



Review

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

Salima Meherali ^{1,*}, Mehnaz Rehmani ², Sonam Ali ¹ and Zohra S. Lassi ³¹ Faculty of Nursing, University of Alberta, Edmonton, AB T6G 1C9, Canada; ssali2@ualberta.ca² School of Public Health, University of Alberta, Edmonton, AB T6G 1C9, Canada; rehmani@ualberta.ca³ Faculty of Medicine, University of Adelaide, Adelaide 5005, Australia; zohra.lassi@adelaide.edu.au

* Correspondence: meherali@ualberta.ca

Abstract: Adolescent access to quality sexual and reproductive health and rights has been a major issue in most low- to middle-income countries (LMICs). This systematic review aims to identify the relevant community and school-based interventions that can be implemented in LMICs to promote adolescents' sexual and reproductive health and rights. We identified 54 studies, and our review findings suggested that educational interventions, financial incentives, and comprehensive post-abortion family planning services were effective in increasing their knowledge and use of Adolescent Sexual and Reproductive Health and Rights (ASRHR) services, such as contraception, which led to a decrease in unwanted pregnancies. However, we found inconclusive and limited evidence on the effectiveness of interventions for improved violence prevention and adolescent behavior towards safe sexual practices. More rigorous studies with long-term follow-ups are needed to assess the effectiveness of such interventions.

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



Citation: Meherali, S.; Rehmani, M.; Ali, S.; Lassi, Z.S. 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. *Adolescents* **2021**, *1*, 363–390. <https://doi.org/10.3390/adolescents1030028>

Academic Editor: Laura L. Hayman

Received: 25 June 2021

Accepted: 10 September 2021

Published: 15 September 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Background

Adolescence is a critical period during which young people experience extensive biological, psychological, and social changes [1]. Sexual and reproductive health (SRH) and access to SRH services are basic human rights, and based on sustainable development goals (SDG) (target 3.7), universal access to SRH services should be attained by 2030. However, SRH knowledge and service remains limited to many in low- to middle-income countries (LMICs) [2], home to 90% of the world's approximately 1.2 billion people aged 10–19 [3–5].

Adolescent Sexual and Reproductive Health and Rights (ASRHR) are distinct from those of adults, and the neglect of a specific ASRHR can affect an adolescent's physical and mental health, future employment, economic well-being, and the ability to reach his or her 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 on the effectiveness and scaling-up of community-based interventions focused on improving SRH among young people in specific cultural contexts. Further research is needed to better understand which SRH interventions have demonstrated effectiveness for improving SRH 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 or unintended pregnancy, unsafe abortions, sexual violence, and sexually transmitted infections (STIs), including HIV [7,8]. Young women, particularly adolescent girls, from LMICs are particularly vulnerable to poor SRH. Almost half of

women aged 20–24 in Asia and Africa are married by the age of 18, which puts them at a 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 initial sexual activity during early young age are growing in many LMICs [11,12], and childbearing and marriage are increasingly unlinked [13]. In many countries, a 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, and young people account for almost two-thirds of people living with HIV [16]. Therefore, developing, implementing, and evaluating interventions that can facilitate the development of healthy sexual behavior 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 [22–28]. However, many questions remain about what interventions work and which interventions can be sustainable and potentially scalable. No existing systematic review has examined the evidence for the effects of community and school-based interventions across multiple areas of ASRHR in LMICs. To address this gap, we conducted a systematic review to assess the range and nature of community and school-based interventions implemented to improve the SRH of adolescents in LMICs. The findings will aid in the development of a research program to better meet the SRH needs of this population. The further objectives of this review are to identify and evaluate the effectiveness of different interventions employed to improve ASRHR in LMICs, understand the approaches and strategies in successful delivery of ASRHR intervention, and identify knowledge gaps in those contexts.

2. Methods

This systematic review has been registered with the International Prospective Register of Systematic Reviews (PROSPERO) database under 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 11 April 2020, and re-updated in April 2021 using MEDLINE, EMBASE, PsychINFO (Psychological Abstracts), Ovid Global Health, CINAHL (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 or 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 S1. No language restrictions were applied; however, only papers published after 1990 were included as the adolescent SRH agenda was formally started at that time.

We included all randomized controlled trials (RCTs), quasi-RCTs, and controlled before–after (CBA) studies on adolescents aged 10–19 living in low- and middle-income countries (LMICs) as 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, contraception and the spacing of pregnancy; providing access to safe abortion; preventing and treating HIV/AIDS and other STIs; addressing intimate partner and sexual violence; menstruation and feminine hygiene; or any other

indirect interventions such as education, economic development, and empowerment. We included studies that compared these interventions with no intervention or standard interventions. We also included studies at a cross-cutting age when data on adolescents was reported separately. 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. Secondary outcomes of interest were knowledge related to ASRHR, use of ASRHR services, quality of life measured using any scale; and maternal/child morbidity and 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 senior reviewer (SM). Two authors (MR and SA) extracted relevant information independently from the 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 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. A mean difference (MD) with a 95% confidence intervals (CI) was used for continuous data and relative risk (RR) with 95% CI was used for dichotomous data. Heterogeneity between the studies was explored using the p -value of Chi^2 and I^2 . Fixed-effect models were used, but when the outcomes were heterogenous, random effect models were used. Subgroup analysis was performed based on the type of strategies employed (school-based interventions, community-based intervention, or a combination of these or other interventions) and the type of study design used.

3. Results

3.1. 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 the 54 included studies, 12 were quasi-RCTs and 42 were RCTs. Three studies were entirely conducted on young people aged 10–24 ($n = 5929$), whereas the remaining 51 studies were conducted either with adolescents aged 10–19 ($n = 69,553$) or youth aged 15–24 ($n = 19,348$). Regarding geographical distribution, 38 studies were conducted in Africa [24,33–69], 9 in Asia [70–78], and 7 in North America (the Caribbean) [79–85]. Of the 54 studies, 39 were meta-analyzed; however, 15 could not be pooled because either they did not report the outcome of interest or reported it differently. Table 1 presents the characteristics of the studies. The methodological qualities 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. (Table 2 presents the findings from the meta-analysis discussed in the sections below).

Table 1. Characteristics of included studies.

S #	First Author, Year	Country and 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 [48]	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 and community stakeholders and training program for nurses and 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 [33]	Malawi; community setting	qRCT	Males and females aged 13–19 years	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 [79]	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 [54]	Soweto and Umlazi districts, South Africa; community setting	qRCT	Adolescents aged between 17–20 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 [43]	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 and 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

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
6	Walker 2006 [80]	Morelos, Mexico; school setting	RCT	Students aged 15–18 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 [81]	Belize City, Belize; 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 2001 [57]	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
9	Darabi 2017 [70]	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 [82]	Bahamas; school and community	qRCT	preadolescents aged 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

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
11	Mon, 2017 [71]	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	Reproductive health knowledge
12	Parwej 2005 [72]	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 [51]	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 [42]	Soroti, Uganda; school setting	RCT	13–14 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 [40]	Kenya; community and school settings	RCT	10–19 years	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

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
16	Chen 2009 [83]	Bahamas; school setting	RCT	Sixth grade aged 10–11 years	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 [50]	Eastern Cape, South Africa; community setting	RCT	Young people aged 16–23	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 [73]	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 [41]	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 [58]	Zimbabwe; community setting	RCT	Female adolescents and maternal orphans aged 16–19 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

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
21	Erulkar 2004 [35]	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 and communication between adolescents and parents/adult on SRHR
22	Lou 2004 [74]	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 [37]	Uganda; community setting	RCT	Youth aged 14–21 years	Intervention: 50 Control: 50 Total: 100	Culturally adopted HIV prevention program	No intervention	Condom use, number of sexual partners
24	Ybarra 2013 [44]	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
25	Agha 2004 [24]	Zambia; school setting	RCT	Male and female adolescents in grades 10 and 11 aged 14–23 years	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 [55]	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

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
27	Mathew 2012 [53]	Cape Town and Mankweng, South Africa, and Dar es Salaam, Tanzania; school setting	RCT	Adolescents aged 12–14 years	Intervention: 6801 Control: 5338 Total: 12,139	Teacher-led school HIV prevention programmes	No intervention	Delayed sexual debut and condom use
28	Okonofua 2003 [60]	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 [52]	Western Cape, 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 [85]	Bahamas; school setting	RCT	Grade 10 students aged 13–17 years	Intervention Group 1—Bahamian Focus on Older Youth (BFOOY) + Caribbean Informed Parents and 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

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
31	Rokicki 2017 [61]	Ghana; Community setting	RCT	Adolescents aged 14–24 years	Intervention Group 1—Unidirectional: 239 Intervention Group 2—Interactive: 196 Control Group: 273 Total: 708	Intervention Group 1: Text-messages with reproductive health information Intervention Group 2: Engaging adolescents in text-messaging reproductive health quizzes	Placebo messages with information about malaria	Reproductive health knowledge, pregnancy risk and use of contraceptive methods
32	Jemmott 2010 [49]	Eastern Cape, South Africa; primary school 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 [64]	Cameroon; community setting	qRCT	Adolescents aged 12–25 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 [34]	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 2009 [38]	Dar es Salaam, Tanzania; in and out of school settings	qRCT	Adolescents aged 12–15 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

