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Use of contraceptives, empowerment and agency of adolescent girls and young women: a systematic review and meta-analysis

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ABSTRACT

Introduction The evidence on adolescent empowerment, which involves access to personal and material resources for reproductive autonomy and economic equity, is limited. This systematic review assesses the use of contraceptives in empowering and strengthening the agency and vice versa among adolescents and young women.

Methods We ran the searches in six electronic databases: Cochrane Database of Systematic Reviews (CDSR) and the Cochrane Central Register of Controlled Trials (CENTRAL), The Campbell Library, MEDLINE (PubMed), EMBASE, Cumulated Index to Nursing and Allied Health Literature (CINAHL) and Web of Science. The methodological quality of studies was assessed using ROBINS-I and ROB-II tools as appropriate. Meta-analysis was performed using Review Manager 5.4.

Results Forty studies that assessed the impact of empowerment on contraceptive use were included. Of these, 14 were non-randomised studies for intervention (NRSIs), and the remaining 26 were randomised controlled trials (RCTs). The results from RCTs show a significant effect of the sexual and reproductive health empowerment in increasing ever use of contraception (RR 1.22; 95% CI 1.02, 1.45; n=9; I^2=77%; GRADE: Very Low), and insignificant effect on unprotected sex (RR 0.97; 95% CI 0.74, 1.26; n=5; I^2=86%; GRADE: Very Low) and adolescent pregnancy (RR 1.07; 95% CI 0.61, 1.87; n=3; I^2=36%; GRADE: Very Low). None of the studies assessed impact of contraceptive use on empowerment.

Conclusions Empowerment of adolescents and young women certainly improves contraceptive use in the immediate or short-term period. However, more robust studies with low risk of bias, longer-term outcomes, and impact of contraceptive use on empowerment and agency-strengthening are required. To increase contraceptive use uptake, tailored policies and delivery platforms are necessary for youth in low- and middle-income countries.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Empowerment interventions focusing on sexual and reproductive health positively influence the short-term increase in contraceptive utilisation among adolescents and young women.

WHAT THIS STUDY ADDS

⇒ There is a notable paucity of empirical evidence elucidating the impact of contraceptive utilisation on the empowerment and agency of adolescents and young women. This research gap necessitates further in-depth investigation. This study fills the gap by assessing the impact of empowerment on contraceptive use and vice versa.

INTRODUCTION

Adolescents (aged 10–19 years) and young people (aged 10–24 years) comprise a quarter of the world population, about 1.8 billion, mostly in South Asia, East Asia and Africa.[1] Globally, approximately 15% of adolescent girls give birth before the

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Additional research endeavours are imperative to understand how empowerment is conceptually framed, subjectively perceived and methodologically assessed within diverse cultural milieus. This underscores the critical importance of contextual comprehension in designing and implementing empowerment interventions.

⇒ It is incumbent on the research community to prioritise conducting more robust studies characterised by diminished bias risks. Such investigations should place a particular emphasis on investigating the protracted ramifications of contraceptive utilisation in bolstering the empowerment and agency of adolescents and young women.

age of 18 years,[2] with up to 45%[3] to 48%[4] of these pregnancies being unintended. Unintentional adolescent pregnancies can threaten their community status, increase violence risk, and hinder education, employment and independence opportunities, diminishing their agency.[1]

Empowerment entails women's control over resources, self-reliance, decision-making and choice. This control can be defined in terms of earnings and expenditures, self-reliance, decision-making and choice, with women having the final say in various issues and having the choice to choose their spouse or be consulted.[5] Empowerment can be measured through various methods, including analysing available resources, examining women's decision-making agency and examining achievement. Changes in women's resources can influence their choices due to other factors. Decision-making agency is based on women's responses to roles, while achievement highlights inequalities in decision-making capacity. These measures are triangulated to capture empowerment.[5]

Unintended pregnancies significantly affect adolescent girls and offspring's health, particularly in low- and middle-income countries (LMICs) alike.[6] Maternal conditions, for instance, are the second most common cause of mortality among teenage girls (7 per 100 000 live births) and contribute significantly to the overall burden of disease in this population (disability-adjusted life years (DALYs): 507 per 100 000 population).[2] Globally, lack of access to contraceptives contributes to unintended pregnancies.[7] Unintended pregnancies and lack of empowerment negatively impact health, socioeconomic status and adolescent girls' education, agency, community stigma and increased violence risk.[8] Lack of education and early pregnancy in adolescent girls leads to reduced agency and lower status, particularly unmarried pregnant girls who face an increased risk of violence from partners and male relatives.[9]

Despite significant focus on sexual and reproductive health (SRH) regulations, national efforts should prioritise creating supporting environments for contraceptive use, addressing social barriers.[10 11] Greater attention is needed to foster enabling environments for contraceptive use, as supply-side efforts are insufficient in addressing the "relational and social barriers faced by women and couples".[12] It has been argued that a more insightful understanding of the constraints imposed by structural environments within which women and girls exercise agency is required.[13] Contraceptive use by married or unmarried girls can enhance education, economic opportunities and decision-making abilities. Self-efficacy is crucial in negotiating contraceptive use with partners, representing empowerment.[14 15] Individual empowerment encompasses various domains, such as health, social, economic, political, educational and spiritual, and is not achieved solely through agency, knowledge and an enabling environment.[16]

The complex link between adolescent contraceptive use and empowerment warrants a comprehensive evaluation. Interventions should target both contraceptive use and empowerment outcomes, with long-term monitoring. This systematic review adopts a bidirectional approach, examining how contraceptives empower adolescents and vice versa (figure 1).

METHODOLOGY

The protocol is registered with PROSPERO (CRD42022331194). We have followed the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[17]

Search strategy and databases

The search strategy was guided by the PICOS (Population, Intervention, Comparator, Outcome, Study Designs) provided but was not restricted by the outcome to retain a broader search. No date or language restrictions were applied. The logic grid adapted for all databases is presented in online supplemental appendix 1.

We ran the searches in the following databases: Cochrane Database of Systematic Reviews (CDSR) and the Cochrane Central Register of Controlled Trials (CENTRAL) in the Cochrane Library, the Campbell Library, MEDLINE (PubMed), EMBASE, Cumulated Index to Nursing and Allied Health Literature (CINAHL) and Web of Science. Additionally, we searched for non-indexed, grey literature using organisational websites reported in online supplemental appendix 2. We searched the bibliography of all included studies and relevant systematic reviews to identify any missing papers. The final search date was 20 October 2023.

Eligibility criteria

We included the studies that met the criteria detailed below.

