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Scoping review of economic evaluation of HIV/AIDS prevention interventions among adolescent girls and young women in sub-Saharan Africa

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Scoping review of economic evaluation of HIV/AIDS prevention interventions among adolescent girls and young women in sub-Saharan Africa

Abstract

Adolescent girls and young women (AGYW) in sub-Saharan Africa face a disproportionate risk of HIV infection, highlighting the need for targeted, cost-effective prevention strategies. This scoping review examines the economic evaluations of HIV prevention interventions for AGYW in the region, by synthesizing findings on cost-effectiveness, identifying gaps in the literature, and suggesting directions for future research. Biomedical interventions, such as oral pre-exposure prophylaxis and long-acting cabotegravir, were found to be cost-effective, particularly when integrated into public healthcare systems. Structural interventions, including school support programs and cash transfers, also demonstrated economic viability, underscoring the importance of addressing socio-economic risk factors alongside biomedical prevention interventions. However, the review identifies significant gaps, including a limited geographic scope and a scarcity of economic evaluations for structural and behavioural interventions. Most studies were undertaken in South Africa, Kenya, and Zimbabwe, thus limiting the generalizability of findings across the continent. Additionally, many evaluations focused solely on direct costs, and overlooked broader economic benefits. Future research should prioritize diverse geographic contexts, assess combination interventions, and adopt standardized outcome measures, such as quality-adjusted life years, to enhance comparability. Emphasizing affordability and scalability will be essential for practical implementation in resource-constrained settings. This review provides valuable insights for policymakers and public health practitioners seeking effective, economically sustainable HIV prevention strategies for AGYW in sub-Saharan Africa.

Keywords: HIV prevention, adolescent girls and young women, sub-Saharan Africa, cost-effectiveness, economic evaluation, PrEP, structural interventions

1. Background

It has been four decades since the discovery of the HIV epidemic, and yet women continue to bear a heavy burden. Globally, an estimated 4,900 adolescent girls and young women (AGYW) contract HIV/AIDS every week (UNAIDS, 2021). In sub-Saharan Africa, where over 80% of the HIV burden is concentrated, AGYW accounted for 63% of all new HIV infections in 2021 (UNAIDS, 2021). Young women aged 15 to 24 years are twice as likely to be living with HIV compared to their male counterparts (UNAIDS, 2021). Despite a 54% reduction in HIV incidence since its peak in 1996, AGYW in sub-Saharan Africa remain a key population for HIV epidemic control.

Accelerating HIV prevention programs for AGYW is a global priority, supported by the Global Fund and other stakeholders. This effort aims to respect, protect, and fulfil AGYW rights while promoting gender equality (UNAIDS, 2019). However, the 7th replenishment of the Global Fund in 2022 fell short of the estimated minimum requirement of USD18 billion needed to effectively combat HIV, tuberculosis, and malaria, strengthen health systems, and enhance pandemic preparedness (The Global Fund, 2022). Consequently, there is limited funding available for the fight against HIV/AIDS, which jeopardizes progress in accelerating HIV prevention among AGYW and overall achievement of the sustainable development goals. To enhance the efficiency of HIV prevention programming for AGYW, it is crucial to optimize limited financial resources by scaling up high-quality, cost-effective interventions that maximize HIV prevention.

Evidence-based prevention tools such as voluntary medical male circumcision, prevention of mother-to-child transmission strategies, HIV pre-exposure prophylaxis (PrEP), and treatment as prevention have shown significant clinical results in reducing HIV transmission in the general adult population (Sarkar et al., 2019). However, as AGYW are disproportionately affected by HIV in sub-Saharan Africa, it is critical for policymakers to evaluate how these interventions can be adapted and prioritized, within regional and national HIV prevention strategies, specifically for this vulnerable group. In resource-limited settings, where budget constraints are a constant challenge, the cost-effectiveness of these interventions must be rigorously assessed to ensure that resources are allocated efficiently and yield the highest possible impact on reducing HIV incidence among AGYW. Such assessments can help identify and rectify inefficiencies within existing prevention programs, ultimately guiding investments towards interventions that deliver the most health benefit per dollar spent (Bautista-Arredondo et al., 2014). This targeted approach is essential not only for maximizing the impact of HIV prevention strategies but also for advancing sustainable, equitable healthcare outcomes for AGYW.

A systematic review on HIV prevention interventions in the general adult population conducted by Sarkar and colleagues in 2019 found that prevention of mother-to-child transmission interventions had the lowest median cost-effectiveness ratios (USD $1,144/HIV infection averted and $191/disability-adjusted life year (DALY) averted), while pre-exposure prophylaxis interventions had the highest ($13,267/HIV infection averted and $799/DALY averted) (Sarkar et al., 2019). Structural interventions, such as partner notification and cash transfer programs, had similar cost-effectiveness ratios ($3,576/HIV infection averted and $392/DALY averted) to male circumcision ($2,965/HIV infection averted/ $388/DALY averted), and were more favourable compared to treatment-as-prevention interventions ($7,903/HIV infection averted and $890/DALY averted) (Sarkar et al., 2019). Overall, most interventions demonstrated increased cost-effectiveness when targeting specific age and risk groups.

However, while targeting specific age and risk groups is important, there is no evidence review focused only on AGYW. It is, therefore, important to acknowledge that the conclusions drawn from Sarkar and colleagues' review cannot be generalized to the AGYW population, as the review focused on a general adult population without specifying the demographic group. Given the complex and evolving needs of AGYW, it is crucial that interventions are tailored to their unique developmental stage, which encompasses physical, emotional, and social transitions. AGYW face distinct vulnerabilities due to factors such as their early sexual debut, gender-based violence, and their limited access to reproductive health services (Karim & Baxter, 2019; Rositch et al, 2014; UNAIDS, 2016). These factors place them at a heightened risk for HIV infection, making AGYW a key population for controlling the HIV epidemic.

This present study aims to address this gap in the literature by providing an overview of the evidence on the costs and cost-effectiveness of HIV prevention interventions for AGYW in sub-Saharan Africa from 2006 to 2022. Additionally, it assesses the methodological gaps in these evaluations. By fulfilling these objectives, this research intends to enhance the understanding of the economic value of AGYW HIV-prevention interventions and support evidence-based decision-making for targeted HIV prevention interventions in sub-Saharan Africa.

2. Methods

A scoping review was conducted to identify and map the available evidence on economic evaluations of biomedical, behavioural and structural HIV prevention interventions among AGYW in sub-Saharan Africa published between 2006 and 2022. A scoping review was chosen, given the broad and varied nature of the field, with the goal of identifying evidence, mapping research methodologies, and highlighting knowledge gaps (Peters et al., 2021). This study was conducted in

accordance with the guidelines for the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extension for scoping reviews (Tricco et al., 2018).

2.1 Inclusion and exclusion criteria

The Population, Intervention, Comparator and Outcome (PICO) framework was used to guide the search strategy as shown in Table 1:

Table 1: The PICO framework

PICO element	**Parameters**	
Participants/ population	adolescent girls and young women (10–24 years)	
Interventions(s)/ exposure(s)	Structural	education support programmes, cash plus/cash transfer, food security, social protection, economic empowerment
	Behavioural	comprehensive sexual education, condom promotion and distribution, abstinence education, peer-based programs, and other behaviour change programs
	Biomedical	PrEP, voluntary counselling and testing, antiretroviral treatment/therapy, voluntary male medical circumcision
Comparator(s)/ control	any control group or comparators assigned when comparing intervention or strategy related to the prevention of HIV	
Outcomes	costs of the intervention or cost-effectiveness or cost benefit or cost utility analysis of the intervention in relation to the HIV-related outcomes or quality of life outcomes	

The review included studies meeting the following inclusion criteria: (a) peer-reviewed journal or project reports; (b) written in English; (c) randomized controlled trials and interventional studies of the economic evaluation of HIV prevention interventions; (d) either a partial economic evaluation of costs, including a cost analysis, or full economic evaluation of both costs and health benefits, including cost-effectiveness analysis, cost-utility analyses, and cost benefit analysis; (e) evaluation of at least a single intervention to prevent HIV infection, compared to an existing practice comparator; (f) published between 2006 and 2022.

