051	**1.10 (1.01, 1.19)**	(P = 0.35); I^2 = 9%
• Intimate partner physical violence	3; 1,995	1.06 (0.92, 1.20)	(P = 0.55); I^2 = 0%
• Intimate partner sexual violence	3; 1,995	1.03 (0.87, 1.23)	(P = 0.97); I^2 = 0%
• Physical/sexual violence or rape	2; 1,179	0.65 (0.10, 4.46)	(P = 0.15); I^2 = 52%
• Spousal emotional violence	1; 665	1.07 (0.90, 1.28)	(P = 0.63); I^2 = 0%
• Spousal economic violence	1; 2,217	1.19 (0.79, 1.80)	(P = 0.01); I^2 = 85%
Any contraceptive use	11; 6,235	**1.02 (0.91, 1.15)**	(P < 0.001); I^2 = 83%
• Community-based intervention	2; 2,514	0.90 (0.64, 1.26)	(P < 0.001); I^2 = 92%
• Counseling intervention based on cognitive behavioral therapy	1; 100	**1.58 (1.27, 1.97)**	Not applicable
• Peer group intervention	2; 1346	1.09 (0.74, 1.61)	(P < 0.001); I^2 = 95%
• School-based intervention	1; 270	0.41 (0.24, 0.72)	Not applicable
• Internet-based intervention	1; 366	1.01 (0.90, 1.13)	Not applicable
• Communication campaign	1; 1264	**1.42 (1.13, 1.80)**	Not applicable
• Multi-component intervention	3; 375	0.98 (0.85, 1.13)	(P = 0.96); I^2 = 0%
Condom use	16; 31,371	**1.28 (1.15, 1.43)**	(P < 0.001); I^2 = 87%
• School-based intervention	4; 13,118	**1.41 (1.11, 1.79)**	(P < 0.001); I^2 = 84%
• School-based peer education intervention	2; 1,769	0.82 (0.59, 1.15)	(P = 0.08); I^2 = 60%
• Community-based intervention	3; 5,289	1.17 (0.92, 1.50)	(P < 0.001); I^2 = 93%
• Counseling intervention based on cognitive behavioral therapy	2; 2,764	2.70 (0.37, 19.97)	(P < 0.0001); I^2 = 96%
• Community-based peer group intervention	1; 776	**1.79 (1.11, 2.89)**	(P < 0.009); I^2 = 85%
• Communication campaign	1; 433	**10.37 (1.44, 74.77)**	Not applicable
• Multi-component intervention	3; 7,222	1.26 (1.01, 1.56)	(P = 0.07); I^2 = 46%
Attitude and practice towards condom Use (School-based Intervention)	5; 3,704	**0.37 (0.17, 0.57)**	(P < 0.001); I^2 = 84%
• Reported condom attitude	1; 50	1.36 (0.74, 1.98)	Not applicable
• Self-efficacy for condom use	2; 1,896	**0.22 (0.04, 0.40)**	(P = 0.02); I^2 = 74%
• Intention to use condom	2; 1,222	0.79 (-0.36, 1.93)	(P = 0.0003); I^2 = 92%
• Uptake of condoms	1; 50	0.54 (-0.02, 1.11)	Not applicable
Prevalence of STI/HIV	2, 4672	**0.71 (0.62, 0.82)**	(P = 0.55); I^2 = 0%
• School-based intervention	1; 1,896	**0.69 (0.59, 0.82)**	Not applicable
• Community-based intervention	1; 2776	0.76 (0.58, 1.01)	Not applicable