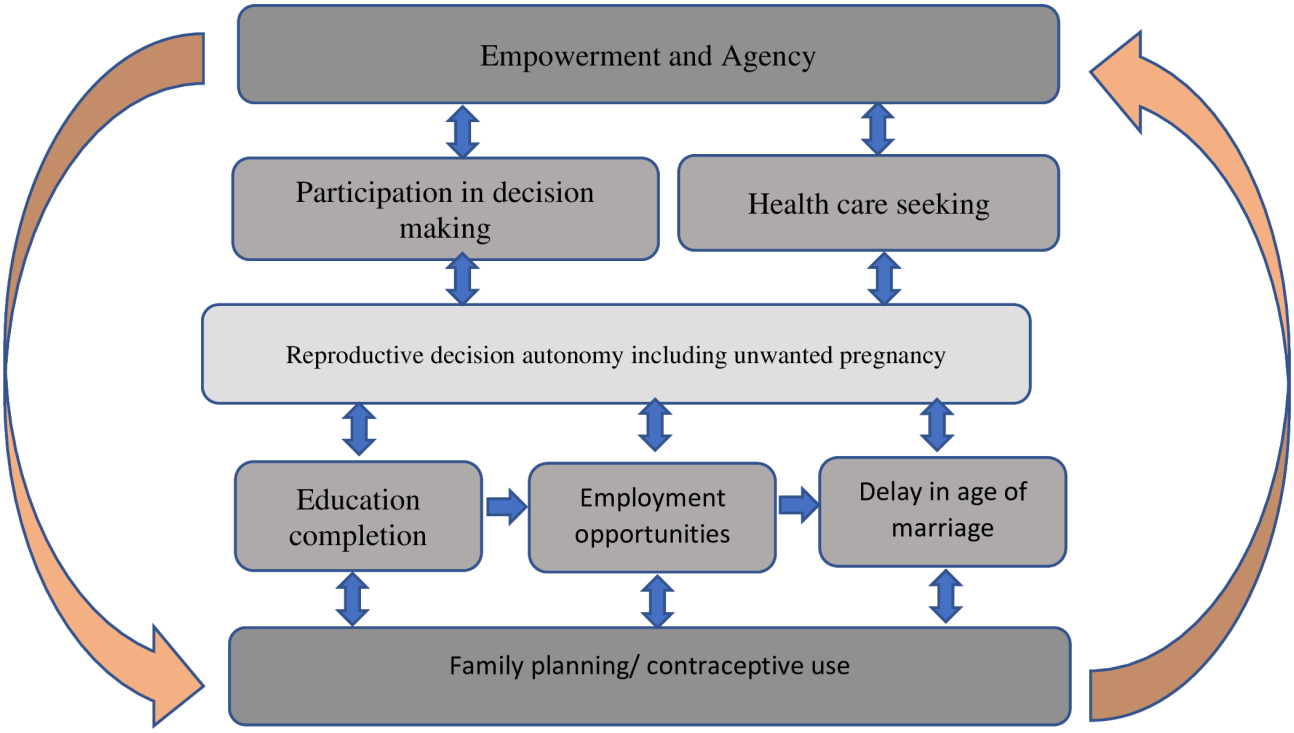


Figure 1 Conceptual framework on family planning and empowerment of adolescents.

Types of studies

The study included experimental studies with a control/comparison arm, including clinical and randomised controlled trials (cRCTs/RCTs), non-randomised studies for intervention (NRSIs), including quasi-randomised controlled trials (q-RCTs), controlled before-after (CBA), and interrupted time series (ITS) studies.[18] Exclusions included observational studies, historic control/comparison arm, cohort, cross-sectional studies, case reports, opinions, editorials, commentaries, letters, conference abstracts and systematic reviews.

Participants

The study included interventions for adolescents and young women aged 10–24 years, including studies with disaggregated data and outcomes for both sexes. Studies with broader age groups included, but not segregated data, were considered separately in subgroups.

Interventions/exposure

We included studies on interventions/strategies that aimed to increase the use of contraceptives or empowerment or agency in adolescents and young women.

The study defined contraceptive use as using modern contraceptives like pills, implants and condoms. Interventions included education, promotion and provision of these contraceptives through community, school and technological platforms, involving teachers, parents, peers and community/outreach workers.[19]

Empowerment, as per our definition, comprises three interconnected dimensions: resources, agency and achievements.[20] Resources encompass material and human assets facilitating choice. Agency involves defining and pursuing goals, employing diverse strategies like bargaining, negotiation, deception, manipulation, subversion and resistance, individually and collectively. Resources and agency combined result in capabilities that drive achievements.

Outcomes

For each outcome, we reported sex-disaggregated data if available, or else the outcomes, including both sex (male and female), were also included. The primary outcomes of the studies assessing the impact of the empowerment on contraceptive use included modern contraceptives, unprotected sex and adolescent/teenage pregnancy. Secondary outcomes included discussions with partners on condom use, refusal to sex, access to healthcare services, gender empowerment and receiving education or income.

The primary outcomes of the study assessing the impact of contraceptive use on empowerment were broadly categorised into educational, employment, social, reproductive autonomy and general autonomy outcomes (details in online supplemental appendix 3).

Data collection and analysis

Selection of studies

Search results were exported into EndNote, de-duplicated and uploaded into Covidence,[21] a web-based systematic review software, for screening. Two review authors independently screened for the potential inclusion of all titles/abstracts/full texts, and discrepancies were resolved by consensus or by contacting a third reviewer.

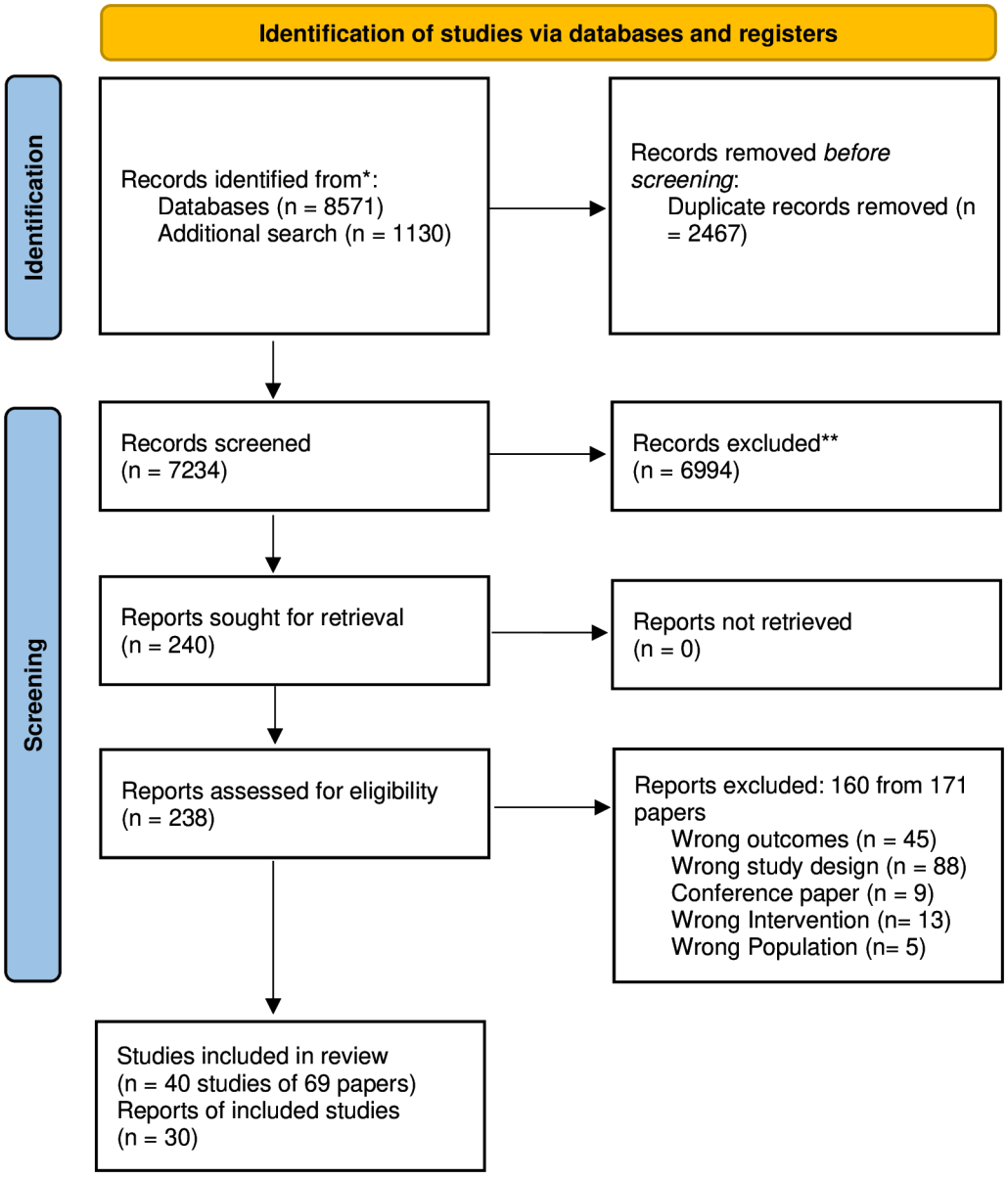


Figure 2 PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram.

Reasons for exclusion were recorded (online supplemental appendix 4). A PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 flow diagram was used to record the numbers (figure 2).