The following were excluded from the review: studies that did not disaggregate costs, or costs and benefits, by age and sex to separate those specific to AGYW; letters; editorials; guidelines; conference proceedings; case reports; and methodology papers

2.2 Search strategy

Three electronic databases (PUBMED, OVID and EMBASE) were searched to identify relevant studies up to December 2022. In addition, reference lists of the relevant systematic reviews were searched for eligible studies. The search was only restricted by the language. The following search terms in Table 2 were used:

Table 2: Search strategy

Relevance	**Search terms**
Population	("hiv"[MeSH Terms] OR "hiv"[All Fields]) AND (woman* OR women* OR girl* OR female*) OR (adolesc* OR "young adult" OR teen* OR "emerging adult" OR "young person" OR "young people" OR juvenile OR minor) OR ("AGYW") AND
Intervention	("prevention and control"[Subheading]) OR ("prevention"[All Fields] AND "control"[All Fields] OR "prevention and control"[All Fields] OR "prevention"[All Fields]) AND
Outcome	'cost effect*' or 'cost benefit*' or 'cost utility*' or 'cost analysis*' or 'cost minimi*' or 'economic evaluation*' or economics, dental+ (MeSH) or health care cost+ (MeSH) or health expenditures+ (MeSH) AND
Setting	("africa south of the sahara"[MeSH Terms] OR ("africa"[All Fields] AND "south"[All Fields] AND "sahara"[All Fields]) OR "africa south of the sahara"[All Fields] OR ("sub"[All Fields] AND "saharan"[All Fields] AND "africa"[All Fields]) OR "Saharan Africa"[All Fields])).

2.3 Data extraction and synthesis of findings

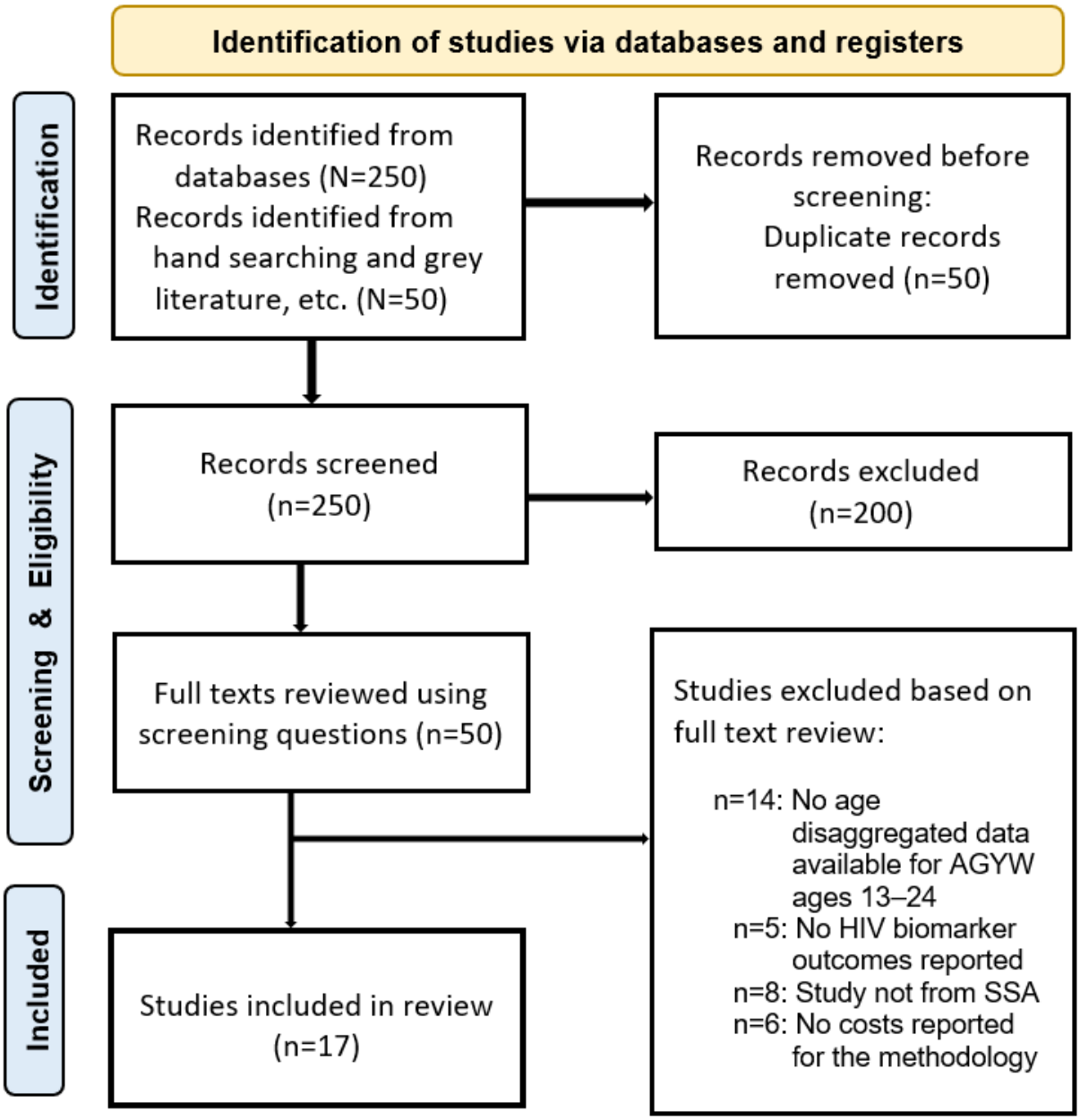
After preliminary screening of the title and the abstract, articles deemed relevant were retrieved for examination by using summary tables. The data fields included the research question, setting and location, perspective, time horizon, discount rate, structure of the economic model if applied, study population, intervention and comparator, outcome measures, incremental cost-effectiveness ratios, and sensitivity analysis method. A narrative summary and tables were used to present

the results from the included studies. We aimed to structure the narrative summary where data was available around the type of HIV prevention interventions or the gaps in research.

3. Results

3.1 Search results

Figure 1: PRISMA flow chart for identifying included studies



The initial search yielded 300 articles, which were reduced to 250 after the removal of duplicates. Two hundred studies were excluded following title- and abstract-screening. This process resulted in 50 studies remaining for full text examination. A final total of 17 studies were judged eligible for inclusion in the review. Further details can be found in the PRISMA flow chart (see Figure 1).

3.2 Study characteristics

Table 3 summarizes the key characteristics of the 17 included studies. These studies span from 2006 to 2022. Overall, more than half (53%) of the study were partial economic evaluations, focusing on cost estimations of the studies, whereas eight studies (47%) were full economic evaluations, comparing both costs and consequences (benefits, effectiveness) of two or more interventions. The majority of the studies were published between 2020 and 2022 comprising 47% of the studies, followed by 35% between 2016 and 2019, whereas the years 2011 to 2015 had the least number of studies (5.88%). The studies were predominantly from South Africa (47%), followed by Kenya (24%) and Zimbabwe (12%), whereas Malawi, Uganda, and Zambia each had one study (5.88%).

In terms of data, the majority of studies (76%) relied on trial data, though most of these were partial economic evaluations focusing solely on intervention costs. In contrast, 24% of the studies employed a modelling study design, with the majority being full economic evaluations. For full economic evaluation studies, outcomes were defined in various ways; the majority of the studies reported either HIV infections averted and HIV deaths averted or disability adjusted life years, with 35.7% studies each. Over 90% of the studies estimated the costs from the provider's perspective and only 6% considered both the costs incurred by the provider and the beneficiary. In terms of discounting, the majority (53%) of the studies used a 3% discount rate, and about 41% of the studies did not specifically report on what discount rate they used, whereas 6% of the studies used an inflation factor to adjust the costs.