Reported pregnancy among young women (Adolescents and youth)	3; 6,194	1.00 (0.92, 1.10)	1.64 (1.29, 2.07)
• Text messaging program (Unidirectional)	1; 381	0.57 (0.17, 1.93)	Not applicable
• Text messaging program (Interactive intervention)	1; 331	0.86 (0.27, 2.75)	Not applicable
• Multi-component intervention	2; 5,482	1.01 (0.92, 1.10)	(P = 0.44); I^2 = 0%
Unprotected Sex	2; 1,326	0.75 (0.48, 1.19)	0.44 (1.29, 2.07)
• School-based intervention	1; 1022	0.50 (0.25, 1.01)	Not applicable
• Internet-based intervention	1; 304	1.02 (0.56, 1.86)	(P = 0.44); I^2 = 0%
Self-efficacy for safer sex	1; 777	**0.26 (0.19, 0.33)**	1.64 (1.29, 2.07)
Multiple sex partners	9; 18,670	**0.66 (0.48, 0.91)**	1.64 (1.29, 2.07)
• Community-based intervention	2; 9616	0.92 (0.64, 1.33)	(P < 0.001); I^2 = 91%
• Community-based peer group intervention	1; 777	1.24 (0.87, 1.78)	Not applicable
• School-based intervention	4; 2746	0.59 (0.27, 1.30)	(P < 0.008); I^2 = 71%
• Multi-component intervention	1; 3,666	0.90 (0.72, 1.11)	(P = 0.97); I^2 = 0%
• Community-based intervention by health educators	1; 1,865	0.02 (0.01, 0.05)	Not applicable
Number of multiple sexual partners	**1; 400**	**-0.60 (-1.02, -0.18)**	**Not applicable**
Uptake of ASRH Services	**5; 7851**	**1.45 (1.17, 1.80)**	**(P < 0.001); I^2 = 91%**
• Community-based peer group intervention	2; 1,441	**1.64 (1.29, 2.07)**	(P = 0.07); I^2 = 53%
• Multi-component intervention	2; 5,146	1.00 (0.95, 1.06)	(P = 0.86); I^2 = 0%
• Communication campaign	1; 1,264	**3.64 (2.51, 5.27)**	Not applicable
Prevalence of STI diseases	2; 14150	**0.86 (0.75, 0.99)**	(P < 0.001); I^2 = 89%
• Prevalence of Gonorrhea	1; 1,308	2.03 (0.62, 6.69)	(P = 0.97); I^2 = 0%
• Prevalence of Syphilis	1; 1,308	0.88 (0.43, 1.78)	(P = 0.90); I^2 = 0%
• Prevalence of HIV	2; 3,643	1.12 (0.79, 1.57)	(P = 0.94); I^2 = 0%
• Prevalence of HSV2	2; 3,643	1.07 (0.88, 1.30)	(P = 0.69); I^2 = 0%
• Prevalence of Trichomonas	1; 1,696	0.18 (0.13, 0.25)	Not applicable
• Prevalence of Chlamydia	1; 2,552	**5.00 (2.44, 10.25)**	(P = 0.05); I^2 = 75%
Intervention 2: Financial Incentive Vs No Intervention			
Uptake of HIV testing services	**1; 1,688**	**2.24 (1.84, 2.71)**	**(P = 0.37); I^2 = 0%**
• Financial incentive - Fixed incentive 2USD	1; 890	**2.43 (1.86, 3.17)**	Not applicable
• Financial incentive - Lottery	1; 798	**2.04 (1.54, 2.69)**	Not applicable
Intervention 3: Comprehensive School Support Vs No Intervention			
Rates of teenage pregnancy	1; 329	0.16 (0.01, 3.26)	Not applicable
Intervention 4: Comprehensive Post Abortion Family Planning Services Vs Standard Intervention			
Use of family planning methods	1; 937	**1.16 (1.09, 1.24)**	(P < 0.001); I^2 = 99%
• Use of any contraceptives	1; 500	1.01 (0.98, 1.03)	Not applicable
• Use of condoms	1; 437	**1.97 (1.45, 2.66)**	Not applicable
Compliance of contraceptives	1; 83	1.23 (0.93, 1.64)	Not applicable
Rate of unwanted pregnancies	1; 1,147	**0.33 (0.15, 0.72)**	Not applicable
Induces abortion	1; 1,147	**0.36 (0.15, 0.87)**	Not applicable
Intervention 5: Provision of Menstrual Products Vs No Intervention			
Rates of STIs and RTIs	1; 384	0.79 (0.34, 1.79)	(P = 0.18); I^2 = 44%
• STIs	1; 174	0.43 (0.13, 1.41)	Not applicable
• RTIs	1; 174	1.05 (0.60, 1.83)	Not applicable

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Figure 1: PRISMA Flow Diagram for Interventions to Improve Adolescents Sexual and Reproductive Health and Rights [Diagram Adapted from Moher et al. 2009].