Data extraction

In a standardised data collection form, data were extracted for key variables, including study characteristics and outcomes. Two review authors independently extracted data, and discrepancies were resolved through discussion until consensus had been achieved or by consulting a third reviewer where required. We extracted data on the following study characteristics (table 1):

Assessment of methodological quality

Two authors carried out quality assessments independently using the updated Cochrane Risk of Bias tool, ROB-II,[22] for RCTs/cRCTs and ROBINS-I for NRSIs.[23]

Data synthesis and measure of treatment effect

The review analysed various empowerment strategies and interventions, including different study designs. Subgroup analysis was conducted for study design and other characteristics. A meta-analysis was conducted where two or more studies were pooled. Results were presented as summary risk ratios (RRs) with 95% confidence intervals (95% CIs) for dichotomous outcomes and mean differences (MDs) for continuous outcomes. The statistical method used was generic inverse variance (GIV) to account for clustering. A random-effects model was used to account for expected heterogeneity in study settings, exposures, comparisons, and outcomes across studies.

Table 1 Data extraction of included studies

Publication information	Journal, publication year, study design, total duration of the study, study location, study setting, and withdrawals
Population	Number of participants, mean age, age range, sex (or gender identity), sociodemographic status, and any specific inclusion and exclusion criteria such as participants with chronic illnesses or mental health disorders or with disability including learning disability
Intervention	Intervention description, the composition of the intervention, duration of intervention, a platform for delivery (school-based or community-based, peer-support, mobile health (mhealth), and comparison group description
Control	Standard of care or control
Outcomes	Outcomes specified earlier, time points of outcomes reported, and outcome measures. The outcomes for empowerment effect on contraceptive use included any contraceptive use, unprotected sex and adolescent pregnancy. The outcomes for contraceptive use on empowerment were broadly categorised into educational, employment, social, reproductive autonomy and general autonomy outcomes (for details see Appendix 3)
Study design	Type of study design
Other information	Funding sources, study limitations, and conflicts of interest

Assessment of heterogeneity

The study assessed statistical heterogeneity using I^2 and χ^2 tests, and visually inspecting forest plots. Based on prior clinical knowledge, the study expected clinical and methodological heterogeneity. To explain observed heterogeneity, participants were empowered differently, and subgroup analyses were conducted on primary outcomes. Subgroup analysis involved stratifying groups and testing for differences based on:

- Study design (eg, NRSI, RCT/cRCT)
- Age groups (adolescents, young adults, or a combination of the two)
- Sex (aggregated data for both sexes or separated data for females)
- Platform for delivery (community, school, technology)
- Setting (regions based on WHO regions).

Assessment of reporting biases

For outcomes including more than 10 studies, we created and examined a funnel plot to explore possible small-study and publication biases.

GRADE and evidence profiles

We constructed GRADE Evidence profiles for the use of contraceptive outcomes as per the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) criteria.[24] The study evaluates the risk of bias, directness of evidence, heterogeneity, precision of effect estimates, and publication bias within a study. It rates the certainty of evidence for key outcomes as high, moderate, low, or very low. For non-randomised studies, the quality of evidence was graded based on effect magnitude, dose–response relationship, and plausible confounding factors.

RESULTS

Description of studies

The database search identified 8571 papers, with 1130 additional sources identified. After removing duplicates, 7234 papers were screened for title and abstract. After 240 articles were screened for full texts, 40 studies were eligible for data synthesis. All studies assessed the impact of empowerment on contraceptive use, with no studies examining the impact of contraceptive use on empowerment. Refer to online supplemental appendix 5 for the characteristics of the included studies.

We excluded 160 studies from 171 records at the full-text screening stage. The PRISMA flow diagram outlines the complete set of reasons for exclusion. A complete set of excluded studies with reasons can be found in online supplemental appendix 4.

Of the 40 studies, 14 were NRSIs,[25–38] 11 were RCTs[39–49] and 15 were cRCTs.[50–64] Some 29 studies targeted adolescents[26 27 29 30 32 35–37 40–42 44–48 50–53 55 57–64] and 11 targeted adolescents and young adults.[25 28 31 33 34 38 39 43 49 54 56] Of all the studies, 32 targeted both genders[25–35 37 40–42 44 46 47 50–62 64] and 8 included females only.[36 38 39 43 45 48 49 63] Of the 32 studies targeting both genders, 13 provided segregated data for females.[27 28 33 34 37 41 53 54 56–58 60 64] The studies on empowerment and strengthening of the agency were further classified as SRH empowerment and behavioural skills[25–36 38–45 47 50–61 64] and multidimensional SRH empowerment.[37 46 48 49 62 63] The delivery platforms included school,[25 26 29 32 34 35 37 42 46 50–53 55 57 58 60–62] community,[27 28 30 31 33 36 38 39 41 44 47–49 54 56 59 63 64] digital[43] and clinic.[45] The outcomes reported in the included studies are detailed in table 2.

A detailed quality assessment for NRSIs and RCTs/cRCTs are mentioned in table 3 and figure 3, respectively. Briefly, among the NRSIs, 2 were high-risk of bias,[27 30] 6 studies had some concerns[25 29 34–37] and the remaining 6 were low-risk of bias studies.[26 28 31–33 38] Of the RCTs/cRCTs, 7 studies were rated as high-risk of bias,[40 41 54 60 61 63 65] 12 had some concerns[39 43 44 46–48 50 53 57–59 64] and 7 studies were low-risk of bias.[42 45 49 51 52 55 62]

Impact of empowerment on contraceptive use

SRH empowerment and behavioural skills

A total of 34 studies provided SRH empowerment.[25–36 38–45 47 50–61 64] Of these, 13 were NRSIs,[25–36 38] 8 were RCTs[39–45 47] and 13 were cRCTs.[50–61 64] Some 24 studies were reported on adolescents only[26 27 29 30 32 35 36 40–42 44 45 47 50–53 55 57–61 64] and 10 were reported on adolescents and young

Table 2 Reported outcomes from the included studies

Study ID	Outcomes								
Author and year of publication	**Condom use/ intention to use**	**Use of contraceptives**	**Educational outcomes**	**Employment outcomes**	**Marital outcomes**	**Reproductive choices**	**Participation in decision-making**	**Health outcomes**	**Access to healthcare services**
Sexual and reproductive health empowerment and behavioural skills									
Agha 2004[25]	X								
Hanna 1994[36]		X			X				
Cartagena 2006[26]	X	X			X				
Dancy 2014[27]	X		X			X			
Erulkar 2004[28]	X						X		
Gelfond 2016[29]	X	X						X	
Hagen 2012[30]	X							X	
Jemmott 2010[50]	X								
Kim 2001[31]	X	X					X		X
Kinsler 2004[32]	X								
LaChausse 2016[51]		X						X	
Lou 2004[33]	X	X	X	X	X				X
Mathews 2012[52]	X					X			
Speizer 2001[34]	X	X							
Van Devanter 2002[39]	X								
Walker 2006[53]	X								
O'Donnell 1999[40]	X	X							
Rossem 2000[54]	X	X				X			
Bauman 2021[41]	X					X			
Berglas 2016[55]	X	X				X		X	X
Jewkes 2008[56]	X							X	
Kelsey 2016[42]	X	X						X	
McCarthy 2020[43]	X	X							
Mmbaga 2017[57]	X								
Ross 2007[58]	X							X	X
Scull 2018[59]	X								
Mason-Jones 2011[35]	X								

Continued

Table 2 Continued

Study ID	Outcomes						
McBride 2000[44]	X	X	X				
Aplasca 1995[60]	X						
Deveaux 2007[61]	X				X		
Robinson 2016[47]		X					
Sieving 2011[45]	X	X					
Cowan 2017[64]	X	X				X	X
Daniel 2008[38]	X						
Multidimensional empowerment							
Philliber 2002[37]	X	X		X	X		X
Burnett 2011[46]	X				X		
Dunbar 2014[48]	X	X					
Jennings 2016[62]	X						
Austrian 2020[63]	X		X			X	
Bandiera 2020[49]	X			X			

Table 3 ROBINS-I tool for assessing quality of non-randomised studies for intervention (NRSIs)