Table 3: Characteristics of included studies

Characteristics	Number of studies	%
Study type		
Partial economic evaluation studies	9	52.9
Average cost	3	17.7
Incremental cost analysis	6	35.3
Full economic evaluation studies	8	47.1
Cost effectiveness analysis	3	17.7
Cost utility analysis	5	29.4
Year of study publication		
2006-2010	2	11.8
2011-2015	1	5.9
2016-2019	6	35.3
2020-2022	8	47.1
Study design		
Trial or real life setting[a]	13	76.5
Modelling[b]	4	23.5
Study country		
South Africa	8	47.1
Kenya	4	23.5
Zimbabwe	2	11.8
Uganda	1	5.9
Malawi	1	5.9
Zambia	1	5.9
Outcomes reported in full economic evaluation studies		
HIV infections averted & HIV deaths averted	3	37.5
Disability adjusted life years	3	37.5
Quality Adjusted life years	2	11.8
Perspective		
Provider	16	94.1
Societal	1	5.9
Discount used		
3%	9	52.9
Not reported	7	41.2
Other (inflation factor)	1	5.9

Note. [a]Includes randomized controlled trials designs. [b]Includes mathematical, quasi experimental, Markov, and original observational data designs.

3.3 Definition and type of interventions included

Table 4 presents a summary of the studies addressing economic evaluation of the HIV-prevention interventions, by type of intervention. From the 17 economic evaluation studies on HIV prevention interventions identified, 11 addressed biomedical interventions; two addressed behaviour change interventions; two dealt with structural interventions; and two analyzed multifaceted interventions.

Table 4: Economic evaluation of HIV Prevention intervention among AGYW studies

Intervention	Number of studies	Reference
Biomedical		
Oral PrEP	6	Mangenah et al., 2022; Phillips et al., 2021; Wanga et al., 2021; Roberts et al., 2019; Mudimu et al., 2022; Hendrickson et al., 2022
Long-acting PrEP	2	Jamieson et al., 2022; Walensky et al., 2016
HIV vaccine	2	Moodley et al., 2016; Amirfar et al., 2006
Multipurpose prevention technologies	2	Quaife et al., 2018; Amirfar et al., 2006
Behavioural		
HIV/AIDS curriculum in schools	1	Dupas, 2009
Afterschool sports program	1	Bango et al., 2022
Structural		
School support programs in terms of school uniform	1	Miller et al., 2013
Cash transfer	1	Remme et al., 2014
Combination		
DREAMS package	1	Okal et al., 2022
Economic livelihood adolescent Program	1	Bandiera et al., 2012

3.4 Results from partial evaluation cost analysis studies

Partial evaluation studies only reported on the total costs and unit costs of implementing a particular intervention. Cost comparisons were made across different implementation models for selected interventions. In this review, we identified nine studies. Table 5 presents a summary of the findings from the cost analysis studies.

3.4.1 Biomedical interventions

Integration of oral PrEP into existing community and facility platforms

In this review, we identified five studies that reported the cost of delivering PrEP to adolescent girls and young women aged 15 to 24 (Roberts et al., 2019; Hendrickson et al., 2022; Mangenah et al., 2022; Mudimu et al., 2022; Wanga et al., 2021). Different delivery models across multiple settings were reported in the studies, including the integration of PrEP into existing community and facility level structures. A South African study analyzed the incremental costs of providing oral PrEP to adolescent girls and young women aged 16 to 25 through three community-based HIV testing platforms: community health clubs, individualized counselling with medication dispensary, and a community-based PrEP dispensary (Mudimu et al., 2022). Costs were estimated under three scenarios: as implemented in the study, following the South African Department of Health (DoH) guidelines, and at-scale implementation by the DoH. The study found high average costs per person-month under the as-implemented scenario (USD $105.74 $105.61 and $106.09 for standard care, group based, and individualised respectively) and the DoH scenario (USD $55.46, $55.32 and $55.65, respectively) due to low people volumes, but noted significant cost reductions under the scaled DoH scenario (USD $13.99, $15.48 and $26.40, respectively). PrEP medication was the largest cost component, with fixed personnel costs contributing to additional costs per person-month in the low-volume scenarios.

In another South African study, researchers compared the costs of providing oral PrEP with long-acting PrEP across various population groups, including AGYW aged 15 to 24, heterosexual men, men who have sex with men, and female sex workers (Jamieson et al., 2022). Costs were analyzed from the provider's perspective, the South African Government, under three scenarios: oral PrEP, long-acting injectable cabotegravir with minimum duration (users remained in the program for a similar time as they would have on oral PrEP), and long-acting injectable cabotegravir with maximum duration (users remained on PrEP for a longer period, i.e., 12 months for AGYW and 24 months for men who have sex with men). The study found that the average cost of providing oral PrEP per

person initiated was $78, $77, $76, and $116 for FSW, AGYW, heterosexual men, and men who have sex with men, respectively. For long-acting cabotegravir under minimum duration, the costs were $81, $80, $78, and $122, while under maximum duration, the costs were $137, $137, $134, and $131.

In Kenya, Roberts and colleagues (2019) evaluated the incremental costs of incorporating oral PrEP into maternal, child health, and family planning facilities across four scenarios: (1) as implemented in the project; (2) postponing creatinine testing to the first follow-up visit; (3) limiting PrEP initiation to high-risk people; and (4) full implementation by the Ministry of Health (MoH). The study, conducted under the PrEP Implementation for Young Women and Adolescents program, categorized costs into fixed and variable. They found that for an annual output of 24,005 screenings, 4,198 PrEP initiations, and 4,427 follow-up visits, the total program cost was $204,253, with personnel, drugs, and laboratory tests being the major cost components. Adjusting creatinine testing reduced costs by 7.5%, targeting high-risk people lowered costs by 14%, and MOH implementation decreased costs by 38% by significantly reducing personnel costs.

Wanga et al. (2021) estimated the economic costs of delivering PrEP to AGYW at two family planning clinics in Kisumu County, Kenya. The study compared two models: one without and one with creatinine, hepatitis B, or STI testing. Costs were analyzed under three scenarios: a POWER study scenario, a MoH scenario, and a scaled MoH scenario. The study found that, excluding additional tests, the annual cost of PrEP delivery in the MoH scenario was $22,566 ($14.52 per person-month), about half the POWER study costs. Including the additional tests increased the cost per person-month to $21.12 in the MoH scenario and $19.39 in the scaled MoH scenario. The main cost drivers were medication, personnel, and laboratory testing.

In Zambia, Hendrickson and colleagues (2022) estimated the annual cost of providing PrEP per person across five delivery models using a guidelines-based approach for visits, laboratory tests, and drugs. The first model targeted key populations (men who have sex with men and FSW) with community-based demand creation programs. The second model focused on AGYW within the Determined, Resilient, Empowered, AIDS-Free, Mentored, and Safe (DREAMS) program. The third, fourth, and fifth integrated models (operated within HIV counselling and testing services at primary healthcare centres) provided PrEP to all persons at risk of HIV, with variations in health promotion, site readiness, and community education approaches. Costs were estimated from the providers' perspective, including program and direct service-delivery costs. Annual costs per PrEP person ranged from $394 (AGYW) to $655 (integrated model 3), translating to $33 and $55 per person per month, respectively. Cost differences were influenced by person volume and the relative costs of program support and

technical assistance, with direct service delivery costs ranging from USD $205 to $212 per person.