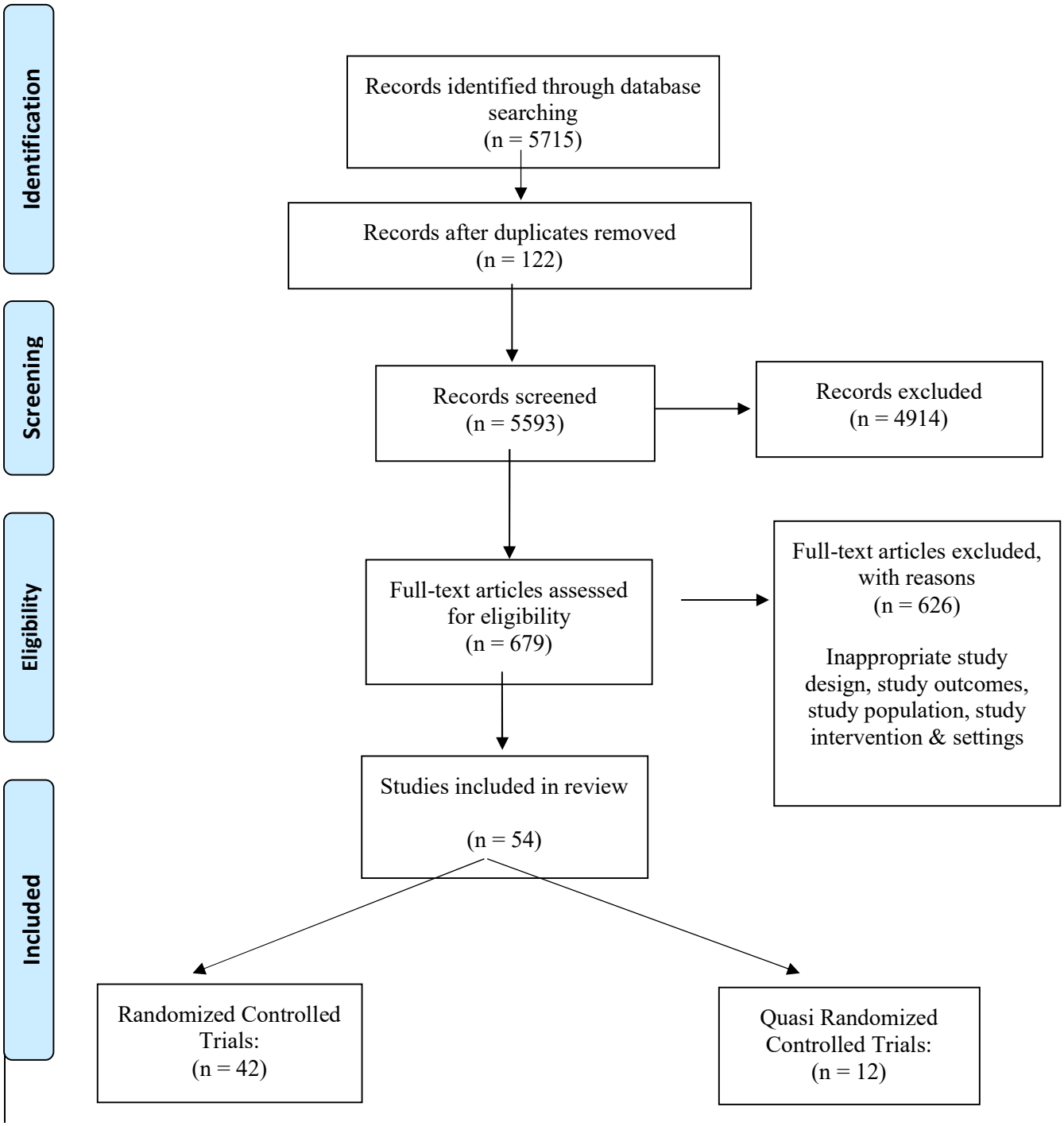

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Figure 2: Methodological quality of included studies