Author and year of publication	Confounding	Selection of participants	Intervention classification	Deviations from interventions	Missing data	Measurement of outcome	Selective reporting	Overall bias
Agha 2004	Low risk	Some concerns	Low risk	Low risk	Some concerns	Low risk	Low risk	Some concerns
Dancy 2014	Low risk	Some concerns	Some concerns	Low risk	Some concerns	High risk	Some concerns	High risk
Eruklar 2004	Low risk	Some concerns	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Gelfond 2016	Low risk	Low risk	Low risk	Some concerns	Some concerns	Some concerns	Low risk	Some concerns
Mason-Jones 2011	Some concerns	Some concerns	Low risk	Some concerns	Low risk	Low-risk	Low risk	Some concerns
Hegan 2012	High risk	Low risk	Low risk	Low risk	Some concerns	Low risk	Low risk	High risk
Kim 2001	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Kinsler 2004	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Speizer 2001	Some concerns	Low risk	Low risk	Low risk	Some concerns	Low risk	Low risk	Some concerns
Philliber 2002	Some concerns	Low risk	Low risk	Low risk	Some concerns	Low risk	Low risk	Some concerns
Lou 2004	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Cartagena 2006	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Hanna 1994	Some concerns	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Some concerns
Daniel 2008	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk

Figure 3 ROB-II for assessing quality of clinical and randomised controlled trials (cRCTs/RCTs). D1: Randomisation process; D2: Deviations from the intended interventions; D3: Missing outcome data; D4: Measurement of the outcome; D5: Selection of the reported result.

adults.[25 28 31 33 34 38 39 43 54 56] The studies were conducted in the African region,[25–28 31 34 35 50 52 54 56–58 64] regions of America,[29 30 32 36 39–45 47 51 53 55 59 61] Western Pacific[33 60] and South Asian region.[38]

Randomised controlled trials (RCTs)

Any contraceptive usage

Nine studies reported any contraceptive usage.[39 43 45 52 53 55 56 58 64] The confidence in the effect estimate is limited in showing a significant impact of the intervention in increasing any modern contraceptive use (RR 1.22; 95% CI 1.02, 1.45; n=9; Heterogeneity: χ^2 p=<0.00001; I^2=77%; GRADE: Very Low) (figure 4).

There is uncertainty about the impact of the intervention on the mean number of contraception use[44 51] in the last 1–3 months (MD −0.02; 95% CI −0.03, –0.01; 2 studies; Heterogeneity: χ^2 p=0.58; I^2=0%; GRADE: Very Low). One study reported insignificant use of emergency contraception (RR 1.41; 95% CI 0.95, 2.10).[53]

Unprotected sex

Five studies reported unprotected sex.[40 42 47 50 64] There is uncertainty about the insignificant impact of the intervention in reducing the frequency of unprotected sex (RR 0.97; 95% CI 0.74, 1.26; n=5; Heterogeneity: χ^2 p=<0.00001; I^2=86%; GRADE: Very Low).

Adolescent pregnancy

Three studies reported adolescent pregnancy.[43 55 56] There is uncertainty about the insignificant impact of the intervention on adolescent pregnancy (RR 1.07; 95% CI 0.61, 1.87; n=3; Heterogeneity: χ^2 p=25; I^2=36%; GRADE: Very Low).

Discussion with partners on condom use

One study reported discussion on condom use with partners.[39] There is a probable significant impact of the intervention in increasing discussion with partners on condom use (RR 1.60; 95% CI 1.28, 2.00).

Refuse unsafe sex

Three studies reported refusal of unsafe sex.[39 41 53] The effect estimate showed no impact in refusing unsafe sex (RR 1.00, 95% CI 0.96, 1.04; n=3; Heterogeneity: χ^2 p=0.07; I^2 = 55%).

Accessed to healthcare services

Four studies reported access to healthcare services.[43 55 58 64] The effect estimate showed an insignificant impact of intervention in increasing uptake of healthcare services (RR 1.11; 95% CI 0.88, 1.40; n=4; Heterogeneity: χ^2 p=0.02; I^2 = 66%).

Gender empowerment

One study reported gender empowerment.[64] The results showed an insignificant impact of intervention in increasing gender empowerment (RR 1.17; 95% CI 0.97, 1.42).

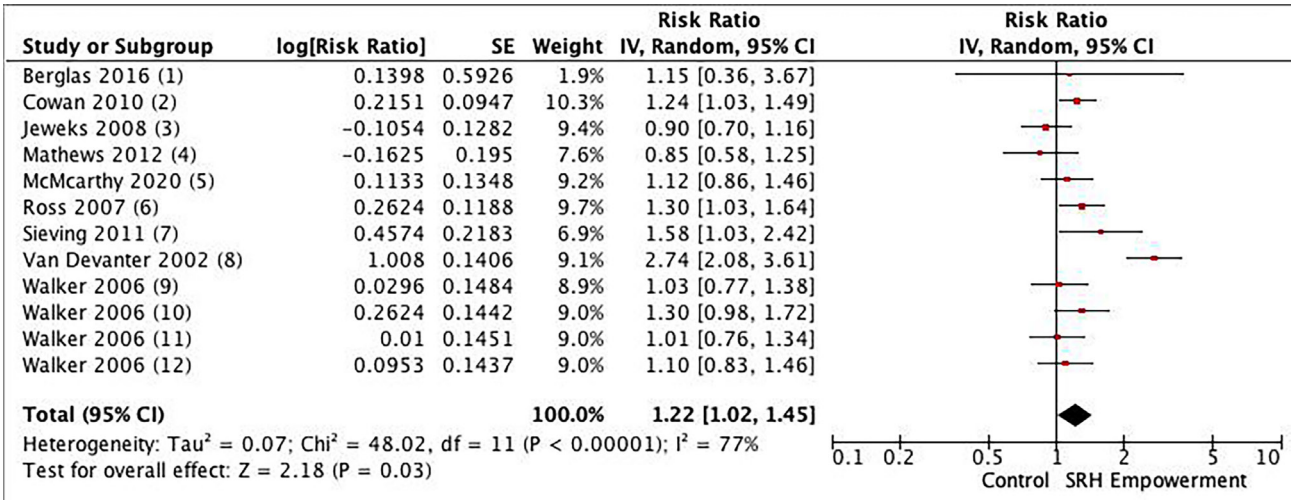
Refer to table 4 for the subgroup analysis of SRH empowerment and behavioural skills for RCTs/cRCTs.

Non-randomised studies for intervention (NRSIs)

Any contraceptive usage

Any contraceptive usage was defined as any modern contraceptive use or ever-used contraceptive.[25–28 30 31 33–35 38] The confidence in the effect estimate is limited in showing a significant impact of the intervention in increasing any modern contraception use (RR 1.14; 95% CI 1.02, 1.27; n=10; Heterogeneity: χ^2 p=<0.00001; I^2=92%; GRADE Certainty: Very low). There was no publication bias as indicated from the funnel plot (figure 5).

Unprotected sex



Footnotes
(1) cRCT; Regions of America Urban; Age 14–15 years; Both genders; School-based; condom use at last sex
(2) cRCT; African region Rural; Mean age 15 years; Females; Community-based; safe sex and condoms
(3) cRCT; African region Rural; Age 16–23 years; Female; community-based; 24 months correct condom use at last sex
(4) cRCT; African region Urban; Age 12–14 years; Both genders; School-based; condom use
(5) RCT; Regions of America Urban; Age 16–24 years; Both genders; Digital-based app; use of effective contraception
(6) cRCT; African Region Rural; Age 14–18 years Female; School-based; used condom during last sex
(7) RCT; Regions of America Urban; Age 13–17 years; Both genders; Clinic-based; condom use
(8) RCT; Regions of America Urban; Age >16 years; Females only; Community-based; ever used female condom
(9) cRCT; Regions of America Urban; Age 15–18 years; females; School-based; condom use at first intercourse; condom group vs...
(10) cRCT; Regions of America Urban; Age 15–18 years; females; School-based; condom use at first intercourse; condom...
(11) cRCT; Regions of America Urban; Age 15–18 years; females; School-based; condom use at last intercourse; condom group vs...
(12) cRCT; Regions of America Urban; Age 15–18 years; females; School-based; condom use at last intercourse; condom...