In Zimbabwe, Mangenah et al. (2022) estimated the costs of delivering oral PrEP to populations at risk of HIV, across a six-clinic non-governmental organization (NGO) network and one government sexual and gender-based violence (SGBV) clinic. The study analyzed full annual economic costs from the providers' perspective for 2018, combining top-down expenditure analysis with ingredients-based costing. Costs were categorized into capital (building space, equipment, vehicles) and recurrent costs (personnel, management, PrEP drugs, laboratory tests, demand creation, and maintenance). The total annual program cost was $1,113,430, with 93% attributed to recurrent costs. Personnel accounted for one-third of costs; the costs of demand creation and PrEP drugs varied between NGO and government clinics.

The average cost per person initiated on PrEP was $238, ranging from $183 at the largest NGO facility to $302 at a smaller clinic, and $86 at the government SGBV clinic. Costs varied by population, being lowest for all males ($215), followed by AGYW ($240), and highest for women aged 25 and older ($243). Due to different engagement periods, the average cost per person continuing on PrEP ranged from $347 to $2,282 at three months and $644 to $3,424 at six months in NGO sites, while the government SGBV clinic had costs of $303 at three months and $1,029 at six months.

3.4.2 Behavioural interventions

This review identified one study conducted by Bango et al. (2022) on behavioural intervention for HIV prevention among AGYW. The researchers conducted an in-depth study on the SKILLS program, which was a behavioural change intervention aimed at HIV prevention among AGYW aged 14 to 17 in the Western Cape, South Africa. SKILLS was a tailored 10-session programme using soccer language and activities to address key drivers of school drop-out, sexually transmitted infections (STIs) including HIV, unintended pregnancy, gender-based violence, and challenges regarding access to critical health services. The study evaluated three scenarios for the implementation and expansion of the program, focusing on different levels of school and learner coverage.

Scenario 1: High school and learner coverage

In this scenario, the program was designed to achieve widespread coverage by including fee-paying schools (the program would be introduced to 102 no-fee schools annually, and a total of 306 high schools). The goal was to reach a broad population of adolescent girls across many schools. By the end of 2024, the program was projected to reach 204,000 girls, with a total estimated cost of USD $21,245,812.

Scenario 2: High learner coverage with limited school coverage

This scenario focused on achieving high learner coverage within a limited number of schools before expanding to new institutions. The target was 80% learner coverage in schools where the program was initially introduced. By the end of 2024, the program was projected to reach 18,000 learners, with an estimated total cost of $1,874,630.

Scenario 3: High school coverage with low learner coverage (base case)

The base case scenario prioritized high coverage of schools with lower coverage among learners, targeting 80% school coverage with 30% learner coverage. This approach aimed to establish the program in a large number of schools first. By the end of 2024, it was projected to reach 76,500 learners, with a total estimated cost of $5,311,453.

The study provided a comprehensive breakdown of the costs associated with the SKILLS program. The total one-year cost was estimated at $75,183.59, categorized as start-up costs (4% of the total cost, covering personnel recruitment, equipment procurement, and community engagement), capital costs (2% of the total cost), and recurrent operational costs (82% of the total cost, excluding personnel expenses). These costs included above-site delivery costs (37%, $22,951.82), with significant portions allocated to administration and support, and site-level delivery costs (63%, $38,490.05), with transport costs for staff and participants making up 74% of these expenses (53% for staff transport and 21% for participant transport).

The costs per learner were estimated at USD $9.92 per learner per session and $69.43 for the minimum graduation requirement (7 sessions). Projected costs were $99.19 per completed curriculum (10 sessions) $8,353.73 per school. The financial feasibility of scaling up the SKILLS program was assessed by comparing the costs with available funding. The base case scenario’s scale-up costs ($5,311,453.00) exceeded the provincial conditional grant allocated for the HIV and AIDS (life skills education) program over three years, which was $4,762,346.36. However, the costs were found to be comparable with those of a similar donor-funded program within the province.

Table 5: Summary of findings of the cost analysis of HIV prevention interventions in the partial evaluation studies

Author	Intervention description	Country	Popu-lation	Study design	Perspect-ive	Discount or IF	Time horizon	Scenarios	Findings
Oral PrEP									
Mudimu et al., 2022	Integrating oral PrEP into community HIV testing and counselling	South Africa	AGYW	Trial	Provider	R=3%	12 months	As implemented	Standard of Care – Annual incremental cost: $135,314; incremental cost per person-month of PrEP: $105.74 Club – Annual incremental cost: $135,143.42; incremental cost per person-month of PrEP: $105.61 Individual – Annual incremental cost: $135,791.40; incremental cost per person-month of PrEP: $106.09
								Department of Health (DoH) scenario	Standard of Care – Annual cost: $70,944.44; cost per person-month of PrEP: $55.46 Club – Annual cost: $70,811.93; cost per person-month of PrEP: $55.32 Individual – Annual cost: $71,227.59; cost per person-month of PrEP: $55.65
								DoH scaled up	Standard of Care – Annual cost: $142,342.77; cost per person-month of PrEP: $13.99 Club – Annual cost: $144,881.73; cost per person-month of PrEP: $15.48 Individual – Annual cost: $133,822.61; cost per person-month of PrEP: $26.40
Jamieson et al., 2022	Providing long-acting (LA) cabotegravir in comparison to oral PrEP	South Africa	AGYW aged 15-24, hetero-sexual men, MSM, FSW	Trial	Provider	3%	12 months	Oral PrEP	$77 per AGYW person initiated
								LA cabotegravir minimum duration	$80 per AGYW person initiated
								LA cabotegravir maximum duration	$137 per AGYW person initiated
Roberts et al., 2019	Integrating oral PrEP into routine maternal, child health and family planning facilities in Kenya	Kenya	AGYW	Trial	Provider	R=3%	12 months	As implemented	Incremental annual cost: $204,253; average incremental cost per person-month of PrEP dispensed: $26.52
								Postponing creatinine testing to the first follow-up visit	Incremental annual cost: $188,932; average incremental cost per person-month of PrEP dispensed: $24.53

Author	Intervention description	Country	Popu-lation	Study design	Perspect-ive	Discount or IF	Time horizon	Scenarios	Findings
								Restricting PrEP initiation to high-risk people	Annual cost: $175,793; average cost per person-month of PrEP dispensed: $31.88
								Ministry of Health (MoH)	Annual total programme cost: $127,421, which constitutes a 38% decrease compared to Implementation for Young Women and Adolescents program implementation; average cost per person-month of PrEP dispensed decreased to $16.54
Wanga et al., 2021	Integrating PrEP into maternal, neonatal and family planning services	Kenya	AGYW aged 16-25 years	Trial	Provider	NR	12 months	As implemented – POWER study	Without including creatine, hepatitis B or STI – Annual cost: $44,933; cost per person-month of PrEP: $28.92 With added costs of the creatine, hepatitis B or STI – Annual cost: $77275; cost per person-month of PrEP: $49.73
								Option 2: MoH Scenario	Without including creatine, hepatitis B or STI – Annual cost: $22,566; cost per person-month of PrEP: $14.52 With added costs of the creatine, hepatitis B or STI – Annual cost: $32,810; cost per person-month of PrEP: $21.12
								Option 3: Scaled-MoH scenario	Without including creatine, hepatitis B or STI – Annual cost: $83,196; cost per person-month of PrEP: $10.88 With added costs of the creatine, hepatitis B or STI – Annual cost: $148,245; cost per person-month of PrEP: $19.39
Hendrick-son et al., 2022	Delivering PrEP across five different models	Zambia	AGYW, FSW, MSM; all HIV risk	Trial	Provider	IF=1.36	12 months	AGYW focused	Total average cost/PrEP-person/year: $394; average cost per person-month: $33
								MSM & FSW	Total average cost/PrEP-person/year: $420; average cost per person-month: $35
								Integrated model 1	Total average cost/PrEP-person/year: $648; average cost per person-month: $54
								Integrated model 2	Total average cost/PrEP-person/year: $408; average cost per person-month: $34
								Integrated model 3	Total average cost/PrEP-person /year: $655; average cost per person-month: $55