Figure 2a: RCTs

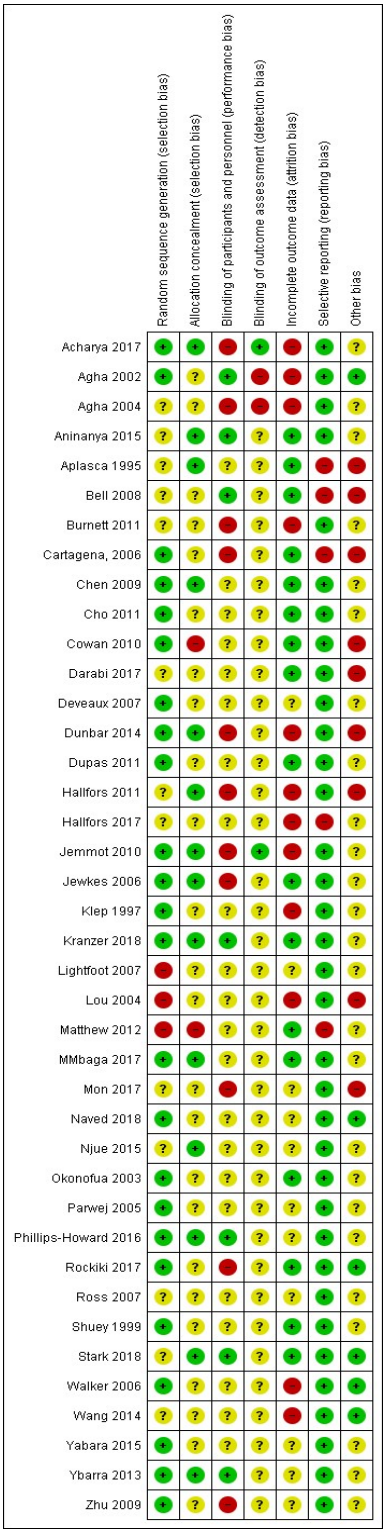

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Figure 2b: q-RCTs

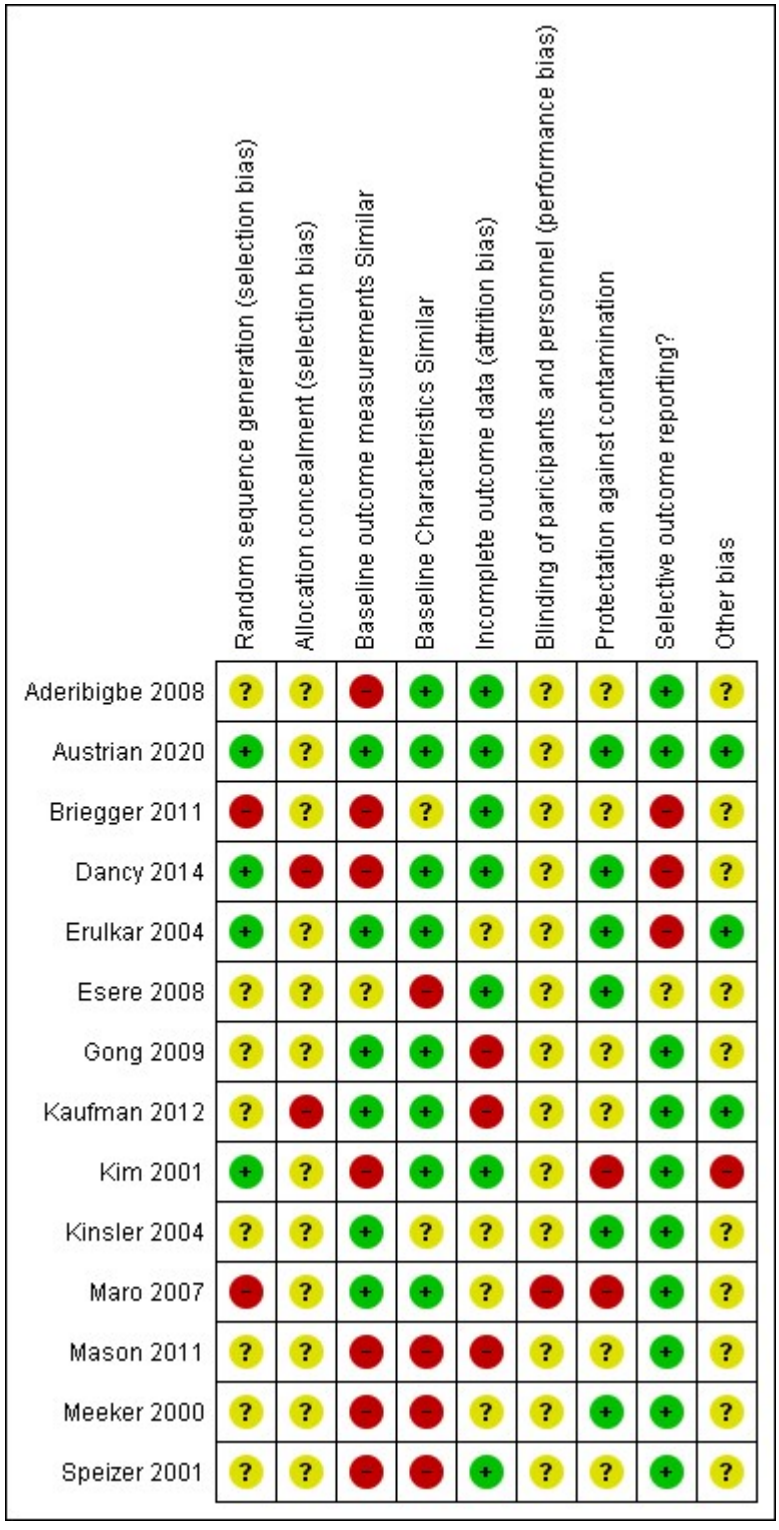