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
36	Deveaux 2007 [84]	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
37	Acharya 2017 [75]	Nepal; school setting	RCT	Secondary school children aged 14–18 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 [62]	Zambia; school setting	RCT	Male and female adolescents grades 10–12	Intervention: 421 Control: 338 Total: 759	School-based peer sexual health intervention (education session about HIV / AIDS)	1-h long session on water purification with the students	Knowledge and positive normative beliefs about abstinence and condoms perception of acquiring HIV
39	Aplasca 1995 [76]	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 [47]	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

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
41	Cartagena 2006 [77]	Mongolia; school setting	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 [59]	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 [56]	Ghana; community setting	RCT	Adolescents aged 10–24 years	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 [45]	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 [46]	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 [39]	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 risky sexual and reproductive health behaviors	No intervention	Sexual Debut Condom Use

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
47	Klepp 1997 [36]	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 [63]	Zambia; community setting	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 [68]	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 [67]	Zimbabwe; school setting	RCT	Orphan girls aged 10–16 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 [65]	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

Table 1. Cont.

S #	First Author, Year	Country and Setting	Study Design	Target Population/Sex	Total Participants	Intervention	Control Group	Outcome (s)
3	Hallfors, 2017 [66]	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 [78]	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 contraceptive methods (iv) free provision of contraceptives (v) male involvement in group and individual counseling (vi) referral of women to existing FP services	Standard post abortion family planning services (i) training of abortion services providers and provision of service guidelines as per standard training schedule and module (one day) (ii) group education and (iii) referral of women to FP services	Use of contraceptive methods, rate of pregnancy, unwanted pregnancy, and induced abortion
Comparison Group 4: Provision of Menstrual Products vs. Standard Intervention								
1.	Phillips-Howard 2016 [69]	Western Kenya; school setting	RCT	Primary-school girls 14–16 years, 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 and 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.

Table 2. SRHR Interventions and Outcomes.

Outcomes	No of Studies; and Participants	Risk Ratio/Mean Difference (95% CI)	Heterogeneity Chi ² <i>p</i> 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)	(<i>p</i> < 0.001); I ² = 94%
• HIV acquisition knowledge	5; 7526	1.17 (0.99, 1.38)	(<i>p</i> < 0.001); I ² = 92%
• STI knowledge	2; 2396	1.10 (0.91, 1.33)	(<i>p</i> = 0.05); I ² = 66%
• Risk of pregnancy knowledge	1; 65	1.10 (0.96, 1.27)	Not applicable
• Pregnancy prevention knowledge	1; 3520	1.63 (1.55, 1.72)	Not applicable
• Emergency contraception knowledge	1; 6930	1.11 (0.94, 1.32)	(<i>p</i> < 0.001); I ² = 94%
Knowledge of Reproductive Health—Overall—End of Intervention	8; 7328	0.80 (0.44, 1.16)	(<i>p</i> < 0.001); I ² = 98%
• HIV prevention	1; 777	0.28 (0.14, 0.43)	Not applicable
• HIV acquisition and prevention	2; 2625	0.16 (−0.22, 0.55)	(<i>p</i> 0.02); I ² = 80%
• Overall SRHR knowledge	5; 3926	1.11 (0.54, 1.67)	(<i>p</i> < 0.001); I ² = 98%
Improved SRHR Behavior	2; 1338	1.61 (0.89, 2.92)	(<i>p</i> < 0.001); I ² = 89%
• Refused sex	1; 421	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; 9324	1.29 (1.13, 1.47)	(<i>p</i> < 0.001); I ² = 86%
• Approved use of condoms	2; 1335	1.20 (1.03, 1.40)	(<i>p</i> = 0.03); I ² = 70%
• Intentions to have sex	1; 1358	0.97 (0.71, 1.32)	(<i>p</i> = 0.34); I ² = 0%
• Approved use of contraception	2; 1335	1.41 (1.12, 1.77)	(<i>p</i> = 0.02); I ² = 76%
• Attitude towards HIV	1; 682	1.95 (1.66, 2.30)	Not applicable
• Condom self-efficacy	1; 4614	1.12 (1.03, 1.23)	(<i>p</i> = 0.25); I ² = 24%
Overall attitude towards SRHR	1; 556	16.70 (15.19, 18.21)	Not applicable
Any Violence	4; 8051	1.10 (1.01, 1.19)	(<i>p</i> = 0.35); I ² = 9%
• Intimate partner physical violence	3; 1995	1.06 (0.92, 1.20)	(<i>p</i> = 0.55); I ² = 0%
• Intimate partner sexual violence	3; 1995	1.03 (0.87, 1.23)	(<i>p</i> = 0.97); I ² = 0%
• Physical/sexual violence or rape	2; 1179	0.65 (0.10, 4.46)	(<i>p</i> = 0.15); I ² = 52%
• Spousal emotional violence	1; 665	1.07 (0.90, 1.28)	(<i>p</i> = 0.63); I ² = 0%
• Spousal economic violence	1; 2217	1.19 (0.79, 1.80)	(<i>p</i> = 0.01); I ² = 85%
Any contraceptive use	11; 6235	1.02 (0.91, 1.15)	(<i>p</i> < 0.001); I ² = 83%
• Community-based intervention	2; 2514	0.90 (0.64, 1.26)	(<i>p</i> < 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)	(<i>p</i> < 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)	(<i>p</i> = 0.96); I ² = 0%

Table 2. Cont.

Outcomes	No of Studies; and Participants	Risk Ratio/Mean Difference (95% CI)	Heterogeneity Chi ² <i>p</i> Value; I ² (%)
Condom use	16; 31,371	1.28 (1.15, 1.43)	(<i>p</i> < 0.001); I ² = 87%
• School-based intervention	4; 13,118	1.41 (1.11, 1.79)	(<i>p</i> < 0.001); I ² = 84%
• School-based peer education intervention	2; 1769	0.82 (0.59, 1.15)	(<i>p</i> = 0.08); I ² = 60%
• Community-based intervention	3; 5289	1.17 (0.92, 1.50)	(<i>p</i> < 0.001); I ² = 93%
• Counseling intervention based on cognitive behavioral therapy	2; 2764	2.70 (0.37, 19.97)	(<i>p</i> < 0.0001); I ² = 96%
• Community-based peer group intervention	1; 776	1.79 (1.11, 2.89)	(<i>p</i> < 0.009); I ² = 85%
• Communication campaign	1; 433	10.37 (1.44, 74.77)	Not applicable
• Multi-component intervention	3; 7222	1.26 (1.01, 1.56)	(<i>p</i> = 0.07); I ² = 46%
Attitude and practice towards condom Use (School-based Intervention)	5; 3704	0.37 (0.17, 0.57)	(<i>p</i> < 0.001); I ² = 84%
• Reported condom attitude	1; 50	1.36 (0.74, 1.98)	Not applicable
• Self-efficacy for condom use	2; 1896	0.22 (0.04, 0.40)	(<i>p</i> = 0.02); I ² = 74%
• Intention to use condom	2; 1222	0.79 (−0.36, 1.93)	(<i>p</i> = 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)	(<i>p</i> = 0.55); I ² = 0%
• School-based intervention	1; 1896	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; 6194	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; 5482	1.01 (0.92, 1.10)	(<i>p</i> = 0.44); I ² = 0%
Unprotected Sex	2; 1326	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)	(<i>p</i> = 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)	(<i>p</i> < 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)	(<i>p</i> < 0.008); I ² = 71%
• Multi-component intervention	1; 3666	0.90 (0.72, 1.11)	(<i>p</i> = 0.97); I ² = 0%
• Community-based intervention by health educators	1; 1865	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)	(<i>p</i> < 0.001); I ² = 91%
• Community-based peer group intervention	2; 1441	1.64 (1.29, 2.07)	(<i>p</i> = 0.07); I ² = 53%
• Multi-component intervention	2; 5146	1.00 (0.95, 1.06)	(<i>p</i> = 0.86); I ² = 0%
• Communication campaign	1; 1264	3.64 (2.51, 5.27)	Not applicable
Prevalence of STI diseases	2; 14,150	0.86 (0.75, 0.99)	(<i>p</i> < 0.001); I ² = 89%
• Prevalence of Gonorrhoea	1; 1308	2.03 (0.62, 6.69)	(<i>p</i> = 0.97); I ² = 0%
• Prevalence of Syphilis	1; 1308	0.88 (0.43, 1.78)	(<i>p</i> = 0.90); I ² = 0%
• Prevalence of HIV	2; 3643	1.12 (0.79, 1.57)	(<i>p</i> = 0.94); I ² = 0%

Table 2. Cont.