Author	Intervention description	Country	Popu-lation	Study design	Perspect-ive	Discount or IF	Time horizon	Scenarios	Findings
Mangenah et al., 2022	Initiating and supporting continuation of people on oral PrEP	Zimbab-we	AGYW, women and MSM	Trial	Provider	NR	12 months	AGYW	Initiation: cost per person-year of receiving oral PrEP: $240; Month 3 follow-up: $434 per person continued to 3 months; Month 6 follow-up: $844 per person continued to 6 months
								General women population	Initiation: cost per person-year of receiving oral PrEP: $243; Month 3 follow-up: $480 per person continued to 3 months; Month 6 follow-up: $828 per person continued to 6 months
								All men	Initiation: cost per person-year of receiving oral PrEP: $215; Month 3 follow-up: $712 per person continued to 3 months; Month 6 follow-up: $1,363 per person continued to 6 months
Behaviour change intervention									
Bango et al., 2022	SKILLS program integrating after-school sports with sexual health education.	South Africa	AGYW	Trial	Provider	3%	three years	Overall annual program cost	Annual total program cost: $75,183.59; start-up and capital costs for 2019 accounted for 4% and 2%, respectively Average cost per learner per session: $9.92; cost per school: estimated $8,353.73; cost per session attended by 20 learners: $198.37 Cost per learner reached (minimum graduation requirement of 7 sessions per learner): estimated $69.43; cost per completed curriculum: projected at $99.19
								Scale up scenario 1: high coverage of schools and high coverage of learners	Total cumulative number of adolescent girls reached: 204,000; total cost for learners who have completed the curriculum: $21,245,811.98 over three years

Author	Intervention description	Country	Popu-lation	Study design	Perspect-ive	Discount or IF	Time horizon	Scenarios	Findings
								Scale up scenario 2: low coverage of schools and high coverage of learners	Accumulated number of learners in the programme: 18,000 at the end of 2024; total accumulated cost: projected $1,874,630.47
								Scale up scenario 3: high coverage of schools and low coverage of learners	Accumulative number of learners: 76,500 at the end of 2024; total accumulated cost: projected $5,311,453.00
Combination interventions									
Okal et al., 2022	DREAMS intervention	Kenya	AGYW	Trial	Provider	3%	12 months	Urban	Total cost: $215,440; average unit cost $67
								Peri urban	Total cost: $408,884; average unit cost: $129
Bandiera et al., 2012	Community empowerment and livelihood programme for adolescents both in and out of school	Uganda	AGYW	Trial	Provider	NR	2 years	Year 1	Total cost: $365,690; average unit cost per AGYW $28.10
								Year 2 onward	Total cost: $ 232,240 ; average unit cost per AGYW $17.90

Note: AGYW, adolescent girls and young women; FSW, female sex workers; MSM, men who have sex with men; IF, inflation factor; R, discount rate; NR, not reported

3.4.3 Combination interventions

DREAMS Package

In 2022, Okal et al. (2022) conducted a study comparing the unit costs of providing the DREAMS interventions to AGYW in two different settings within Kisumu County, Kenya: an urban area and a peri-urban area. The study employed a micro-costing approach from the provider's perspective, with costs categorized into medical and professional staff, administrative and support staff, materials and supplies, building space and utilities, equipment, establishment, and miscellaneous. Only site-level costs were considered. Costs were divided by the total number of AGYW reached at each site to determine the unit costs.

In the urban site of Nyalenda A, the program reached 3,210 AGYW, resulting in a total program cost of $215,440 and a unit cost of $67 per AGYW. In the peri-urban site of Kolwa East, the program reached 3,173 AGYW, with a total program cost of $408,884 and a unit cost of $129 per AGYW, approximately 1.9 times higher than in the urban area. The cost variation between the two sites was primarily driven by building space and utilities.

Empowerment and Livelihood for Adolescents program in Uganda

A study by Bandiera et al. (2012) analyzed the cost and effectiveness of the Empowerment and Livelihood for Adolescents program in Uganda, targeting AGYW aged 14 to 20. This program, implemented by BRAC Uganda, aimed to improve the lives of adolescent girls through vocational skills, life skills, and a safe space for socialization. The study estimated costs from the provider's perspective, categorizing them as fixed and variable costs. In the 100 treated communities, the program's first-year costs totalled $365,690, translating to an average unit cost of $28.10 per person. In subsequent years, costs decreased to $232,240, resulting in an average unit cost of $17.90 per girl due to the absence of set-up costs.

3.5 Results from full economic evaluation studies

This review identified eight full economic evaluation studies (see Table 6). These studies allowed a comprehensive analysis of both costs and effectiveness by comparing different interventions. The interventions were oral PrEP (Phillips et al., 2021); long-acting PrEP (Walensky et al., 2016); HIV vaccine (Amirfar et al., 2006a; Moodley et al., 2016); multipurpose technologies (Quaife et al., 2018); cash transfer (Remme et al., 2014a); school support (Miller et al., 2013) and behavioural change intervention (Dupas, 2009).

Table 6: Full economic evaluation studies

Author	Country	Intervention	Study design	Model used	Perspect-ive	Discount rate	Scenarios	Outcome measure	Cost effective measure	Threshold used
Oral PrEP										
Phillips et al., 2019	South Africa	PrEP use concentrated in periods of condomless sex, accounting for effects on drug resistance	model based	Individual-based model of HIV transmission, progression, and the effect of antiretroviral therapy	Provider	3% per annum, with a 7% local discount rate based on the South African Reserve Bank	FSW having multiple condomless sex partners and AGYW aged 15-24 (PrEP-for-AGYW/FSW).	Average 25% decline in annual HIV incidence over 20 years; 16,300 DALYs averted	Cost saving 5.1 million USD	$750 based on the cost per life-year averted of HIV interventions at the borderline for inclusion within the South African HIV investment
							all men and women aged 15-64 years (PrEP-for-all)	36% decline in HIV incidence; 54,700 DALYs averted	Cost saving 15 million USD	
Long-acting PrEP										
Walensky et al., 2016	South Africa	Delivery of facility PrEP to high-risk women	model based	Cost-Effectiveness of Preventing AIDS Complications –International (CEPAC-I)	Provider	3%	No PrEP	—	—	"Very cost-effective" if the ICER was less than the South African annual per capita gross domestic product (GDP; i.e., $7,000); "cost-effective" if the ICER was <3 times the GDP
							Standard oral PrEP (effectiveness, 62%; cost per patient, $150/year)	Averted 15 deaths per 1000 over 5 years compared to no PrEP; 127 infections averted over 5 years	$10,100 per lifetime HIV infection averted compared to no PrEP	
							Long-acting PrEP (effectiveness, 75%; cost per patient, $220/year)	Averted 16 deaths per 1000 over 5 years compared to no PrEP; 156 infections averted	$12,400 per infection averted compared to no PrEP; ICER of long-acting PrEP compared to standard PrEP: $150 per life-year saved	