Figure 4 Sexual and reproductive health empowerment on any contraceptive use.

One study reported unprotected sex.[29] There is uncertainty on the effect estimate showing an insignificant impact of the intervention in reducing unprotected sex (RR 0.70; 95% CI 0.44, 1.12; GRADE Certainty: Very Low).

Adolescent pregnancy

Two studies reported adolescent pregnancies.[29 30] There is uncertainty on the effect estimate showing an insignificant impact of the intervention in reducing adolescent pregnancy (RR 0.39, 95% CI 0.06, 2.64; n=2; Heterogeneity: χ^2 p=0.0005; I^2=92%; GRADE Certainty: Very low).

Joint decision to use contraception

One study reported a joint decision to use contraception.[33] There is moderate confidence in the effect estimate showing a potentially significant impact of the intervention in increasing joint decision to use contraception (RR 1.07; 95% CI 1.00, 1.14; GRADE Certainty: Moderate).

Discussion on condom use

One study reported discussion on condom use.[31] There is uncertainty in the results showing an insignificant impact of the intervention in increasing discussion on condom use (RR 1.48; 95% CI 0.18, 2.54; GRADE Certainty: Very Low).

Access to healthcare services

One study reported access to healthcare services.[31] There is confidence in the results showing a significant impact of the intervention in increasing access to healthcare (RR 3.89; 95% CI 1.90, 7.93; GRADE Certainty: High).

Multidimensional empowerment

A total of six studies provided multidimensional empowerment.[37 46 48 49 62 63] Of these six studies, four were RCTs,[46 48 49 62] one a cRCT,[63] and one an NRSI.[37] Five studies reported on adolescents only,[37 46 48 62 63] and one reported on adolescents and young adults.[49] The studies were conducted in the African region[46 48 49 62 63] and in the regions of America.[37]

Randomised controlled trials (RCTs)

Any contraceptive usage

Three studies provided estimates for any contraceptive usage.[46 48 63] There is uncertainty about the effect of intervention in increasing uptake of contraception (RR 1.10; 95% CI 1.00, 1.20; n=2 studies; Heterogeneity: χ^2 p=0.94; I^2=0%; GRADE Certainty: Very Low).[48 63] The results from another study that reported mean contraceptive usage showed an insignificant difference in contraceptive usage in the intervention and control group (MD 0.03; 95% CI −0.18, 0.24).[46]

Adolescent pregnancy

Table 4 Subgroup analysis of sexual and reproductive health empowerment and behavioural skills for clinical and randomised controlled trials (cRCTs/RCTs)

		Estimate (RR) with 95% CI; Number of studies (n); Heterogeneity: χ^2 p value, I^2					
Subgroup analysis	**Categories**	**Any contraception usage**	**Subgroup difference**	**Unprotected sex**	**Subgroup difference**	**Adolescent pregnancy**	**Subgroup difference**
Age	Adolescent	**1.17 (1.06, 1.29)** n=6; Heterogeneity: χ^2 (p=0.41); I^2 = 3% GRADE Certainty: Moderate	Test for subgroup differences: χ^2 (p=0.20), I^2 = 38.2%	0.97 (0.74, 1.26) n=5; Heterogeneity: χ^2 (p<0.00001); I^2 = 86% GRADE Certainty: Very low	Not applicable	1.09 (0.57, 2.07) n=2; Heterogeneity: χ^2 (p=0.10); I^2 = 62% GRADE Certainty: Very low	Test for subgroup differences: χ^2 (p=0.51), I^2 = 0%
	Adolescent and young adult	**1.55 (1.02, 2.34)** n=3; Heterogeneity: χ^2 (p<0.00001); I^2 = 93% GRADE Certainty: Very low				0.33 (0.01, 10.89) n=1; NA GRADE Certainty: Very low	
Sex	Both sexes	1.13 (0.87, 1.46) n=4; Heterogeneity: χ^2 (p=0.21); I^2 = 33% GRADE Certainty: Low	Test for subgroup differences: χ^2 (p=0.30), I^2 = 6.4%	0.96 (0.67, 1.37) n=4; Heterogeneity: χ^2 (p<0.00001); I^2 = 89% GRADE Certainty: Very low	Test for subgroup differences: χ^2 (p=0.85), I^2 = 0%	0.73 (0.38, 1.39) n=2; Heterogeneity: χ^2 (p=0.65); I^2 = 0% GRADE Certainty: Very low	Test for subgroup differences: χ^2 (p=0.09), I^2 = 65.8%
	Females	**1.36 (1.07, 1.74)** n=5; Heterogeneity: χ^2 (p<0.00001); I^2 = 87% GRADE Certainty: Very low		1.00 (0.85, 1.17) n=1; NA GRADE Certainty: Very low		1.45 (0.92, 2.29) n=1; GRADE Certainty: Low	
Regions	African region	1.09 (0.89, 1.33) n=4; Heterogeneity: χ^2 (p=0.05); I^2 = 61% GRADE Certainty: Very low	Test for subgroup differences: χ^2 (p=0.11), I^2 = 60.3%	0.91 (0.77, 1.09) n=2; Heterogeneity: χ^2 (p=0.21); I^2 = 32% GRADE Certainty: Low	Test for subgroup differences: χ^2 (p=0.64), I^2 = 0%	1.45 (0.92, 2.29) n=1; NA GRADE Certainty: Very low	Test for subgroup differences: χ^2 (p=0.09), I^2 = 65.8%
	Regions of America	**1.44 (1.08, 1.92)** n=5; Heterogeneity: χ^2 (p<0.00001); I^2 = 85% GRADE Certainty: Very low		1.01 (0.70, 1.46) n=3; Heterogeneity: χ^2 (p<0.00001); I^2 = 89% GRADE Certainty: Very low		0.73 (0.38, 1.39) n=2; Heterogeneity: χ^2 (p=0.65); I^2 = 0% GRADE Certainty: Low	

Continued

Table 4 Continued

Subgroup analysis	Categories	Estimate (RR) with 95% CI; Number of studies (n); Heterogeneity: χ^2 p value, I^2					
		Any contraception usage	Subgroup difference	Unprotected sex	Subgroup difference	Adolescent pregnancy	Subgroup difference
Delivery platform	School-based	1.12 (1.00, 1.26) n=4; Heterogeneity: χ^2 (p=0.48); I^2 = 0% GRADE Certainty: Low	Test for subgroup differences: χ^2 (p=0.22), I^2 = 32.4%	0.94 (0.59, 1.50) n=2; Heterogeneity: χ^2 (p=0.01); I^2 = 76% GRADE Certainty: Very low	Test for subgroup differences: χ^2 (p=0.90), I^2 = 0%	1.09 (0.57, 2.07) n=2; Heterogeneity: χ^2 (p=0.10); I^2 = 62% GRADE Certainty: Very low	Test for subgroup differences: χ^2 (p=0.51), I^2 = 0%
	Community-based	**1.72 (1.01, 2.95)** n=3; Heterogeneity: χ^2 (p<0.00001); I^2 = 94% GRADE Certainty: Very low		0.98 (0.72, 1.34) n=3; Heterogeneity: χ^2 (p<0.00001); I^2 = 88% GRADE Certainty: Very low			
	Digital-based	1.12 (0.86, 1.46) n=1; NA GRADE Certainty: Low				0.33 (0.01, 10.89) n=1; NA GRADE Certainty: Very low	
	Clinic-based	**1.58 (1.03, 2.42)** n=1; NA GRADE Certainty: High					

Bold type denotes statistical significance ; It is defined as the confidence interval capturing the null value 1.
CI, confidence interval; MD, mean difference; NA, not available; RR, risk ratio.

Two studies reported adolescent pregnancy.[48 63] There is uncertainty in the effect estimate showing an insignificant impact of the intervention on reducing adolescent pregnancy (RR 0.82; 95%CI 0.62, 1.08; n=2; Heterogeneity: χ^2 p=0.001; I^2=81%; GRADE Certainty: Very Low).