Outcomes	No of Studies; and Participants	Risk Ratio/Mean Difference (95% CI)	Heterogeneity Chi ² <i>p</i> Value; I ² (%)
• Prevalence of HSV2	2; 3643	1.07 (0.88, 1.30)	(<i>p</i> = 0.69); I ² = 0%
• Prevalence of Trichomonas	1; 1696	0.18 (0.13, 0.25)	Not applicable
• Prevalence of Chlamydia	1; 2552	5.00 (2.44, 10.25)	(<i>p</i> = 0.05); I ² = 75%
Intervention 2: Financial Incentive vs. No Intervention			
U of HIV testing services	1; 1688	2.24 (1.84, 2.71)	(<i>p</i> = 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)	(<i>p</i> < 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; 1147	0.33 (0.15, 0.72)	Not applicable
Induces abortion	1; 1147	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)	(<i>p</i> = 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

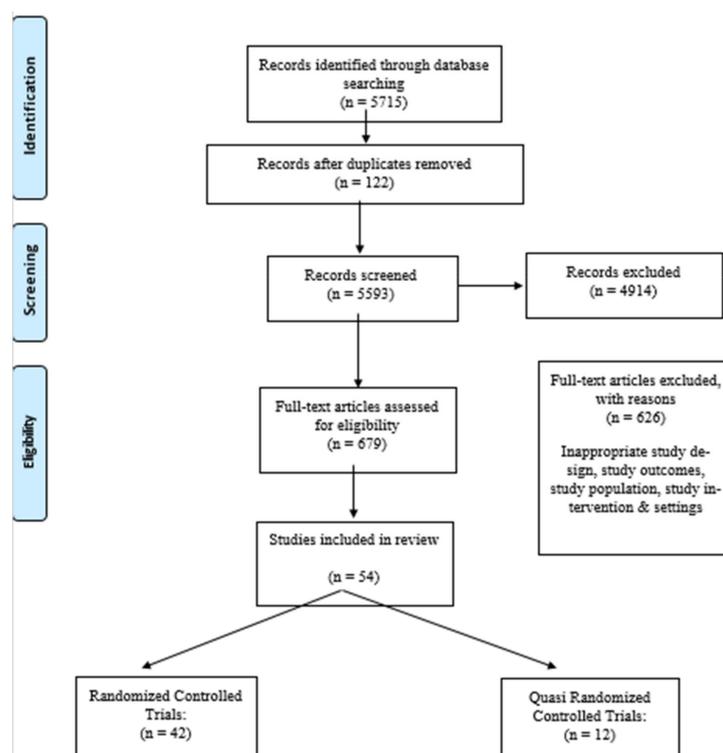


Figure 1. PRISMA Flow diagram for interventions to improve Adolescent Sexual and Reproductive Health and Rights (Adapted from Moher et al. 2009).

(a): RCTs

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Acharya 2017	+	+	+	+	+	+	?
Agha 2002	+	?	+	+	+	+	+
Agha 2004	?	?	+	+	+	+	?
Aninanya 2015	?	+	+	?	+	+	?
Aplasca 1995	?	+	?	?	+	+	+
Bell 2008	?	?	+	?	+	+	+
Burnett 2011	?	?	+	?	+	+	?
Cartagena, 2006	+	?	+	?	+	+	+
Chen 2009	+	+	?	?	+	+	?
Cho 2011	+	?	?	?	+	+	?
Cowan 2010	+	+	?	?	+	+	+
Darabi 2017	?	?	?	?	+	+	+
Deveaux 2007	+	?	?	?	?	+	?
Dunbar 2014	+	+	+	?	+	+	+
Dupas 2011	+	?	?	?	+	+	?
Hallfors 2011	?	+	+	?	+	+	+
Hallfors 2017	?	?	?	?	+	+	?
Jemmot 2010	+	+	+	+	+	+	?
Jewkes 2006	+	+	+	?	+	+	?
Klep 1997	+	?	?	?	+	+	?
Kranzer 2018	+	+	+	?	+	+	?
Lightfoot 2007	+	?	?	?	?	+	?
Lou 2004	+	?	?	?	+	+	+
Matthew 2012	+	+	?	?	+	+	?
Mmbaga 2017	+	+	?	?	+	+	?
Mon 2017	?	?	+	?	?	+	+
Naved 2018	+	?	?	?	?	+	+
Njue 2015	?	+	?	?	?	+	?
Okonofua 2003	+	?	?	?	+	+	?
Parwej 2005	+	?	?	?	?	+	?
Phillips-Howard 2016	+	+	?	?	?	+	?
Rockiki 2017	+	?	+	?	+	+	+
Ross 2007	?	?	?	?	?	+	?
Shuey 1999	+	?	?	?	+	+	?
Stark 2018	?	+	+	?	+	+	+
Walker 2006	+	?	?	?	+	+	+
Wang 2014	?	?	?	?	+	+	+
Yabara 2015	+	?	?	?	?	+	?
Ybarra 2013	+	+	?	?	?	+	?
Zhu 2009	+	?	+	?	?	+	?

(b): q-RCTs

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Baseline outcome measurements Similar	Baseline Characteristics Similar	Incomplete outcome data (attrition bias)	Blinding of participants and personnel (performance bias)	Protection against contamination	Selective outcome reporting?	Other bias
Aderibigbe 2008	?	?	+	+	?	?	+	?	
Austrian 2020	+	?	+	+	?	+	+	+	
Briegger 2011	+	?	+	?	?	?	+	?	
Dancy 2014	+	+	+	+	?	+	+	?	
Erulkar 2004	+	?	+	?	?	+	+	+	
Esere 2008	?	?	?	+	?	+	?	?	
Gong 2009	?	?	+	+	?	?	+	?	
Kaufman 2012	?	+	+	+	?	?	+	+	
Kim 2001	+	?	+	+	?	?	+	+	
Kinsler 2004	?	?	?	?	?	+	+	?	
Maro 2007	+	?	+	?	?	+	+	?	
Mason 2011	?	?	+	+	?	?	+	?	
Meeker 2000	?	?	+	?	?	+	+	?	
Speizer 2001	?	?	+	+	?	?	+	?	

Figure 2. Methodological quality of the 54 studies (a) RCTs, (b) q-RCTs.

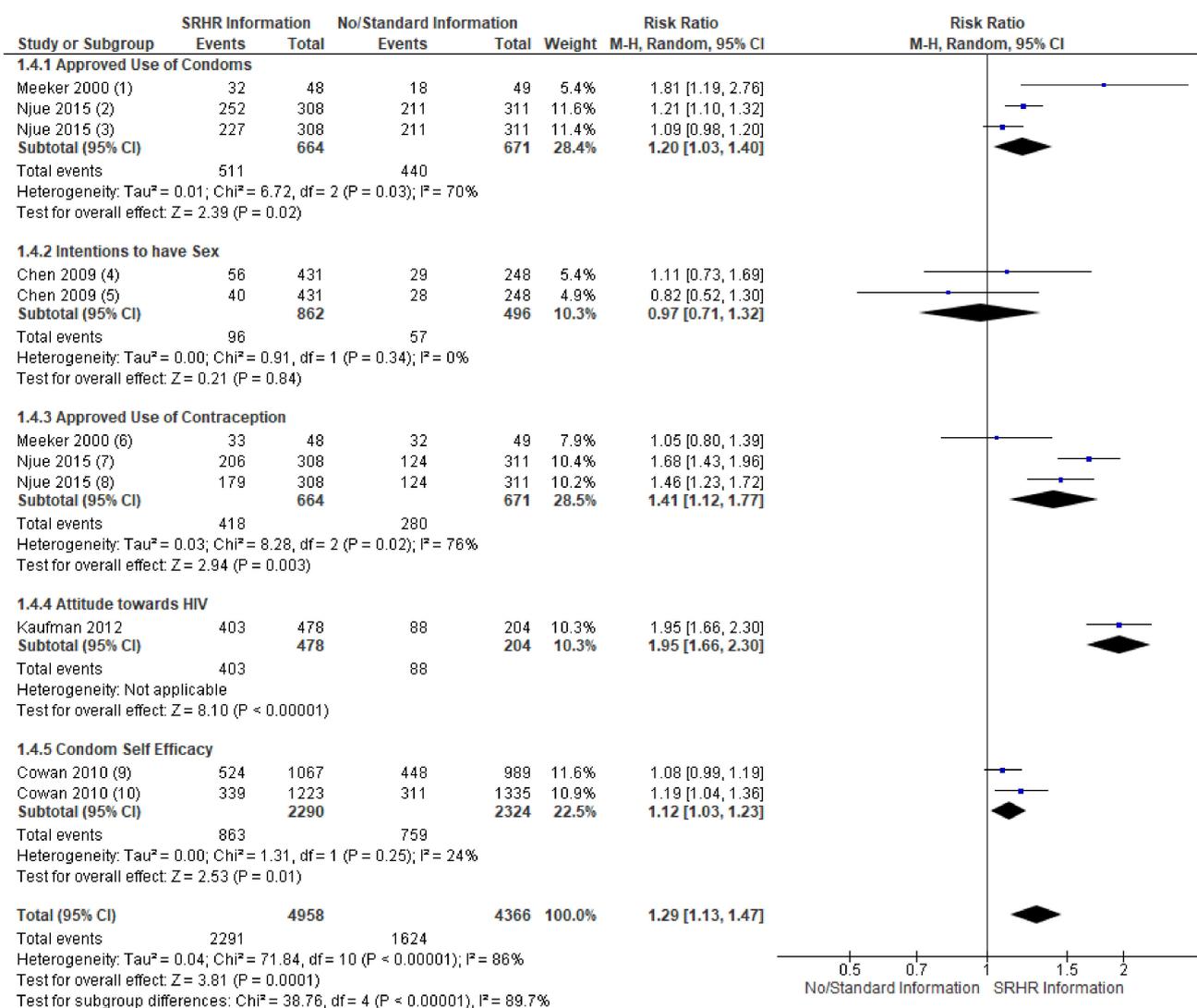
3.2. Summary of Adolescent Sexual and Reproductive Health and Rights (ASRHR) Interventions