Author	Country	Intervention	Study design	Model used	Perspect-ive	Discount rate	Scenarios	Outcome measure	Cost effective measure	Threshold used
HIV vaccine										
Moodley et al., 2016	South Africa	HIV vaccine intervention for school-based adolescents	model based	Microsoft Excel (Version 2010) – Semi-Markov model	Provider	3%	Whole sample of 9-year-old adolescents	5.11 QALYs gained	ICER of $43.07 per QALY gained (95% CI: $38.92-$47.43).	WHO – CHOICE guidelines.
							Girls only	68% increase in QALY gain of 6.36 (95% CI: 5.86-6.85)	NR	
							Boys only	QALY gain of 3.79 (3.50-4.07)	NR	
Amirfar et al., 2006	South Africa	HIV vaccine for 15-year-old adolescent girls	model based	Markov model	Provider	NR	10% vaccine efficacy; 2.5% HIV incidence rate	3,000 HIA	$4,500 per HIV case averted; compared to no vaccine: $5.8 million over 10 years	NR
							20% vaccine efficacy; 2.5% HIV incidence rate	5,000 HIA	$3,100 per HIV case averted; compared to no vaccine: $18.8 million over 10 years	
							30% vaccine efficacy; 5% HIV incidence	10,000 HIA	Compared to no vaccine: $68.2 million over 10 years	
							40% vaccine efficacy; 5% HIV incidence	12,000 HIA	Compared to no vaccine: $93.8 million over 10 years	
							50% vaccine efficacy; 5% HIV incidence	40,000 HIA	$300 per HIV case averted; compared to no vaccine: $120.8 million over 10 years	

Author	Country	Intervention	Study design	Model used	Perspect-ive	Discount rate	Scenarios	Outcome measure	Cost effective measure	Threshold used
Multipurpose technologies										
Quaife et al., 2018	South Africa	multi-purpose prevention technologies (MPTs)	program data	A cost model combined with a static model of product impact data	Provider	NR	Single-purpose oral PrEP	500,000 DALYs averted	ICER of $810/DALY averted	1× and 3× GDP/capita; USD1,175 per DALY
							Oral PrEP, vaginal ring	800,000 DALYs averted	ICER of $808/DALY averted	
							Oral PrEP, MPT vaginal ring	1,100,000 DALYs averted	ICER of $563/DALY averted	
							Oral PrEP, intravaginal ring, injectable ARV agent, microbicide gel, SILCS diaphragm with microbicide gel	900,000 DALYs averted	ICER of $700/DALY averted	
							MPT oral PrEP, MPT vaginal ring, injectable MPT agent, MPT microbicide gel, SILCS diaphragm with microbicide gel	2,900,000 DALYs averted	ICER of $589/DALY averted	
Behavioural change interventions for HIV prevention										
Dupas, 2009	Kenya	school-based risk-relative information campaign on cross-generational sex	program data	NR	Provider	NR	1,300 girls in 77 schools	Reduced the incidence of childbearing by 1.5 percentage points in the treatment group	$653 per primary HIV infection averted	NR

Author	Country	Intervention	Study design	Model used	Perspect-ive	Discount rate	Scenarios	Outcome measure	Cost effective measure	Threshold used
School support interventions										
Miller et al., 2013	Zimbabwe	uniform and school tuition support	program data	NR	Societal	3%		0.36 QALYs per orphan supported	$6/QALY gained	WHO – CHOICE guidelines.
Cash transfers										
Remme et al., 2014	Malawi	cash transfer provided between 2008 and 2009 to 1,225 girls (ages 13-22 years) and their households, conditional upon school attendance for a subsample of 506 girls	trial data	NR	Provider	NR	Long-term benefits of 18-month cash transfer trial	93,600 HIV DALYs averted	$297/HIV DALY averted	WHO threshold < Malawi GDP per capita

Note: AGYW, adolescent girls and young women; CI, confidence interval; DALYs, disability-adjusted life years; FSW, female sex workers; HIA, HIV infections averted; ICER, incremental cost effectiveness ratio; NR, not reported; QALYs, quality adjusted life years

3.5.1 Biomedical interventions

Oral PrEP

Phillips and colleagues (2021) investigated the impact and cost-effectiveness of oral PrEP in KwaZulu-Natal using an individual-based model. The study focused on the concentrated use of PrEP during periods of condomless sex and its potential effects on drug resistance. Two PrEP implementation policies were compared: PrEP-for-AGYW/FSW targeting FSW with multiple condomless sex partners and AGYW aged 15 to 24 years, and PrEP-for-all targeting all men and women aged 15 to 64 years.

These policies were evaluated against a scenario with no PrEP introduction. Costs were estimated from the South African government's perspective, including resource use related to PrEP (clinic visits, PrEP utilization, and HIV tests) and subsequent healthcare interventions such as antiretroviral therapy and treatment for HIV-related diseases. Unit costs were based on 2017 public-sector prices in South Africa, with an annual cost of $136 per person on PrEP. This cost included four 3-monthly HIV tests ($36), four clinic visits and laboratory costs, demand generation ($40), and PrEP drugs ($60).

The model predicted that the PrEP-for-AGYW/FSW policy would result in a 25% decline in mean annual HIV incidence among women aged 15 to 24 years over 20 years. In contrast, the PrEP-for-all policy would achieve a 36% decline in HIV incidence. The PrEP-for-all policy was associated with averting 54,700 DALYs per year, compared to 16,300 DALYs per year for the PrEP-for-AGYW/FSW policy. The study concluded that the PrEP-for-all policy, by concentrating PrEP availability among individuals engaging in condomless sex, would have a significantly greater overall impact on HIV incidence and be more cost-effective than restricting PrEP access to AGYW and FSW. Additionally, the PrEP-for-all policy had a greater impact on reducing HIV incidence among women aged 15 to 24 years, due to a reduction in HIV prevalence among men.

Long-acting PrEP

While daily oral PrEP has proven highly effective in preventing HIV infection (Sarkar et al., 2019), its uptake, continuation, and adherence in sub-Saharan Africa have been low (Siegler et al., 2018). A promising solution is long-acting injectable cabotegravir-PrEP, administered every two months, which may improve uptake and demonstrate superior efficacy to oral PrEP for women in sub-Saharan Africa (Little et al., 2024). This review identified one study evaluating the delivery of long-acting PrEP among AGYW.

Walensky and colleagues (2016) assessed the clinical and economic value of long-acting PrEP for high-risk South African women aged 18 to 25 years, using the Cost-Effectiveness of Preventing AIDS Complications—International model.

The study compared three PrEP strategies: no PrEP, standard oral PrEP (effectiveness: 62%; cost per patient: USD $150/year), and long-acting injectable PrEP (effectiveness: 75%; cost per patient: $220/year). Costs were reported from the provider's perspective. Over a 5-year period, the per-person costs of PrEP were significantly higher for standard PrEP ($840) and long-acting PrEP ($1,130) compared to no PrEP ($260). The cost of averting one HIV infection over a lifetime was estimated at $10,100 for standard PrEP and $12,400 for long-acting PrEP. Both PrEP strategies were found to be less expensive and more effective than no PrEP, resulting in overall cost savings. Additionally, the incremental cost-effectiveness ratio (ICER) of long-acting PrEP compared to standard PrEP was $150 per life-year saved. Implementing long-acting PrEP at an average cost of $1,530 per person reduced HIV treatment by $1,960 per person, compared to not implementing PrEP.

HIV Vaccine

HIV vaccines are administered to individuals without HIV infection to prevent future infections. This review identified two studies evaluating the effectiveness of HIV vaccines among young adolescents and AGYW.

Moodley et al. (2016) conducted a study in South Africa assessing the cost-effectiveness of implementing school-based HIV vaccination as part of the public sector's HIV management strategy. Using a semi-Markov model, they analyzed the costs from a provider's perspective. The HIV vaccination costs included laboratory tests, pharmaceuticals, and human resources. The unit cost per adolescent for the intervention was $89.00, compared to $80.34 for standard care. The total cost of vaccine administration was higher for females ($2,628) compared to males ($2,043). Introducing HIV vaccination in the general adolescent population resulted in a net cost of $187, an 8.68% increase, with a gain of 5.11 quality-adjusted life years (QALYs) and an ICER of $43.07 per QALY gained. Administering the vaccine to females only led to a 68% increase in QALYs gained (6.36) compared to males only (3.79), reflecting the higher disease burden among females.