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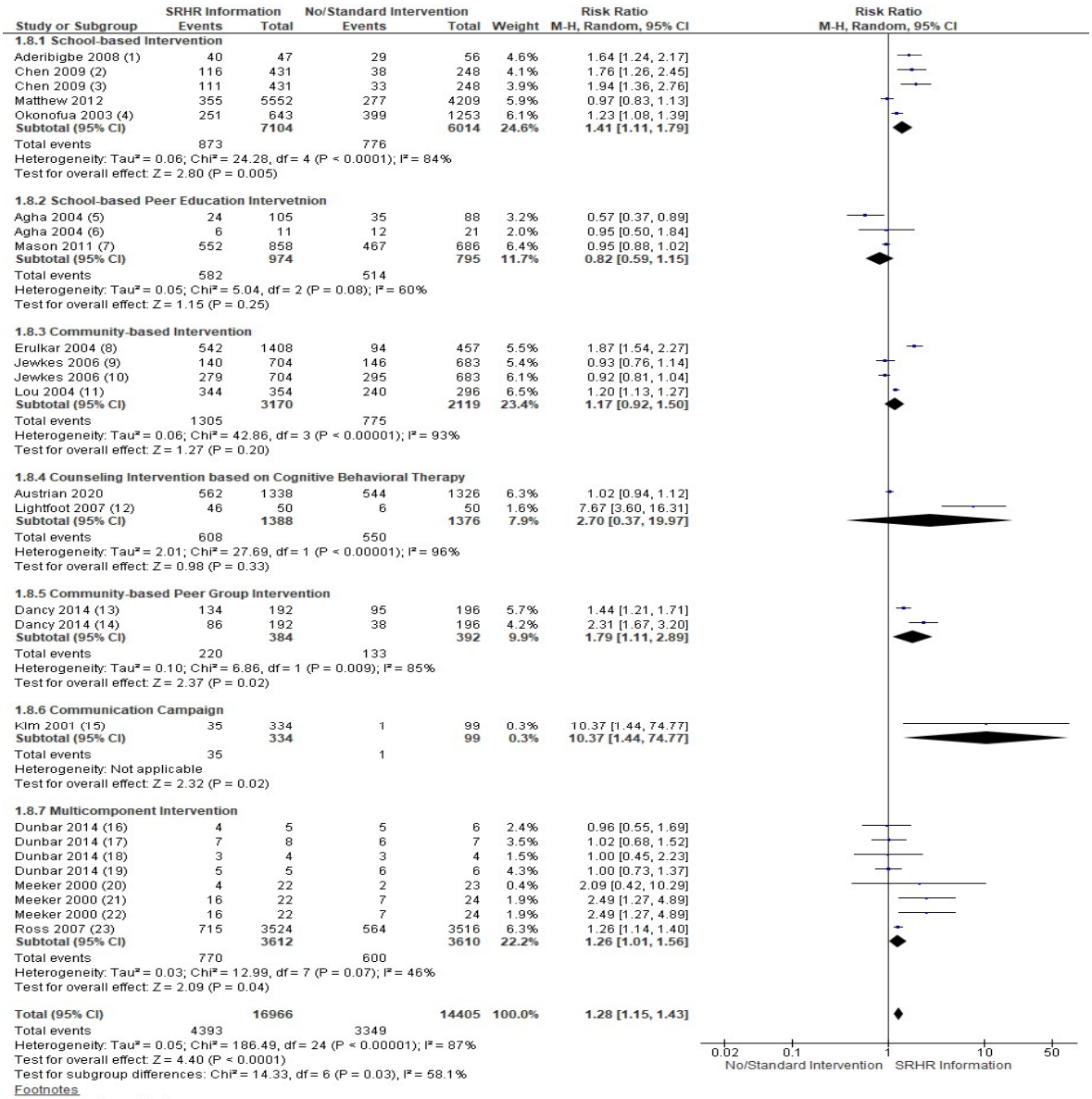
Figure 3: Impact of Adolescents Sexual and Reproductive Health and Rights (ASRHR) Information on Condom Use among Adolescents