Of the 54 studies, 48 studies focused on interventions related to ASRHR education, and of these, 33 were conducted in Africa [24,33–64]; 8 in Asia [70–77]; and 7 in North America (the Caribbean) [79–85]. 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 a combination of the above (i.e., multicomponent interventions). Another three studies conducted in Africa, including Kenya [34,40,65]; and Zimbabwe (n = 1) [67], implemented interventions that focused on providing comprehensive school support packages to adolescents. These packages included uniforms, tuition fees, and helpers to school-going students. While the remaining three studies assessed a number of cross-cutting ASRHR interventions: one study focused on the provision of comprehensive post-abortion family planning service packages to young women in China (n = 1) [78]; another focused on evaluating the effect of financial incentives to caregivers to have adolescents undergo HIV testing and counseling services in Harare, Zimbabwe, (n = 1) [68]; and the third focused on addressing menstrual health and hygiene by providing menstrual products to school-going adolescents in rural western Kenya (n = 1) [69] (See Table 2).

3.3. ASRHR Education Interventions

Our pooled results suggested that educational interventions had a significant impact on improving adolescents' knowledge of ASRHR (RR 1.16; 95% CI 1.04 to 1.29; n = 6 studies), their attitudes towards ASRHR (RR 1.29; 95% CI 1.13 to 1.47; n = 5 studies) (Figure 3), and their practices related to ASRHR, such as the use 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) (Figure 4), limiting 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 come from single studies. Moreover, these interventions were also effective in reducing the prevalence of STIs (RR 0.86; 95% CI 0.75 to 0.99; n = 2 studies) and HIV among adolescents (RR 0.71; 95% CI 0.62 to 0.82; n = 2 studies) (Table 2).

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 knowledge of ASRHR (Figure 4). The multicomponent interventions included a range of interventions that aimed to increase ASRHR knowledge to adolescents via mass media campaigns, peer education, and targeted condom distribution in communities. Whereas interventions including counseling based on cognitive behavioral therapy, school-based programs, and communication campaign interventions were effective in improving the use ASRHR services, contraceptive methods, and condom use. The communication campaign incorporated various wide-distribution strategies to reach out to different audiences and reinforce ASRHR messages: posters in the community with key messages around sexual responsibility, peer pressure, AIDS, drugs, and alcohol; five different leaflets on saying “no” to sex, postponing sex, delaying parenthood, and STIs; newsletters by peer educators and schools on reproductive health issues. The campaign also entailed peer education, the launch and implementation of radio campaigns, community theatre and events, and a hotline to provide ASRHR support (Table 2).

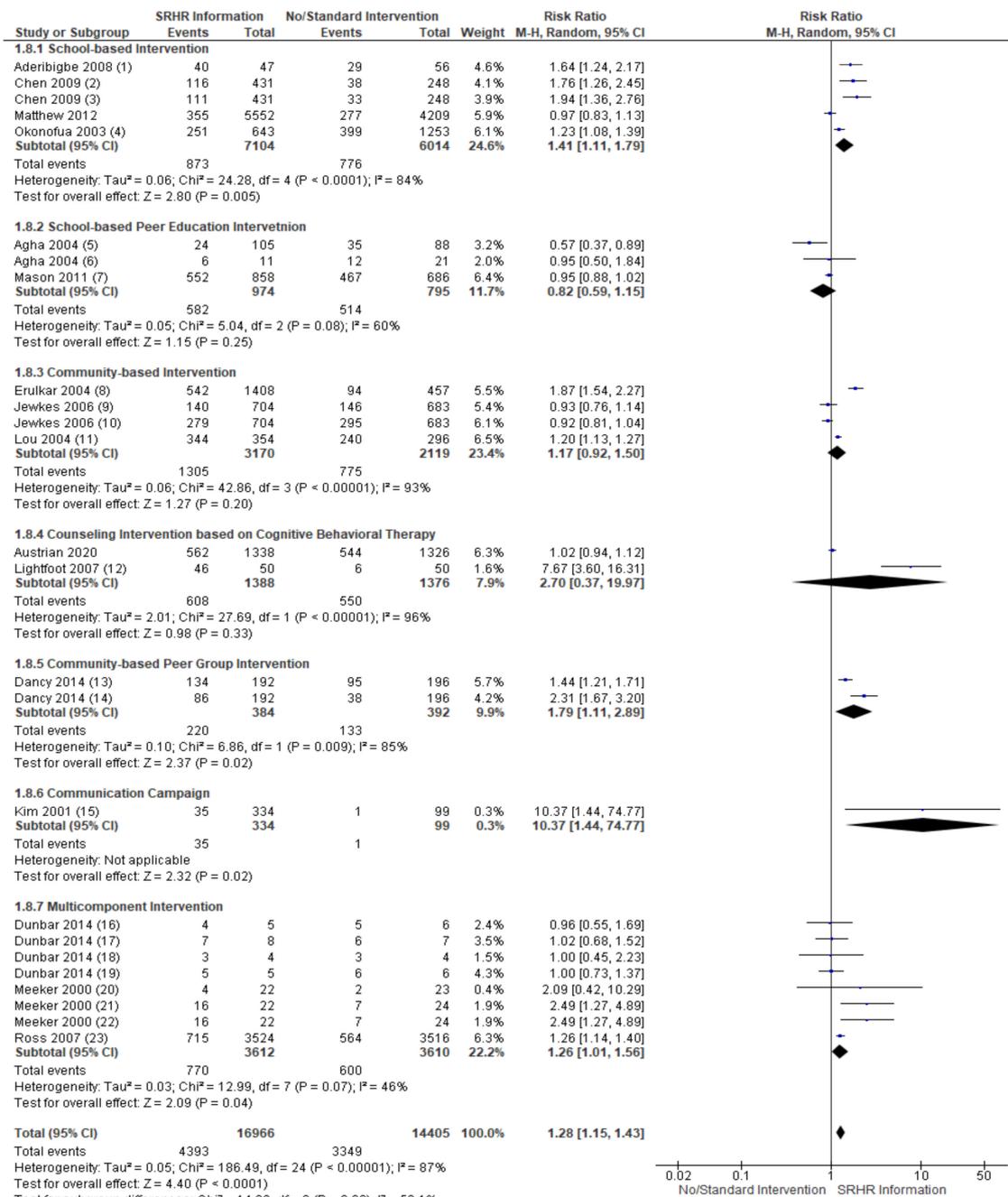


Footnotes

- (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) community 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...

Figure 3. Impact of Adolescent Sexual and Reproductive Health and Rights (ASRHR) information on adolescent attitudes towards SRHR.

It is significant to note that ASRHR education interventions like Internet-based programs and text messaging (unidirectional or interactive) were not found effective for improving ASRHR outcomes related to family planning (Internet-based programs RR 1.01; 95% CI 0.90 to 1.13; n = 1 study); or pregnancy rates (via unidirectional text messaging RR 0.57; 95% CI 0.17 to 1.93, n = 1 study; via interactive text messaging intervention RR 0.86; 95% CI 0.27 to 2.75; n = 1 study). Similarly, community-based behavioral interventions with teenage girls and community-based interventions that included group sessions and the provision of health and legal services 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 S2; Figures S1–S3).



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 assisted sexual health education, training and supervision of...

Figure 4. Impact of Adolescent Sexual and Reproductive Health and Rights (ASRHR) information on condom use.

3.4. 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 caregivers of children and adolescents for them to seek HIV testing and counseling services [68]. Findings from the meta-analysis revealed them to be significantly effective (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).