Amirfar et al. (2006) focused on 15-year-old adolescent girls in South Africa to evaluate the impact of an HIV vaccine in preventing infections and deaths in mothers and infants. Using a Markov simulation model, they estimated the cost-effectiveness of the vaccine under various scenarios, with efficacy ranging from 10% to 50% over a 10-year period. The vaccine cost, including delivery and implementation, was estimated at $20 per person. The study found the vaccine to be highly effective, reducing HIV cases among adolescent girls from 10,000 (at 10% efficacy) to 57,653 (at 50% efficacy) based on HIV incidence levels over 10 years. Even in the least cost-effective scenario (10% efficacy in a low incidence setting), the $20 per dose vaccination program was cost-effective and cost-saving, with potential savings of approximately $6 million.

Multipurpose technologies

Multipurpose technologies (MPTs) that provide simultaneous protection against HIV, other STIs, and unintended pregnancy offer a promising approach to increasing their desirability and impact among potential users.

Quaife and colleagues (2018) conducted a comprehensive study evaluating the additional benefits and health system costs associated with single- and multi-purpose prevention products compared to the current practices of condom use and male circumcision prevalent in South Africa. The study estimated the cost-effectiveness of various MPT delivery scenarios (i.e., delivering antiretrovirals and contraceptives) by combining a cost model with a static model of product impact data. The analysis considered three distinct groups of females: younger women (aged 16 to 24), older women (aged 25 to 49), and FSWs, incorporating end-users' preferences through a discrete choice experiment.

Five potential rollout scenarios were evaluated:
(1) single-purpose oral PrEP
(2) oral PrEP and vaginal ring
(3) oral PrEP and MPT vaginal ring
(4) oral PrEP, intravaginal ring, injectable ARV agent, microbicide gel, and SILCS diaphragm (single size contraceptive barrier) with microbicide gel
(5) MPT oral PrEP, MPT vaginal ring, injectable MPT agent, MPT microbicide gel, and SILCS diaphragm with microbicide gel.
The comparison point for each scenario was the current level of male condom use, and a health system perspective was employed to estimate the discounted lifetime treatment costs saved per HIV infection.

The estimated costs accounted for delivering a combination prevention package across all public clinics in South Africa, considering fixed costs (such as national start-up costs, provider training, and mass media) and variable costs (including averted health costs, antiretroviral therapy, and expenses related to miscarriages and unplanned births). The findings indicated that all single- and multi-purpose scenarios modelled were cost-effective for women aged 16 to 24, with a governmental willingness-to-pay threshold of $1,175 per DALY averted. The cost per DALY averted ranged between $563 and $810. Among the scenarios, the combination of oral PrEP and an MPT intravaginal ring (Scenario 3) demonstrated the highest cost-effectiveness, with an ICER of $563 per DALY averted. In contrast, Scenario 1, consisting of oral PrEP only, had the highest ICER of $810 per DALY averted.

3.5.2 Behavioural interventions

In this review we identified one study that estimated the cost effectiveness of a behavioural intervention with the goal of reducing HIV risk.

School relative risk information campaign

A study conducted by Dupas (2009) in Kenya evaluated the effectiveness and cost-effectiveness of the behavioural change intervention called the relative risk information campaign. This campaign, implemented by a non-governmental organization in 2004, targeted Grade 8 students in 71 selected schools out of a total of 328 schools. A trained project officer delivered a 40-minute session in each school, focusing on the risks of cross-generational sex and its role in spreading HIV. Notably, in line with Kenyan government policy, the project officers did not provide information on condoms or demonstrate their use, but did answer students' questions about condoms scientifically.

The campaign reached approximately 1,300 girls across the 71 schools, with a total cost of just under USD $2,000 from the provider's perspective. The campaign led to a 1.5 percentage point reduction in childbearing incidence among the treatment group, preventing a total of 20 cross-generational pregnancies. This translated to an overall cost of just under $100 per cross-generational pregnancy averted. To estimate the cost per HIV infection averted, the study used three hypothetical ratios: 5/100, 15/100, and 25/100. Using the ratio of 15/100, the cost of $98 per cross-generational pregnancy averted corresponded to a cost of $653 per primary HIV infection averted among teenage girls.

3.5.3 Structural Interventions

School support programs

A study by Miller and colleagues (2013) evaluated the cost-effectiveness of a school support intervention aimed at reducing HIV risk factors among orphaned adolescent girls in Zimbabwe. The intervention's costs were analyzed from a societal perspective, encompassing both program expenses and costs borne by beneficiaries. Program costs, incurred only by the intervention group, included fees, uniforms, school supplies, honoraria for helpers and headmasters, boarding charges, and supplies for students in boarding schools. Informal boarding costs were also considered, with a typical monthly fee of $50 per child paid to a teacher for food and other expenses.

The study found that the intervention yielded societal benefits estimated at US$1,472 and a gain of 0.36 QALYs per supported orphan. The cost per QALY gained was US$6, approximately 1% of Zimbabwe's annual per capita income, and well below the maximum cost recommended by the WHO for health gains in low- and middle-income countries. For non-boarders, the intervention's financial benefits exceeded its costs, resulting in an estimated net savings of $502 per pupil.

The intervention remained cost-saving even with a 34% reduction in effectiveness if replicated. However, boarding was not cost-effective, incurring an additional cost of $1,234 per girl over three years without affecting outcome measures compared to non-boarding girls. The average cost for approximately three years of school support for non-boarders was US$973.

Cash transfer

Cash transfer programs are widely implemented as part of poverty reduction and social protection strategies, and have the potential to mitigate factors contributing to HIV risk behaviours and to achieve global HIV prevention and treatment targets. However, limited evidence exists on their cost-effectiveness, especially among AGYW.

A study by Remme and colleagues (2014) conducted an economic evaluation of a cash transfer program in Zomba, Malawi. The intervention provided cash to 1,225 girls, aged 13 to 22, and their households, with payments conditional on school attendance for a subset of 506 girls. The study compared those who received cash to those who did not, and estimated the incremental financial cost for providers at US$90 per beneficiary. The findings showed that the cost per HIV DALY averted was $297, which is considered cost-effective by WHO standards, being below Malawi's per capita GDP. This suggests that the cash transfer program in Zomba was cost-effective in improving health outcomes.

4. Discussion

This scoping review synthesizes the current landscape of economic evaluations for HIV prevention interventions targeting AGYW in sub-Saharan Africa. Included studies demonstrate that biomedical interventions such as oral PrEP and long-acting cabotegravir are cost-effective, especially when integrated within existing healthcare systems. Structural interventions, including school support programs and cash transfers, also show promise as cost-effective approaches to reducing HIV risk among AGYW. However, the limited breadth of economic evaluations of interventions reaching this demographic highlights a need for further research which applies a range of methods and evaluates diverse interventions – alone and in combination.

The cost-effectiveness of oral PrEP and long-acting cabotegravir interventions indicates the potential of biomedical approaches to reduce HIV incidence in AGYW populations, especially in high-prevalence areas. The effectiveness of PrEP, particularly when scaled through public health systems, underscores the role of preventative medicine in HIV-reduction efforts. However, the higher cost associated with long-acting cabotegravir may limit its feasibility in low-resource settings (Walensky et al., 2016), highlighting the trade-offs between efficacy and

affordability. Structural interventions, like school-based programs and conditional cash-transfers, appear both effective and economically feasible, suggesting that preventive strategies can extend beyond biomedical approaches (UNAIDS, 2019). These findings underscore the value of combining biomedical and structural approaches in developing comprehensive HIV-prevention strategies for AGYW.