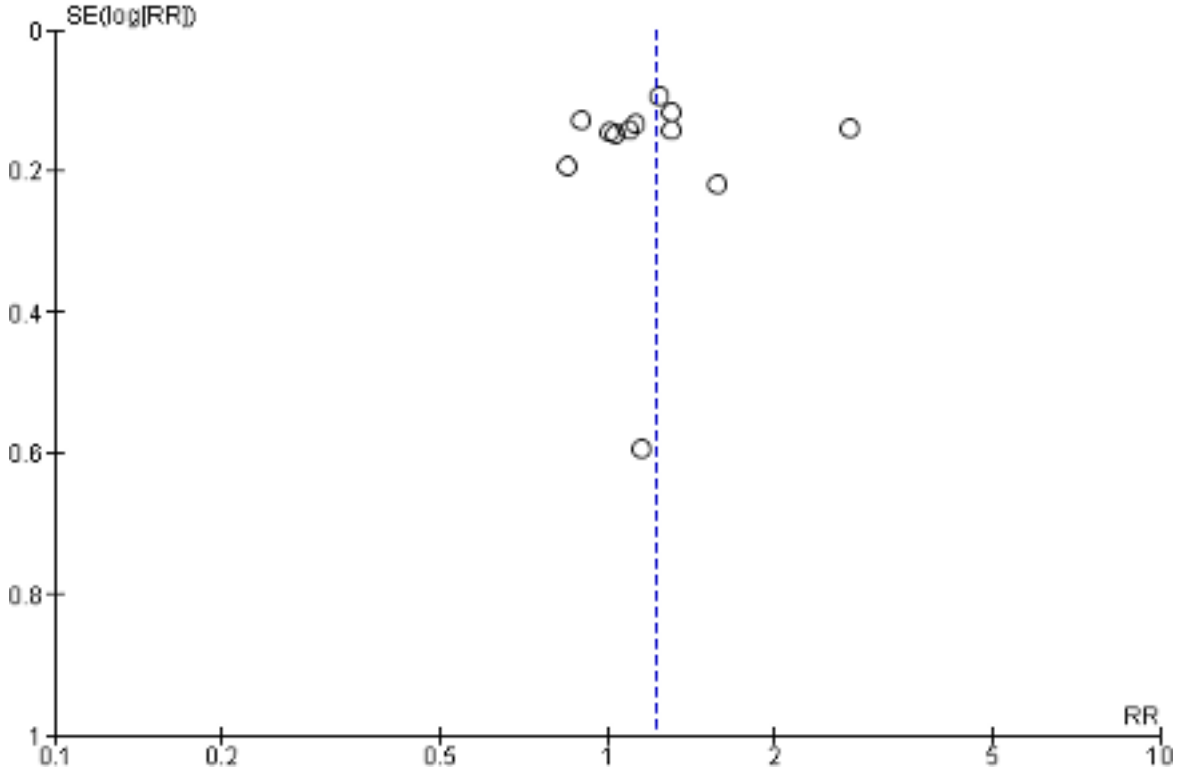


Figure 5 Funnel Plot for Publication Bias of SRH Empowerment Any Contraceptive Usage (NRSI).

Received own income

One study reported receiving income after the intervention.[48] The results showed an insignificant impact of the intervention in increasing own income generation (1.06; 95% CI 0.81, 1.37).

Received education

One study reported receiving education.[63] The results showed an insignificant impact of the intervention on receiving education (RR 0.94; 95% CI 0.89, 1.01).

Non-randomised studies of intervention (NRSIs)

Any contraceptive usage

One study reported any contraceptive usage.[37] There is uncertainty in the results showing an insignificant impact of the intervention on using a condom in the last sex in females only study (RR 1.19; 95% CI 0.97, 1.45; GRADE Certainty: Very Low).

Adolescent pregnancy

One study reported adolescent pregnancy.[37] There is uncertainty in the results showing a significant effect of the intervention on preventing adolescent pregnancy among females (RR 0.48; 95% CI 0.24, 0.98; GRADE Certainty: Very low).

Access to healthcare services

One study reported access to healthcare services.[37] There is uncertainty on the effect estimates showing that females insignificantly accessed healthcare services (RR 1.15; 95% CI 0.96, 1.37; GRADE Certainty: Very Low).

Impact of contraceptive use on empowerment

There were no studies that assessed the impact of contraceptive use on empowerment.

DISCUSSION

This review focuses on studies that assessed the impact of empowerment on contraceptive use. Of 40 studies, 34 provided SRH empowerment with behavioural skills and 6 provided multidimensional empowerment. The pooled estimates showed a significant impact on increasing the use of modern contraceptives and a non-significant reduction in unprotected sex. A significant difference was observed in contraceptive use across different regions and delivery platforms. The intervention also improved communication with partners and combined decision-making on contraceptive use. However, the evidence is limited, and the GRADE certainty of these studies is low and of very low quality. Multidimensional empowerment could potentially improve the overall uptake of modern contraceptives. The low-GRADE certainty is due to high risk of bias, statistical heterogeneity and precision in the studies. Despite these issues, there is suggestive evidence that empowerment may be positively associated with improved contraceptive uptake.

Our findings are consistent with an earlier review that showed a significant impact of SRH empowerment on increasing adolescent knowledge of SRH and the use of contraception.[66 67] A Cochrane review found school-based interventions effectively prevent unintended pregnancies but found inconclusive evidence on contraceptive use and sexually transmitted infection (STI) prevention.[68] Our review included studies that empowered adolescents and young adults at individual or group levels. The literature suggests that group-based interventions are more effective in improving SRH outcomes, such as the prevention of HIV and STIs.[69] Earlier reviews underscored that studies did not report the longer-term outcomes of the use of contraceptives on empowering girls and young women.[70 71] Our review also did not report any long-term impact of empowerment on contraceptive use.

Our review found that empowerment interventions primarily targeted SRH with limited focus on multidimensional empowerment. Community norms play a vital role, but barriers include resource scarcity, monitoring limitations and insufficient government collaboration.[72] Interventions aimed at changing societal norms, building capacity, and financial means are crucial for enhancing contraceptive use among younger populations. Strengthening economic and health domains is integral to empowerment, but only one study targeted both. Economic empowerment has shown beneficial impacts on married adult women.[73]

Empowerment, a concept that differs across cultures and settings, is crucial for understanding its impact on adolescents' use of contraceptives. In an ideal world, cross-country comparisons of empowerment or undertaking qualitative evidence synthesis (QES) are possible with a measure validated in various settings or regions. However, studies have not consistently defined or measured empowerment. Despite this, school-based programmes are effective in empowering adolescents in SRH, including the use of contraceptives.[74 75] However, the literature also suggests that the effectiveness of school-based empowerment is amplified when these are linked to communities.[76 77] Our included studies were also conducted in community-based settings. Community-based SRH empowerment strategies are prioritised over school-based ones, as WHO defines adolescent-friendly services as accessible, acceptable, equitable, appropriate and effective for various youth subpopulations.[78]

This systematic review used a comprehensive search strategy across multiple databases, excluding language and date restrictions. It examined publication bias in outcomes from 10 or more studies. However, potential biases include missing evidence from unpublished studies and the likelihood of publishing studies with statistically significant positive findings. The review also found four potential studies on trial registries, which may be included in future updates.[79–82]

The review explored empowerment's link with contraceptive use in adolescents and young people but lacked evidence on how on contraceptive use affects

empowerment. Multidimensionality of empowerment complicates overall improvement. Most studies focused on Africa and the Americas, suggesting varied perceptions. Cross-region comparisons and studies from regions are needed. Adolescent-focused studies highlight their unique needs. Evidence quality varied, with limitations like insufficient randomisation and self-reported data. Long-term effects of empowerment on contraceptive use remain unclear due to study limitations and a focus on short-term outcomes.

CONCLUSIONS

This review highlights the impact of empowerment on adolescent and young adult contraceptive use, boosting uptake and decision-making. Tailored programmes and policies for LMIC youth are crucial. Rigorous evaluation with consistent measures is vital. Future research should focus on long-term outcomes, agency and achievement-related measures. Increased accessibility to empowerment programmes is crucial for enhancing contraceptive use in resource-limited settings, especially for out-of-school adolescents. Assessing agency outcomes can inform informed decision-making. Further research is necessary in South Asia, the Gulf and Europe.