Footnotes

(1) used condom at last sex
(2) condom use 12 month post intervention follow up
(3) condom use post intervention 6 months follow up
(4) Some Condom use
(5) Ever used condom with regular partner
(6) Used condom with casual partner last time
(7) Used condom at last sex
(8) used condom on last sex
(9) Always use condom
(10) used condom on last sex
(11) Condom use ever among sexually active adolescents
(12) Always use condom
(13) Ever used condom - among sexually active adolescents
(14) Always use condom
(15) Started using condom (Youth Campaign: Posters, leaflets, newsletters, Radio shows, Launch events, dramas, peer education, hot line.)
(16) Condom use - 18 months follow up (Multicomponent intervention: Life Skills, Red Cross, Vocational training and start up grant)
(17) Condom use - 24 months follow up (Multicomponent intervention: Life Skills, Red Cross, Vocational training and start up grant)
(18) Condom use - 6 months follow up (Multicomponent intervention: Life Skills, Red Cross, Vocational training and start up grant)
(19) Condom use - 12 months follow up (Multicomponent intervention: Life Skills, Red Cross, Vocational training and start up grant)
(20) used condom on last sex (Multi component intervention: mass media campaign, peer education, adolescent targeted condom distribution)
(21) ever used condom (Multi component intervention: mass media campaign, peer education, adolescent targeted condom distribution)
(22) Uses condoms as FP method (Multi component intervention: mass media campaign, peer education, adolescent targeted condom distribution)
(23) used condom on last sex (Multi component interventions: Community activities, teacher led and peer asssited sexual health education, training and supervision of...