3.5. Comprehensive Post-Abortion Family Planning Services

We identified one study that found significant intervention effects related to family planning. Zhu et al. [78] examined the impact of providing comprehensive post-abortion family planning service packages to young women in three different cities in China. These included training of abortion service providers, group education and individual counseling of women on contraception, male involvement in education and counseling sessions, and referral of women to family planning services. Interestingly, our meta-analysis of this intervention revealed significant improvement in the use 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 pregnancies (RR 0.33; 95% CI 0.17 to 0.72); and induced abortions (RR 0.36; 95% CI 0.15 to 0.87) (Table 2).

3.6. Comprehensive School Support to Adolescents in Schools

Hallfors et al. examined the effect of providing comprehensive school support to school-going adolescents on rates of teenage pregnancy in Zimbabwe [67]. The school support package included tuition fees, uniforms, and helpers. However, the meta-analysis indicated that the intervention was not effective in reducing teenage pregnancy rates (RR 0.16; 95% CI 0.01 to 3.26) (Table 2).

3.7. Provision of Menstrual Products to the School-Going Adolescents

The study in rural western Kenya conducted by Phillips-Howard et al. explored the effect of providing menstrual products (menstrual cups and pads) to in schools to decrease rates of STIs and Reproductive Tract infections (RTIs) [69]. Findings from the analysis revealed that such interventions may not be effective (RR 0.79; 95% CI 0.34 to 1.79) (Table 2).

4. Discussion

Our systematic review aimed to evaluate the effectiveness of community and school-based ASRHR interventions in LMICs. The review also aimed to understand the approaches and strategies taken to successfully implement ASRHR interventions in these limited-resource settings. The findings suggest that ASRHR education (school and community-based interventions, sports-based interventions, counseling based on cognitive behavioral therapy, multi-component interventions, and communication campaigns) are effective for improving young people's knowledge, attitudes, and practices toward ASRHR. The outcomes that were significantly improved through these interventions were the increased use of contraceptive methods, reduced sexual partners, adopting safe sexual behaviors, decreased rates of STIs and HIV, and the increased use of ASRHR services. On the other hand, technology-based ASRHR interventions were not found effective regarding protected sex and reducing unwanted pregnancies. Our findings are consistent with existing studies related to digital-based ASRHR interventions. A systematic review found statistically significant impacts mostly for the knowledge-based outcomes [86]. However, these may not essentially translate into meaningful reductions in sexually risky behavior [86]. Very limited RCTs or qRCTs studies were conducted to evaluate the effectiveness of digital or mHealth interventions, but more RCT studies are needed to understand the effectiveness, replicability, and scalability of new digital/mHealth-based ASRHR interventions in LMICs [87].

Our review also found that non-drug interventions such as providing financial incentives can be effective in improving the use of ASRHR services such as HIV testing and

counseling services. This finding was consistent with another systematic review conducted by Wekesah et al., which evaluated non-drug interventions on maternal health [88]. Cost-sharing programs between public and health care facilities and output-based approach (OBA) vouchers to cover the cost of certain maternal health services (antenatal visits and facility-based deliveries) have the potential to increase access to these services among the poor and reduce maternal mortality [88]. Similarly, our findings also suggested that the use of contraception 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 for reducing unwanted pregnancy and unsafe abortion. Globally, comprehensive post-abortion family planning services have been endorsed as a high-impact practice in family planning services [89]. Several studies found that providing family planning services as part of post-abortion care can increase contraceptive use and reduce repeat abortions [89,90].

Interestingly, our review suggested that comprehensive school support programs (provision of tuition fees, uniforms, and helpers to adolescents) to decrease school dropout rates, are not effective for reducing teenage pregnancy. However, our findings are insignificant compared to the available evidence on the effectiveness of comprehensive school support programs. According to Ferre (as cited in a guidance document by UNFPA, 2015), the World Bank estimates that the risk of pregnancy declines every year when a young girl remains in school after age 11 [91]. Moreover, a systematic literature review conducted to evaluate the influence of education on teenage pregnancy in low-income countries, suggests that teenage girls who remained longer in schools had delayed pregnancy longer than girls who had little or no education or had been out of school [92]. Moreover, the study suggested that social workers should focus on interventions that ensure enrollment of girls in LMICs and provide opportunities to them to be able to attend school [92]. Such interventions can facilitate decreasing the burden of teenage pregnancy [92]. Similarly, our review suggested that the provision of free menstrual cups and sanitary pads in schools may not decrease the rates of STIs and RTIs. However, this finding is inconsistent with the available evidence attesting to their effectiveness. According to a scientific review conducted by Van Eijk et al., menstrual cups are safe for menstruation management [93]. Furthermore, the review found that there was no increased risk of infection associated with their use.

5. Limitations

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

6. Conclusion

Given the urgent need to identify strategies to promote ASRHR, this systematic review provided a comprehensive summary of effective interventions that can be implemented to improve ARSHR in LMICs. This review also provided potentially useful insights for the adaptation of evidence-based interventions to prevent and control adverse ASRHR outcomes. Our review suggested that a range of comprehensive interventions targeting sexual health education, counseling, and consistent birth control promotion and provision have the potential to promote ASRHR and prevent and control the adverse outcomes.

However, more rigorous studies with long-term follow-ups are needed to assess how the interventions are designed, carried out, and evaluated. The findings of this review can enable key stakeholders including public health practitioners, program managers, policymakers, and donors to make evidence-based decisions regarding the replicability and scalability of the ASRHR interventions in LMICs.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/adolescents1030028/s1>, File S1: Search Strategy; Figure S1: Impact of Adolescents Sexual and Reproductive Health and Rights (ASRHR) Information on the Uptake of SRHR Services by the Adolescents; Figure S2: Impact of Adolescents Sexual and Reproductive Health and Rights (ASRHR) Information on Adolescents Overall Knowledge Related to SRHR; Figure S3: Impact of Adolescents Sexual and Reproductive Health and Rights (ASRHR) Information on Adolescents Behavior Towards Sexual Practice—Multiple Sexual Partners.

Author Contributions: S.M. and Z.S.L., participated in the study design. S.M., Z.S.L., M.R. participated in analyses. S.A. and M.R. performed the quality assessment. S.M. and M.R. wrote a first draft of the manuscript. Z.S.L. commented on this draft and performed critical revisions. All authors have read and agreed to the published version of the manuscript.

Funding: This project was supported by Killam Research Funds [grant number: RES0044591].

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: All data generated or analyzed during this study are included in this published article.

Conflicts of Interest: The authors declare that they have no competing interest.

References

1. Fatusi, A.O.; Hindin, M.J. Adolescents and youth in developing countries: Health and development issues in context. *J. Adolesc. Health* **2010**, *33*, 499–508. Available online: <https://pubmed.ncbi.nlm.nih.gov/20598362/> (accessed on 12 June 2021). [CrossRef]
2. Desrosiers, A.; Betancourt, T.; Kergoat, Y.; Servilli, C.; Say, L.; Kobeissi, L. A systematic review of sexual and reproductive health interventions for young people in humanitarian and lower-and-middle-income country settings. *BMC Public Health* **2020**, *20*, 666. [CrossRef] [PubMed]
3. Nagata, J.M.; Hathi, S.; Ferguson, B.J.; Hindin, M.J.; Yoshida, S.; Ross, D.A. Research priorities for adolescent health in low- and middle-income countries: A mixed-methods synthesis of two separate exercises. *J. Glob. Health* **2018**, *8*, 1–8. [CrossRef] [PubMed]
4. Gupta, M.D.; Engelman, R.; Levy, J.; Luchsinger, G.; Merrick, T.; Rosen, J.E. The power of 1.8 billion: Adolescents, youth and the transformation of the future. In *State of the World Population*; United Nations Population Fund (UNFPA): New York, NY, USA, 2014; p. 126.
5. Dick, B.; Ferguson, B.J. Health for the world's adolescents: A second chance in the second decade. *J. Adolesc. Health* **2015**, *56*, 3–6. [CrossRef] [PubMed]
6. Chandra-Mouli, V.; Camacho, A.V.; Michaud, P.A. WHO guidelines on preventing early pregnancy and poor reproductive outcomes among adolescents in developing countries. *J. Adolesc. Health* **2013**, *52*, 517–522. [CrossRef] [PubMed]
7. World Health Organization. *Early Marriages, Adolescent and Young Pregnancies*; World Health Organization: Geneva, Switzerland, 2011.
8. Salam, R.A.; Faqqah, A.; Sajjad, N.; Lassi, Z.S.; Das, J.K.; Kaufman, M.; Bhutta, Z.A. Improving adolescent sexual and reproductive health: A systematic review of potential interventions. *J. Adolesc. Health* **2016**, *59*, S11–S28. [CrossRef]
9. Fatusi, A.O. Young people's sexual and reproductive health interventions in Developing countries: Making the investments count. *J. Adolesc. Health* **2016**, *59*, S1–S3. [CrossRef]
10. Williamson, N. *Motherhood in Childhood: Facing the Challenge of Adolescent Pregnancy*; United Nations Population Fund State of World Population: New York, NY, USA, 2013.
11. World Health Organization. *Adolescent Pregnancy*; World Health Organization: Geneva, Switzerland, 2020. Available online: <http://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy> (accessed on 12 June 2021).
12. Ali, M.M.; Cleland, J. Sexual and reproductive behaviour among single women aged 15–24 in eight Latin American countries: A comparative analysis. *Soc. Sci. Med.* **2005**, *60*, 1175–1185. [CrossRef]
13. Gupta, N.; Mahy, M. Sexual initiation among adolescent girls and boys: Trends and differentials in sub-Saharan Africa. *Arch. Sex. Behav.* **2003**, *32*, 41–53. [CrossRef] [PubMed]
14. Bearinger, L.H.; Sieving, R.E.; Ferguson, J.; Sharma, V. Global perspectives on the sexual and reproductive health of adolescents: Patterns, prevention, and potential. *Lancet* **2007**, *369*, 1220–1231. [CrossRef]