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REFERENCES

1 UNICEF. Adolescent demographics. 2019. Available: https://data.unicef.org/topic/adolescents/demographics [Accessed 22 Sep 2021].
2 UNICEF. Early childbearing. 2021. Available: https://data.unicef.org/topic/child-health/adolescent-health [Accessed 22 Sep 2021].

3 Bearak J, Popinchalk A, Alkema L, *et al*. Global, regional, and subregional trends in unintended pregnancy and its outcomes from 1990 to 2014: estimates from a Bayesian hierarchical model. *Lancet Glob Health* 2018;6:e380–9.
4 Bearak J, Popinchalk A, Ganatra B, *et al*. Unintended pregnancy and abortion by income, region, and the legal status of abortion: estimates from a comprehensive model for 1990–2019. *Lancet Glob Health* 2020;8:e1152–61.
5 Kabeer N. Resources, agency, achievements: reflections on the measurement of women's Empowermen. *Dev Change* 1999;30:435–64. 10.1111/1467-7660.00125 Available: https://onlinelibrary.wiley.com/toc/14677660/30/3
6 Chandra-Mouli V, Akwara E. Improving access to and use of contraception by adolescents: what progress has been made, what lessons have been learnt, and what are the implications for action. *Best Pract Res Clin Obstet Gynaecol* 2020;66:107–18.
7 Bishwajit G, Tang S, Yaya S, *et al*. Unmet need for contraception and its association with unintended pregnancy in Bangladesh. *BMC Pregnancy Childbirth* 2017;17:186.
8 World Health Organization (WHO). Adolescent pregnancy. 2022. Available: https://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy [Accessed 22 Sep 2023].
9 Radhakrishnan A. Across Africa, many young mothers face education barriers. OCHA Services: reliefweb; 2022. Available: https://reliefweb.int/report/world/across-africa-many-young-mothers-face-education-barriers [Accessed 22 Sep 2023].
10 Santhya KG, Jejeebhoy SJ. Sexual and reproductive health and rights of adolescent girls: evidence from low- and middle-income countries. *Glob Public Health* 2015;10:189–221.
11 Lim SC, Yap YC, Barmania S, *et al*. Priority-setting to integrate sexual and reproductive health into universal health coverage: the case of Malaysia. *Sex Reprod Health Matters* 2020;28:1842153.
12 Skinner J, Hempstone H, Raney L, *et al*. Elevating social and behavior change as an essential component of family planning programs. *Stud Fam Plann* 2021;52:383–93.
13 Margherio C. Centering female agency while investigating contraceptive use: a case study in Agincourt, South Africa. *Int J Equity Health* 2019;18:60.
14 Ahinkorah BO, Hagan JE Jr, Seidu A-A, *et al*. Female adolescents' reproductive health decision-making capacity and contraceptive use in sub-Saharan Africa: what does the future hold *PLoS One* 2020;15:e0235601.
15 Engelbert Bain L, Amu H, Enowbeyang Tarkang E. Barriers and motivators of contraceptive use among young people in sub-Saharan Africa: a systematic review of qualitative studies. *PLoS One* 2021;16:e0252745.
16 Hennink M, Kiiti N, Pillinger M, *et al*. Defining empowerment: perspectives from international development organisations. *Dev Pract* 2012;22:202–15.
17 Page MJ, Moher D, Bossuyt PM, *et al*. PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. *BMJ* 2021;372:n160.
18 EPOC. What study designs should be included in an EPOC review and what should they be called? 2020. Available: https://epoc.cochrane.org/sites/epoc.cochrane.org/files/public/uploads/EPOC%20Study%20Designs%20About.pdf [Accessed 27 Sep 2021].
19 World Health Organization (WHO). Family planning/contraception methods. 2020. Available: https://www.who.int/news-room/fact-sheets/detail/family-planning-contraception [Accessed 27 Sep 2021].
20 Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Change* 1999;30:435–64. 10.1111/1467-7660.00125 Available: https://onlinelibrary.wiley.com/toc/14677660/30/3
21 Covidence systematic review software. V.H.I: Melbourne, Australia. n.d. Available: www.covidence.org
22 Sterne JAC, Savović J, Page MJ, *et al*. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ* 2019;366:l4898.
23 Sterne JA, Hernán MA, Reeves BC, *et al*. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ* 2016;355:i4919.
24 Guyatt GH, Oxman AD, Vist GE, *et al*. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008;336:924–6.
25 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;34:441–52.
26 Cartagena RG, Veugelers PJ, Kipp W, *et al*. Effectiveness of an HIV prevention program for secondary school students in Mongolia. *J Adolesc Health* 2006;39:925.
27 Dancy BL, Jere DL, Kachingwe SI, *et al*. HIV risk reduction intervention for rural adolescents in Malawi. *J HIV AIDS Soc Serv* 2014;13:271–91.
28 Erulkar AS. Nyeri youth health project - Kenya - E&A including sexual health - FP use - both gender and females only results reported. *Int Fam Plan Perspect* 2004. 30(2):58-67. doi:10.1363/ifpp.30.58.04.
29 Gelfond J, Dierschke N, Lowe D, *et al*. Preventing pregnancy in high school students: observations from a 3-year longitudinal, quasi-experimental study. *Am J Public Health* 2016;106:S97–102.
30 Hagen JW, Skenandore AH, Scow BM, *et al*. Adolescent pregnancy prevention in a rural native American community. J Fam Soc Work 2012;15:19–33.
31 Kim YM, Kols A, Nyakauru R, *et al*. Promoting sexual responsibility among young people in Zimbabwe. Int Fam Plan Perspect 2001;27:11.
32 Kinsler J, Sneed CD, Morisky DE, *et al*. Evaluation of a school-based intervention for HIV/AIDS prevention among Belizean adolescents. *Health Educ Res* 2004;19:730–8.
33 Lou C-H, Wang B, Shen Y, *et al*. Effects of a community-based sex education and reproductive health service program on contraceptive use of unmarried youths in Shanghai. *J Adolesc Health* 2004;34:433–40.
34 Speizer IS, Tambashe BO, Tegang SP. An evaluation of the "Entre Nous Jeunes" peer-educator program for adolescents in Cameroon; 2001. 32(4):339-51. doi: 10.1111/j.1728--4465.2001.00339.x..
35 Mason-Jones AJ, Mathews C, Flisher AJ. Can peer education make a difference? Evaluation of a South African adolescent peer education program to promote sexual and reproductive health. *AIDS Behav* 2011;15:1605–11.
36 Hanna KM. The relationship between female adolescents' oral contraceptive adherence and autonomy. *Issues Compr Pediatr Nurs* 1994;17:137–45.
37 Philliber S, Kaye JQ, Herrling S, West E. Preventing pregnancy and improving health care access among teenagers: an evaluation of the children's aid society-Carrera program. *Perspective on Sexual and Reproductive Health* 2002;34(5):244-251.