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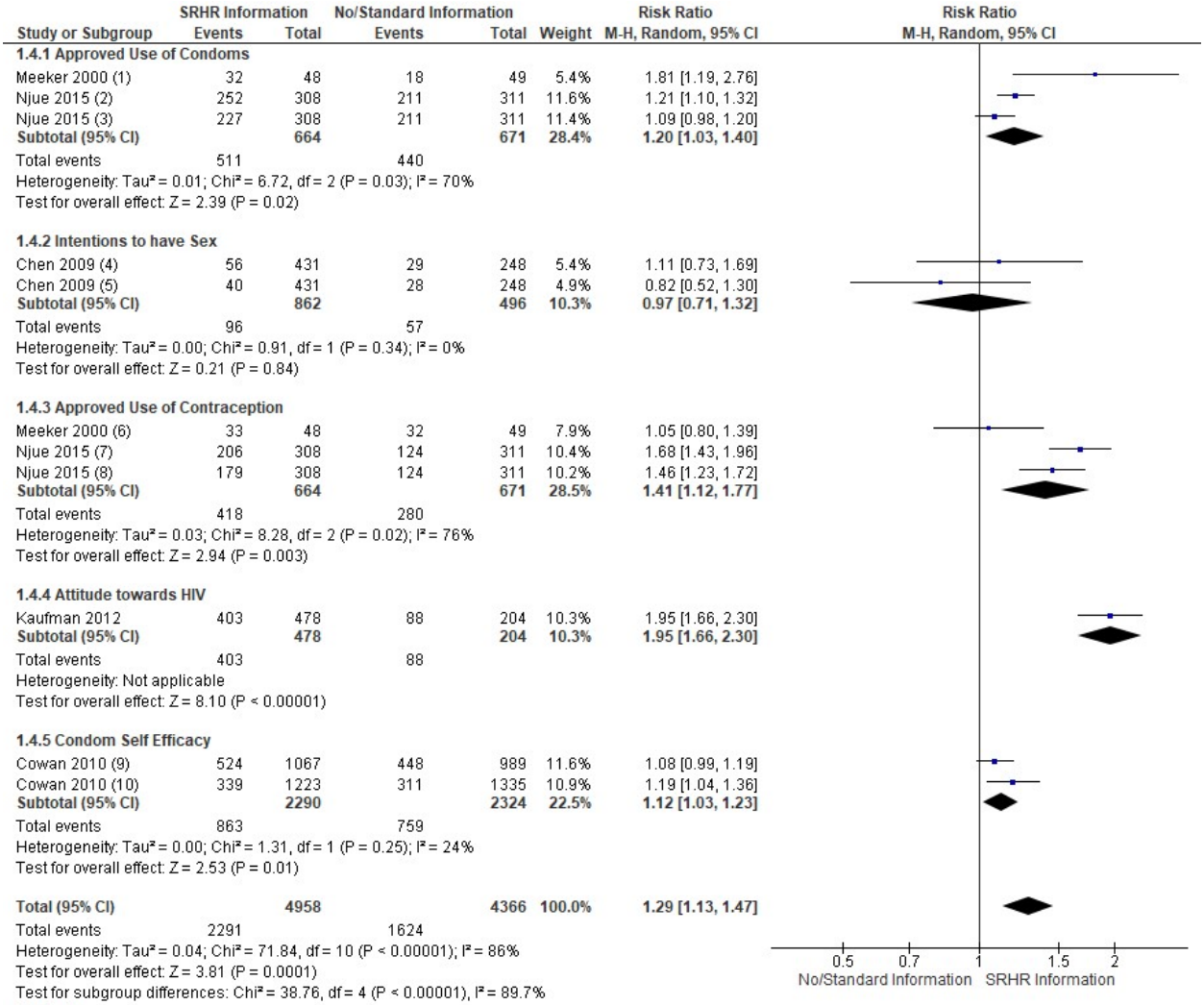
Figure 4: Impact of Adolescents Sexual and Reproductive Health and Rights (ASRHR) Information on Adolescents Attitude Towards SRHR



Footnotes

(1) Multicomponent intervention - Social marketing, peer education, distribution of information materials and condoms, radio shows, tv shows.
(2) Approved use of Condoms - community based intervention
(3) Approved use of condom - community based + school based intervention
(4) post intervention 12 months follow up
(5) post intervention 6 months follow up
(6) social marketing, peer education, distribution of informational materials and condoms, radio shows, tv shos etc.
(7) commmunity based intervention
(8) Community based intervention + school based intervention
(9) Multicomponent intervention (Males) - youth program for in and out of school children by peer educators, 22-session community based intervention for parents &...
(10) Multicomponent intervention (Females) - youth program for in and out of school children by peer educators, 22-session community based intervention for parents...