15. Pettifor, A.E.; van der Straten, A.; Dunbar, M.S.; Shiboski, S.C.; Padian, N.S. Early age of first sex: A risk factor for HIV infection among women in Zimbabwe. *AIDS* **2004**, *18*, 1435–1442. [[CrossRef](#)] [[PubMed](#)]
16. Dixon-Mueller, R. Starting young: Sexual initiation and HIV prevention in early adolescence. *AIDS Behav.* **2009**, *13*, 100–109. [[CrossRef](#)]
17. Joint United Nations Programme on HIV/AIDS. *HIV and Young People: The Threat for Today's Youth, 2004 Report on the Global AIDS Epidemic*, 4th ed.; UNAIDS: Geneva, Switzerland, 2004; pp. 93–98.
18. United Nations. *The Millennium Development Goals Report 2008*; United Nations: New York, NY, USA, 2008. Available online: https://www.un.org/millenniumgoals/2008highlevel/pdf/newsroom/mdg%20reports/MDG_Report_2008_ENGLISH.pdf (accessed on 12 June 2021).
19. Paul-Ebhohimhen, V.A.; Poobalan, A.; van Teijlingen, E.R. A systematic review of school-based sexual health interventions to prevent STI/HIV in sub-Saharan Africa. *BMC Public Health* **2008**, *8*, 4. [[CrossRef](#)] [[PubMed](#)]
20. Kirby, D.; Obasi, A.; Laris, B.A. The effectiveness of sex education and HIV education interventions in schools in developing countries. In *Preventing HIV/AIDS in Young People. A Systematic Review of the Evidence from Developing Countries*; Ross, D.A., Dick, B., Ferguson, J., Eds.; World Health Organization: Geneva, Switzerland, 2006; pp. 103–150.
21. Kirby, D.B.; Laris, B.A.; Roller, L.A. Sex and HIV education programs: Their impact on sexual behaviors of young people throughout the world. *J. Adolesc. Health* **2007**, *40*, 206–217. [[CrossRef](#)]
22. Department of Maternal Newborn Child and Adolescent Health. *Making Health Services Adolescent Friendly: Developing National Quality Standards for Adolescent Friendly Health Services*; World Health Organization: Geneva, Switzerland, 2012. Available online: http://www.who.int/iris/bitstream/10665/75217/1/9789241503594_eng.pdf?ua=1 (accessed on 12 June 2021).
23. Hindin, M.J.; Fatusi, A.O. Adolescent sexual and reproductive health in developing countries: An overview of trends and interventions. *Int. Perspect. Sex. Reprod. Health* **2009**, *35*, 58–62. [[CrossRef](#)] [[PubMed](#)]
24. Agha, S.; Van Rossem, R. Impact of a school-based peer sexual health intervention on normative beliefs, risk perceptions, and sexual behavior of Zambian adolescents. *J. Adolesc. Health* **2004**, *34*, 441–452. [[CrossRef](#)]
25. Berenson, A.B.; Rahman, M. A randomized controlled study of two educational interventions on adherence with oral contraceptives and condoms. *Contraception* **2012**, *86*, 716–724. [[CrossRef](#)] [[PubMed](#)]
26. Bonell, C.; Maisey, R.; Speight, S.; Purdon, S.; Keogh, P.; Wollny, I.; Sorhaindo, A.; Wellings, K. Randomized controlled trial of ‘teens and toddlers’: A teenage pregnancy prevention intervention combining youth development and voluntary service in a nursery. *J. Adolesc.* **2013**, *36*, 859–870. [[CrossRef](#)]
27. Bull, S.S.; Levine, D.K.; Black, S.R.; Schmiege, S.J.; Santelli, J. Social media-delivered sexual health intervention: A cluster randomized controlled trial. *Am. J. Prev. Med.* **2012**, *43*, 467–474. [[CrossRef](#)]
28. Cornelius, J.B.; Dmochowski, J.; Boyer, C.; St Lawrence, J.; Lightfoot, M.; Moore, M. Text-messaging-enhanced HIV intervention for African American adolescents: A feasibility study. *J. Assoc. Nurses AIDS Care* **2013**, *24*, 256–267. Available online: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3627821/> (accessed on 12 June 2021). [[CrossRef](#)] [[PubMed](#)]
29. Moher, D.; Liberati, A.; Tetzlaff, J.; Altman, D.G.; PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med.* **2009**, *6*, e1000097. [[CrossRef](#)]
30. The World Bank. The World Bank. World Bank Country and Lending Groups. Available online: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups> (accessed on 12 June 2021).
31. Higgins, J.P.T.; Altman, D.G.; Sterne, J.A.C.; on behalf of the Cochrane Statistical Methods Group and the Cochrane Bias Methods Group. 8.5 The Cochrane Collaboration’s tool for assessing risk of bias. In *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [Updated March 2011]*; Higgins, J.P.T., Green, S., Eds.; The Cochrane Collaboration: London, UK, 2011. Available online: <http://handbook-5-1.cochrane.org/> (accessed on 15 August 2020).
32. Cochrane Effective Practice and Organisation of Care (EPOC). EPOC Resources for Review Authors. 2017. Available online: <http://epoc.cochrane.org/epoc-resources-review-authors> (accessed on 12 June 2020).
33. Dancy, B.L.; Jere, D.L.; Kachingwe, S.I.; Kaponda, C.P.; Norr, J.L.; Norr, K.F. HIV Risk Reduction Intervention for Rural Adolescents in Malawi. *J. HIV AIDS Soc. Serv.* **2014**, *13*, 271–291. [[CrossRef](#)]
34. Dupas, P. Do teenagers respond to HIV risk information? Evidence from a field experiment in Kenya. *Am. Econ. J. Appl. Econ.* **2011**, *3*, 1–34. Available online: <https://www.nber.org/papers/w14707> (accessed on 12 June 2021). [[CrossRef](#)]
35. Erulkar, A.S.; Ettyang, L.I.; Onoka, C.; Nyagah, F.K.; Muyonga, A. Behavior change evaluation of a culturally consistent reproductive health program for young Kenyans. *Int. Fam. Plan. Perspect.* **2004**, *30*, 58–67. [[CrossRef](#)] [[PubMed](#)]
36. Klepp, K.I.; Ndeki, S.S.; Leshabari, M.T.; Hannan, P.J.; Lyimo, B.A. AIDS education in Tanzania: Promoting risk reduction among primary school children. *Am. J. Public Health* **1997**, *87*, 1931–1936. [[CrossRef](#)]
37. Lightfoot, M.A.; Kasirye, R.; Comulada, W.S.; Rotheram-Borus, M.J. Efficacy of a culturally adapted intervention for youth living with HIV in Uganda. *Prev. Sci.* **2007**, *8*, 271–273. [[CrossRef](#)]
38. Maro, C.N.; Roberts, G.C.; Sørensen, M. Using sport to promote HIV/AIDS education for at-risk youths: An intervention using peer coaches in football. *Scand. J. Med. Sci. Sports* **2009**, *19*, 129–141. [[CrossRef](#)]
39. Mmbaga, E.J.; Kajula, L.; Aarø, L.E.; Kilonzo, M.; Wubs, A.G.; Eggers, S.M.; de Vries, H.; Kaaya, S. Effect of the PREPARE intervention on sexual initiation and condom use among adolescents aged 12–14: A cluster randomised controlled trial in Dar es Salaam, Tanzania. *BMC Public Health* **2017**, *17*, 322. [[CrossRef](#)]