38 Daniel EE, Masilamani R, Rahman M. The effect of community-based reproductive health communication interventions on contraceptive use amoung young married couples in Bihar, India. *IFPP* 2008;34:189–97.
39 Van Devanter N, Gonzales V, Merzel C, *et al*. Effect of an STD/HIV behavioral intervention on women's use of the female condom. *Am J Public Health* 2002;92:109–15.
40 O'Donnell L, Stueve A, San Doval A, *et al*. The effectiveness of the Reach for Health Community Youth Service Learning Program in reducing early and unprotected sex among urban middle school students. *Am J Public Health* 1999;89:176–81.
41 Bauman LJ, Watnick D, Silver EJ, *et al*. Reducing HIV/STI risk among adolescents aged 12 to 14 years: a randomized controlled trial of project prepared. *Prev Sci* 2021;22:1023–35.
42 Kelsey M, Walker JT, Layzer J, *et al*. Replicating the safer sex intervention: 9-month impact findings of a randomized controlled trial. *Am J Public Health* 2016;106:S53–9.
43 McCarthy OL, Aliaga C, Torrico Palacios ME, *et al*. An intervention delivered by mobile phone instant messaging to increase acceptability and use of effective contraception among young women in Bolivia: randomized controlled trial. *J Med Internet Res* 2020;22:e14073.
44 McBride D, Gienapp A. Using randomized designs to evaluate client-centered programs to prevent adolescent pregnancy. *Fam Plann Perspect* 2000;32:227:227–35.:.
45 Sieving RE, Resnick MD, Garwick AW, *et al*. A clinic-based, youth development approach to teen pregnancy prevention. *Am J Health Behav* 2011;35:346–58.
46 Burnett SM, Weaver MR, Mody-Pan PN, *et al*. Evaluation of an intervention to increase human immunodeficiency virus testing among youth in Manzini, Swaziland: a randomized control trial. *J Adolesc Health* 2011;48:507–13.
47 Robinson WT, Seibold-Simpson SM, Crean HF, *et al*. Randomized trials of the Teen Outreach Program in Louisiana and Rochester, New York. *Am J Public Health* 2016;106:S39–44.
48 Dunbar MS, DufourMSK, Lambdin B, *et al*. The SHAZ! project: results from a pilot randomized trial of a structural intervention to prevent HIV among adolescent women in Zimbabwe. *Plos One* 2014;9.
49 Bandiera O. Women's empowerment in action: evidence from a randomized control trial in Africa. *Am Econ J Appl Econ* 2020;12:210–59.
50 Jemmott JB, Jemmott LS, O'Leary A, *et al*. School-based randomized controlled trial of an HIV/STD risk-reduction intervention for South African adolescents. *Arch Pediatr Adolesc Med* 2010;164:923–9.
51 LaChausse RG. A clustered randomized controlled trial of the positive prevention PLUS adolescent pregnancy prevention program. *Am J Public Health* 2016;106:S91–6.
52 Mathews C, Aarø LE, Grimsrud A, *et al*. 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;4:111–22.
53 Walker D, Gutierrez JP, Torres P, *et al*. HIV prevention in Mexican schools: prospective randomised evaluation of intervention. *BMJ* 2006;332:1189–94.
54 Rossem RV, Meekers D. Reduction in human immunodeficiency virus risk among youth in developing countries. *AIDS Educ Perspect* 2000;12:383–404.
55 Berglas NF, Jerman P, Rohrbach LA, *et al*. An implementation and outcome evaluation of a multicomponent sexuality education programme for high school students. *Sex Educ* 2016;16:549–67.
56 Jewkes R, Nduna M, Levin J, *et al*. Impact of stepping stones on incidence of HIV and HSV-2 and sexual behaviour in rural South Africa: cluster randomised controlled trial. *BMJ* 2008;337:a506.
57 Mmbaga EJ, Kajula L, Aarø LE, *et al*. 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.
58 Ross DA, Changalucha J, Obasi AI, *et al*. Biological and behavioural impact of an adolescent sexual health intervention in Tanzania: a community-randomized trial. *AIDS* 2007;21:1943–55.
59 Scull TM, Kupersmidt JB, Malik CV, *et al*. Examining the efficacy of an mHealth media literacy education programme for sexual health promotion in older adolescents attending community college. *J Am Coll Health* 2018;66:165–77.
60 Aplasca MR, Siegel D, Mandel JS, *et al*. Results of a model AIDS prevention program for high school students in the Philippines. *AIDS* 1995;9 Suppl 1:S7–13.
61 Deveaux L, Stanton B, Lunn S, *et al*. Reduction in human immunodeficiency virus risk among youth in developing countries. *Arch Pediatr Adolesc Med* 2007;161:1130–9.
62 Jennings L, Ssewamala FM, Nabunya P. Effect of savings-led economic empowerment on HIV preventive practices among orphaned adolescents in rural Uganda: results from the Suubi-Maka randomised experiment. *AIDS Care* 2016;28:273–82.
63 Austrian K, Soler-Hampejsek E, Behrman JR, *et al*. 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.
64 Cowan FM, Pascoe SJS, Langhaug LF, *et al*. The Regai Dzive Shiri project: results of a randomised trial of an HIV prevention intervention for youth. *AIDS* 2017;24:2541–52.
65 Jewkes R, Nduna M, Levin J, *et al*. A cluster randomized-controlled trial to determine the effectiveness of stepping stones in preventing HIV infections and promoting safer sexual behaviour among youth in the rural Eastern Cape, South Africa: trial design, methods and baseline findings. *Trop Med Int Health* 2006;11:3–16.
66 Salam RA, Faqqah A, Sajjad N, *et al*. Improving adolescent sexual and reproductive health: a systematic review of potential interventions. *J Adolesc Health* 2016;59:S11–28.
67 Speizer IS, Magnani RJ, Colvin CE. The effectiveness of adolescent reproductive health interventions in developing countries: a review of the evidence. *J Adolesc Health* 2003;33:324–48.
68 Oringanje C, Meremikwu MM, Eko H, *et al*. Interventions for preventing unintended pregnancies among adolescents. *Cochrane Database Syst Rev* 2009;4:CD005215.
69 Chin HB, Sipe TA, Elder R, *et al*. The effectiveness of group-based comprehensive risk-reduction and abstinence education interventions to prevent or reduce the risk of adolescent pregnancy, HIV, and sexually transmitted infections: two systematic reviews for the Guide to Community Preventive Services. *Am J Prev Med* 2012;42:272–94.
70 Widman L, Choukas-Bradley S, Noar SM, *et al*. Parent-adolescent sexual communication and adolescent safer sex behaviour: a meta-analysis. *JAMA Pediatr* 2016;170:52–61.
71 McQueston K, Silverman R, Glassman A. Adolescent fertility in low- and middle-income countries: effects and solutions.

Center for Global Development Working Paper No. 295; 2012. Available: http://dx.doi.org/10.2139/ssrn.2102763 [Accessed 22 Sep 2021].
72 Nguyen G, Costenbader E, Plourde KF, *et al*. Scaling-up normative change interventions for adolescent and youth reproductive health: an examination of the evidence. *J Adolesc Health* 2019;64:S16–30.
73 Asif MF, Pervaiz Z. Socio-demographic determinants of unmet need for family planning among married women in Pakistan. *BMC Public Health* 2019;19:1226.
74 Parida SP, Gajjala A, Giri PP. Empowering adolescent girls, is sexual and reproductive health education a solution? *J Family Med Prim Care* 2021;10:66–71.
75 Mulubwa C, Hurtig A-K, Zulu JM, *et al*. Can sexual health interventions make community-based health systems more responsive to adolescents? A realist informed study in rural Zambia. *Reprod Health* 2020;17:1.
76 Chandra-Mouli V, Svanemyr J, Amin A, *et al*. Twenty years after International Conference on Population and Development: where are we with adolescent sexual and reproductive health and rights? *J Adolesc Health* 2015;56(1 Suppl):S1–6.
77 Svanemyr J, Amin A, Robles OJ, *et al*. Creating an enabling environment for adolescent sexual and reproductive health: a framework and promising approaches. *J Adolesc Health* 2015;56(1 Suppl):S7–14.
78 World Health Organization (WHO). Making health services adolescent friendly. Developing national quality standards for adolescent friendly health services; 2012. Available: https://www.who.int/publications/i/item/9789241503594 [Accessed 22 Sep 2021].
79 Nolan C, Packel L, Hope R, *et al*. Design and impact evaluation of a digital reproductive health program in Rwanda using a cluster randomized design: study protocol. *BMC Public Health* 2020;20:1701.
80 Andrew A, Krutikova S. Promoting adolescent engagement, knowledge and health evaluation of PAnKH: an adolescent girl intervention in Rajasthan, India (ISRCTN77449378; Available: https://doi.org/10.1186/ISRCTN77449378
81 Gilliam M, Hasselbacher L. This study aims to improve sexual and reproductive health knowledge and attitudes among young people, age 12-16, living in Uttar Pradesh, India;
82 Challa Sneha, DeLong SM, Carter Nicole. Evaluating household visits and small groups to increase contraception use among married adolescent girls in rural Niger (IMPACT-RMA); 2019.