40. Njue, C.; Voeten, H.A.C.M.; Ohuma, E.; Looman, C.; Habbema, D.F.; Askew, I. Findings of an evaluation of community and school-based reproductive health and HIV prevention programs in Kenya. *Afr. Pop. Stud.* **2015**, *29*, 1934–1953. [[CrossRef](#)]
41. Stark, L.; Asghar, K.; Seff, I.; Yu, G.; Tesfay Gessesse, T.; Ward, L.; Bayse, A.A.; Neiman, A.; Falb, K.L. Preventing violence against refugee adolescent girls: Findings from a cluster randomised controlled trial in Ethiopia. *BMJ Glob. Health* **2018**, *3*, e000825. [[CrossRef](#)]
42. Shuey, D.A.; Babishangire, B.B.; Omiat, S.; Bagarukayo, H. Increased sexual abstinence among in-school adolescents as a result of school health education in Soroti district, Uganda. *Health Educ. Res.* **1999**, *14*, 411–419. [[CrossRef](#)]
43. Ross, D.A.; Changalucha, J.; Obasi, A.I.; Todd, J.; Plummer, M.L.; Cleophas-Mazige, B.; Anemona, A.; Everett, D.; Weiss, H.A.; Mabey, D.C.; et al. Biological and behavioural impact of an adolescent sexual health intervention in Tanzania: A community-randomized trial. *AIDS* **2007**, *21*, 1943–1955. [[CrossRef](#)]
44. Ybarra, M.L.; Bull, S.S.; Prescott, T.L.; Korchmaros, J.D.; Bangsberg, D.R.; Kiwanuka, J.P. Adolescent abstinence and unprotected sex in CyberSenga, an Internet-based HIV prevention program: Randomized clinical trial of efficacy. *PLoS ONE* **2013**, *8*, e70083. [[CrossRef](#)]
45. Ybarra, M.L.; Korchmaros, J.D.; Prescott, T.L.; Birungi, R. A Randomized Controlled Trial to Increase HIV Preventive Information, Motivation, and Behavioral Skills in Ugandan Adolescents. *Ann. Behav. Med.* **2015**, *49*, 473–485. [[CrossRef](#)] [[PubMed](#)]
46. Bell, C.C.; Bhana, A.; Petersen, I.; McKay, M.M.; Gibbons, R.; Bannon, W.; Amatya, A. Building protective factors to offset sexually risky behaviors among black youths: A randomized control trial. *J. Natl. Med. Assoc.* **2008**, *100*, 936–944. [[CrossRef](#)]
47. Burnett, S.M.; Weaver, M.R.; Mody-Pan, P.N.; Thomas, L.A.; Mar, C.M. Evaluation of an intervention to increase human immunodeficiency virus testing among youth in Manzini, Swaziland: A randomized control trial. *J. Adolesc. Health* **2011**, *48*, 507–513. [[CrossRef](#)] [[PubMed](#)]
48. Cowan, F.M.; Pascoe, S.J.; Langhaug, L.F.; Mavhu, W.; Chidiya, S.; Jaffar, S.; Mbizvo, M.T.; Stephenson, J.M.; Johnson, A.M.; Power, R.M.; et al. The Regai Dzive Shiri project: Results of a randomized trial of an HIV prevention intervention for youth. *AIDS* **2010**, *24*, 2541–2552. [[CrossRef](#)]
49. Jemmott, J.B.; Jemmott, L.S.; O’Leary, A.; Ngwane, Z.; Icard, L.D.; Bellamy, S.L.; Jones, S.F.; Landis, J.R.; Heeren, G.A.; Tyler, J.C.; et al. School-based randomized controlled trial of an HIV/STD risk-reduction intervention for South African adolescents. *Arch. Pediatr. Adolesc. Med.* **2010**, *164*, 923–929. [[CrossRef](#)]
50. Jewkes, R.; Nduna, M.; Levin, J.; Jama, N.; Dunkle, K.; Khuzwayo, N.; Koss, M.; Puren, A.; Wood, K.; Duvvury, N. A cluster randomized-controlled trial to determine the effectiveness of Stepping Stones in preventing HIV infections and promoting safer sexual behaviour amongst youth in the rural Eastern Cape, South Africa: Trial design, methods and baseline findings. *Trop. Med. Int. Health* **2006**, *11*, 3–16. [[CrossRef](#)]
51. Kim, Y.M.; Kols, A.; Nyakauru, R.; Marangwanda, C.; Chibatamoto, P. Promoting sexual responsibility among young people in zimbabwe. *Int. Fam. Plan. Perspect.* **2001**, *27*, 11–19. [[CrossRef](#)]
52. Mason-Jones, A.J.; Mathews, C.; Flisher, A.J. Can peer education make a difference? Evaluation of a South African adolescent peer education program to promote sexual and reproductive health. *AIDS Behav.* **2011**, *15*, 1605–1611. [[CrossRef](#)]
53. Mathews, C.; Aaro, L.E.; Grimsrud, A.; Flisher, A.J.; Kaaya, S.; Onya, H.; Schaalma, H.; Wubs, A.; Mukoma, W.; Klepp, K.-I. Effects of the SATZ teacher-led school HIV prevention programmes on adolescent sexual behaviour: Cluster randomised controlled trials in three sub-Saharan African sites. *Int. Health* **2012**, *4*, 111–122. [[CrossRef](#)]
54. Meekers, D. The effectiveness of targeted social marketing to promote adolescent reproductive health: The case of Soweto, South Africa. *J. HIV AIDS Prev. Child. Youth* **2000**, *3*, 73–92. [[CrossRef](#)]
55. Aderibigbe, S.; Araoye, M. Effect of health education on sexual behaviour of students of public secondary schools in Ilorin, Nigeria. *Eur. J. Sci Res.* **2008**, *24*, 33–41.
56. Aninanya, G.A.; Debpuur, C.Y.; Awine, T.; Williams, J.E.; Hodgson, A.; Howard, N. Effects of an adolescent sexual and reproductive health intervention on health service usage by young people in northern Ghana: A community-randomised trial. *PLoS ONE* **2015**, *10*, e0125267. [[CrossRef](#)]
57. Brieger, W.R.; Delano, G.E.; Lane, C.G.; Oladepo, O.; Oyediran, K.A. West African youth initiative: Outcome of a reproductive health education program. *J. Adolesc. Health* **2001**, *29*, 436–446. [[CrossRef](#)]
58. Dunbar, M.S.; Kang Dufour, M.S.; Lambdin, B.; Mudekunye-Mahaka, I.; Nhamo, D.; Padian, N.S. The SHAZI! project: Results from a pilot randomized trial of a structural intervention to prevent HIV among adolescent women in Zimbabwe. *PLoS ONE* **2014**, *9*, e113621. [[CrossRef](#)]
59. Esere, M.O. Effect of Sex Education Programme on at-risk sexual behaviour of school-going adolescents in Ilorin, Nigeria. *Afr. Health Sci.* **2008**, *8*, 120–125. Available online: <https://pubmed.ncbi.nlm.nih.gov/19357762/> (accessed on 12 June 2021).
60. Okonofua, F.E.; Coplan, P.; Collins, S.; Oronsaye, F.; Ogunakin, D.; Ogonor, J.T.; Kaufman, J.A.; Heggenhougen, K. Impact of an intervention to improve treatment-seeking behavior and prevent sexually transmitted diseases among Nigerian youths. *Int. J. Infect. Dis* **2003**, *7*, 61–73. [[CrossRef](#)]
61. Rokicki, S.; Cohen, J.; Salomon, J.A.; Fink, G. Impact of a Text-Messaging Program on Adolescent Reproductive Health: A Cluster-Randomized Trial in Ghana. *Am. J. Public Health* **2017**, *107*, 298–305. [[CrossRef](#)]
62. Agha, S. An evaluation of the effectiveness of a peer sexual health intervention among secondary-school students in Zambia. *AIDS Educ. Prev.* **2002**, *14*, 269–281. [[CrossRef](#)]

63. Austrian, K.; Soler-Hampejsek, E.; Behrman, J.R.; Digitale, J.; Jackson Hachonda, N.; Bweupe, M.; Hewett, P.C. The impact of the Adolescent Girls Empowerment Program (AGEP) on short and long term social, economic, education and fertility outcomes: A cluster randomized controlled trial in Zambia. *BMC Public Health* **2020**, *20*, 349. [[CrossRef](#)]
64. Speizer, I.S.; Tambashe, B.O.; Tegang, S.P. An evaluation of the “Entre Nous Jeunes” peer-educator program for adolescents in Cameroon. *Stud. Fam. Plann.* **2001**, *32*, 339–351. [[CrossRef](#)]
65. Cho, H.; Hallfors, D.D.; Mbai, I.I.; Itindi, J.; Milimo, B.W.; Halpern, C.T.; Iritani, B.J. Keeping adolescent orphans in school to prevent human immunodeficiency virus infection: Evidence from a randomized controlled trial in Kenya. *J. Adolesc. Health* **2011**, *48*, 523–526. [[CrossRef](#)]
66. Hallfors, D.D.; Cho, H.; Hartman, S.; Mbai, I.; Ouma, C.A.; Halpern, C.T. Process Evaluation of a Clinical Trial to Test School Support as HIV Prevention Among Orphaned Adolescents in Western Kenya. *Prev. Sci.* **2017**, *18*, 955–963. [[CrossRef](#)]
67. Hallfors, D.; Cho, H.; Rusakaniko, S.; Iritani, B.; Mapfumo, J.; Halpern, C. Supporting adolescent orphan girls to stay in school as HIV risk prevention: Evidence from a randomized controlled trial in Zimbabwe. *Am. J. Public Health* **2011**, *101*, 1082–1088. [[CrossRef](#)] [[PubMed](#)]
68. Kranzer, K.; Simms, V.; Bandason, T.; Dauya, E.; McHugh, G.; Munyati, S.; Chonzi, P.; Dakshina, S.; Mujuru, H.; Weiss, H.A.; et al. Economic incentives for HIV testing by adolescents in Zimbabwe: A randomised controlled trial. *Lancet HIV* **2018**, *5*, e79–e86. [[CrossRef](#)]
69. Phillips-Howard, P.A.; Nyothach, E.; Ter Kuile, F.O.; Omoto, J.; Wang, D.; Zeh, C.; Onyango, C.; Mason, L.; Alexander, K.T.; Odhiambo, F.O.; et al. Menstrual cups and sanitary pads to reduce school attrition, and sexually transmitted and reproductive tract infections: A cluster randomised controlled feasibility study in rural Western Kenya. *BMJ Open* **2016**, *6*, e013229. [[CrossRef](#)]
70. Darabi, F.; Yaseri, M.; Kaveh, M.H.; Khalajabadi Farahani, F.; Majlessi, F.; Shojaeizadeh, D. The Effect of a Theory of Planned Behavior-based Educational Intervention on Sexual and Reproductive Health in Iranian Adolescent Girls: A Randomized Controlled Trial. *J. Res. Health Sci.* **2017**, *17*, e00400. [[PubMed](#)]
71. Mon, M.; Liabsuetrakul, T.; McNeil, E.B.; Htut, K. Mindfulness-integrated reproductive health package for adolescents with parental HIV infection: A group-randomized controlled trial. *Vulnerable Child. Youth Stud.* **2017**, *12*, 147–159. [[CrossRef](#)]
72. Parwej, S.; Kumar, R.; Walia, I.; Aggarwal, A.K. Reproductive health education intervention trial. *Indian J. Pediatr.* **2005**, *72*, 287–291. [[CrossRef](#)] [[PubMed](#)]
73. Naved, R.T.; Mamun, M.A.; Mourin, S.A.; Parvin, K. A cluster randomized controlled trial to assess the impact of SAFE on spousal violence against women and girls in slums of Dhaka, Bangladesh. *PLoS ONE* **2018**, *13*, e0198926. [[CrossRef](#)]
74. Lou, C.; Wang, B.; Shen, Y.; Gao, E.S. Effects of a Community-based Sex Education and Reproductive Health Service Program on Contraceptive Use of Unmarried Youths in Shanghai. *J. Adolesc. Health* **2004**, *34*, 433–440. [[CrossRef](#)]
75. Acharya, D.; Thomas, M.; Cann, R. Evaluating school-based sexual health education programme in nepal: An outcome from a randomised controlled trial. *Int. J. Educ. Res.* **2017**, *82*, 147–158. [[CrossRef](#)]
76. Aplasca, M.R.; Siegel, D.; Mandel, J.S.; Santana-Arciaga, R.T.; Paul, J.; Hudes, E.S.; Monzon, O.T.; Hearst, N. Results of a model AIDS prevention program for high school students in the Philippines. *AIDS* **1995**, *9* (Suppl. 1), S7–S13. [[PubMed](#)]
77. Cartagena, R.G.; Veugelers, P.J.; Kipp, W.; Magigav, K.; Laing, L.M. Effectiveness of an HIV prevention program for secondary school students in Mongolia. *J. Adolesc. Health* **2006**, *39*, 925.e9–925.e16. [[CrossRef](#)] [[PubMed](#)]
78. Zhu, J.L.; Zhang, W.H.; Cheng, Y.; Xu, J.; Xu, X.; Gibson, D.; Støvring, H.; Claeys, P.; Temmerman, M. Impact of post-abortion family planning services on contraceptive use and abortion rate among young women in China: A cluster randomised trial. *Eur. J. Contracept. Reprod. Health Care* **2009**, *14*, 46–54. [[CrossRef](#)]
79. Kaufman, Z.A.; Welsch, R.L.; Erickson, J.D.; Craig, S.; Adams, L.V.; Ross, D.A. Effectiveness of a sports-based HIV prevention intervention in the Dominican Republic: A quasi-experimental study. *AIDS Care* **2012**, *24*, 377–385. [[CrossRef](#)] [[PubMed](#)]
80. Walker, D.; Gutierrez, J.P.; Torres, P.; Bertozzi, S.M. HIV prevention in Mexican schools: Prospective randomised evaluation of intervention. *BMJ* **2006**, *332*, 1189–1194. [[CrossRef](#)] [[PubMed](#)]
81. Kinsler, J.; Sneed, C.D.; Morisky, D.E.; Ang, A. Evaluation of a school-based intervention for HIV/AIDS prevention among Belizean adolescents. *Health Educ. Res.* **2004**, *19*, 730–738. [[CrossRef](#)]
82. Gong, J.; Stanton, B.; Lunn, S.; Deveaux, L.; Li, X.; Marshall, S.; Brathwaite, N.V.; Cottrell, L.; Harris, C.; Chen, X. Effects through 24 months of an HIV/AIDS prevention intervention program based on protection motivation theory among preadolescents in the Bahamas. *Pediatrics* **2009**, *123*, e917–e928. [[CrossRef](#)]
83. Chen, X.; Lunn, S.; Deveaux, L.; Li, X.; Brathwaite, N.; Cottrell, L.; Stanton, B. A cluster randomized controlled trial of an adolescent HIV prevention program among Bahamian youth: Effect at 12 months post-intervention. *AIDS Behav.* **2009**, *13*, 499–508. [[CrossRef](#)]
84. Deveaux, L.; Stanton, B.; Lunn, S.; Cottrell, L.; Yu, S.; Brathwaite, N.; Li, X.; Liu, H.; Marshall, S.; Harris, C. Reduction in human immunodeficiency virus risk among youth in developing countries. *Arch. Pediatr. Adolesc. Med.* **2007**, *161*, 1130–1139. [[CrossRef](#)] [[PubMed](#)]
85. Wang, B.; Stanton, B.; Deveaux, L.; Li, X.; Koci, V.; Lunn, S. The impact of parent involvement in an effective adolescent risk reduction intervention on sexual risk communication and adolescent outcomes. *AIDS Educ. Prev.* **2014**, *26*, 500–520. [[CrossRef](#)]
86. Guse, K.; Levine, D.; Martins, S.; Lira, A.; Gaarde, J.; Westmorland, W.; Gilliam, M. Interventions using new digital media to improve adolescent sexual health: A systematic review. *J. Adolesc. Health* **2012**, *51*, 535–543. [[CrossRef](#)]

87. Feroz, A.S.; Ali, N.A.; Khoja, A.; Asad, A.; Saleem, S. Using mobile phones to improve young people sexual and reproductive health in low and middle-income countries: A systematic review to identify barriers, facilitators, and range of mHealth solutions. *Repro. Health* **2021**, *18*, 9. [[CrossRef](#)]
88. Wekesah, F.M.; Mbada, C.E.; Muula, A.S.; Kabiru, C.W.; Muthuri, S.K.; Izugbara, C.O. Effective non-drug interventions for improving outcomes and quality of maternal health care in sub-Saharan Africa: A systematic review. *Syst. Rev.* **2016**, *5*, 137. [[CrossRef](#)] [[PubMed](#)]
89. Huber, D. Postabortion Care and the Voluntary Family Planning Component: Expanding Contraceptive Choices and Service Options. *Glob. Health Sci. Pract.* **2019**, *7* (Suppl. 2), S207–S210. [[CrossRef](#)]
90. High Impact Practices in Family Planning. *Postabortion Family Planning: Strengthening the Family Planning Component of Postabortion Care*; USAID: Washington, DC, USA, 2012.
91. United Nations Population Fund. *Girlhood, not motherhood*. In *Preventing Adolescent Pregnancy*; United Nations Population Fund: New York, NY, USA, 2015.
92. Mohr, R.; Carbajal, J.; Sharma, B.B. The influence of educational attainment on teenage pregnancy in low-income countries: A systematic literature review. *J. Soc. Work Glob. Community* **2019**, *17*, 4. [[CrossRef](#)]
93. Van Eijk, A.M.; Zulaika, G.; Lenchner, M.; Mason, L.; Sivakami, M.; Nyothach, E.; Unger, H.; Laserson, K.; Phillips-Howard, P.A. Menstrual cup use, leakage, acceptability, safety, and availability: A systematic review and meta-analysis. *Lancet Public Health* **2019**, *4*, e376–e393. [[CrossRef](#)]