Our findings align with prior research that emphasizes the effectiveness of biomedical interventions like PrEP in reducing HIV transmission among high-risk populations (Sarkar et al., 2019). Studies such as Walensky et al. (2016) support the notion that long-acting cabotegravir has high efficacy, although its cost remains a barrier. The cost-effectiveness of structural interventions, particularly those addressing socio-economic barriers, echoes findings from interventions in sub-Saharan countries that illustrate the indirect health benefits of economic and educational support for AGYW (Remme et al., 2014). This review adds to existing literature by providing a focused synthesis on AGYW, a demographic often under-represented in economic evaluations, particularly in the context of HIV prevention.

Several gaps in the literature became apparent through this review. Firstly, there is a concentration of studies in specific countries such as South Africa, Kenya, and Zimbabwe, thereby limiting the generalizability of these findings across the continent. Moreover, while biomedical interventions have been extensively evaluated, there is a scarcity of economic evaluations for structural and behavioural approaches, such as community empowerment programs and comprehensive sexual education programs. Additionally, many studies focus only on direct costs and benefits, omitting broader economic benefits, such as indirect cost savings from improved health or educational outcomes, or increased productivity. These gaps indicate an opportunity for more geographically diverse and comprehensive evaluations in future research.

Future research should prioritize the evaluation of structural and behavioural interventions across a wider range of sub-Saharan countries to ensure broader applicability of findings. Studies that assess combination interventions incorporating both biomedical and structural components would provide a more comprehensive understanding of HIV prevention strategies for AGYW. Additionally, adopting standardized outcome measures like QALYs across studies could improve comparability and enable more cohesive evidence-based policymaking. Lastly, future studies should also consider affordability and scalability; addressing these gaps will not only contribute to a more robust evidence base but also support the development of comprehensive, cost-effective, and accessible HIV prevention strategies tailored to the unique needs of AGYW across diverse settings.

5. Conclusion

This scoping review highlights the cost-effectiveness of select HIV prevention interventions for AGYW, while also identifying critical gaps in the literature. Addressing these gaps will be essential to inform targeted, scalable, and impactful HIV prevention strategies for AGYW in sub-Saharan Africa. By building on these insights, future research can contribute to a robust evidence base that supports sustainable health policy and program development, ultimately advancing progress toward reducing HIV incidence and improving health outcomes for AGYW.

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References

Amirfar, S., Hollenberg, J.P. & Abdool Karim, S.S. 2006. Modeling the impact of a partially effective HIV vaccine on HIV infection and death among women and infants in South Africa. *Journal of Acquired Immune Deficiency Syndromes*, 43(2), 219–225. https://doi.org/10.1097/01.qai.0000230526.79341.83

Bandiera, O., Buehren, N., Burgess, R., Goldstein, M., Gulesci, S., Rasul, I. & Sulaiman, M. 2012. *Empowering adolescent girls: evidence from a randomized control trial in Uganda*. Washington, D.C.: enGender Impact, World Bank's Gender Impact Evaluation Database, World Bank Group.

Bango, F., Pike, C., Coakley, C., Bekker, L.G. & Cleary, S. 2022. A cost analysis of a sports-based sexual health education programme for adolescent girls in South African schools. *Health Policy and Planning*, 37(10), 1236–1247. https://doi.org/10.1093/heapol/czac082

Bautista-Arredondo, S., Sosa-Rubí, S.G., Opuni, M., Kwan, A., Chaumont, C., Coetzee, J., Condo, J., Dzekedzeke, K. et al. 2014. Assessing cost and technical efficiency of HIV prevention interventions in sub-Saharan Africa: the ORPHEA study design and methods. *BMC Health Services Research*, 14, 599. https://doi.org/10.1186/s12913-014-0599-9

Dupas, P. 2009. Do teenagers respond to HIV risk information? Evidence from a field experiment in Kenya. *CCPR On-Line Working Paper PWP-CCPR-2009-066*. Los Angeles: California Center for Population Research, University of California.

The Global Fund. 2022. Fight for what counts. Investment case: seventh replenishment 2022. Geneva: The Global Fund to Fight AIDS, Tuberculosis and Malaria.

Hendrickson, C., Long, L.C., Van Rensburg, C., Claassen, C.W., Njelesani, M., Moyo, C., Mulenga, L., O'Bra, H., Russell, C.A. & Nichols, B.E. 2022. The early-stage comprehensive costs of routine PrEP implementation and scale-up in Zambia. *PLOS Global Public Health*, 2(11), 1–13. https://doi.org/10.1371/journal.pgph.0001246

Jamieson, L., Johnson, L.F., Nichols, B.E., Delany-Moretlwe, S., Hosseinipour, M.C., Russell, C. & Meyer-Rath, G. 2022. Relative cost-effectiveness of long-acting injectable cabotegravir versus oral pre-exposure prophylaxis in South Africa based on the HPTN 083 and HPTN 084 trials: a modelled economic evaluation and threshold analysis. *The Lancet. HIV*, 9(12), e857–e867. https://doi.org/10.1016/S2352-3018(22)00251-X

Karim, S.S.A. & Baxter, C. 2019. HIV incidence rates in adolescent girls and young women in sub-Saharan Africa. *The Lancet. Global Health*, 7(11), e1470–e1471. https://doi.org/10.1016/S2214-109X(19)30404-8

Little, K.M., Hanif, H., Anderson, S.M., Clark, M.R., Gustafson, K. & Doncel, G.F. 2024. Preferences for long-acting PrEP products among women and girls: a quantitative survey and discrete choice experiment in Eswatini, Kenya, and South Africa. *AIDS and Behavior*, 28, 936–950. https://doi.org/10.1007/s10461-023-04202-0

Mangenah, C., Nhamo, D., Gudukeya, S., Gwavava, E., Gavi, C., Chiwawa, P., Chidawanyika, S., Muleya, P. et al. 2022. Efficiency in PrEP delivery: estimating the annual costs of oral PrEP in Zimbabwe. *AIDS and Behavior*, 26(1), 161–170. https://doi.org/10.1007/s10461-021-03367-w

Miller, T., Hallfors, D., Cho, H., Luseno, W. & Waehrer, G. 2013. Cost-effectiveness of school support for orphan girls to prevent HIV infection in Zimbabwe. *Prevention Science*, 14(5), 503–512. https://doi.org/10.1007/s11121-012-0315-0

Moodley, N., Gray, G. & Bertram, M. 2016. The case for adolescent HIV vaccination in South Africa: a cost-effectiveness analysis. *Medicine*, 95(4). https://doi.org/10.1097/MD.0000000000002528

Mudimu, E., Sardinia, J., Momin, S., Medina-Marino, A., Bezuidenhout, C., Bekker, L., Barnabas, R.V. & Peebles, K. 2022. Incremental costs of integrated PrEP provision and effective use counselling in community-based platforms for adolescent girls and young women in South Africa: an observational study. *Journal of the International AIDS Society*, 25(2), 1–9. https://doi.org/10.1002/jia2.25875

Okal, J.O., Awiti, J.O., Matheka, J., Oluoch-Madiang, D., Obanda, R., & Mathur, S. 2022. Unit costs of a community-based girl-centered HIV prevention program: a case study of Determined, Resilient, Empowered, AIDS-Free, Mentored, and Safe program. *AIDS*, 36, S109–S117. https://doi.org/10.1097/QAD.0000000000003217

Peters, M.D.J., Marnie, C., Colquhoun, H., Garritty, C.M., Hempel, S., Horsley, T., Langlois, E.V., Lillie, E. et al. 2021. Scoping reviews: reinforcing and advancing the methodology and application. *Systematic Reviews*, 10(1). https://doi.org/10.1186/s13643-021-01821-3

Phillips, A.N., Cambiano, V., Johnson, L., Nakagawa, F., Homan, R., Meyer-Rath, G., Rehle, T., Tanser, F. et al. 2021. Potential impact and cost-effectiveness of condomless-sex – concentrated PrEP in KwaZulu-Natal accounting for drug resistance. *The Journal of Infectious Diseases*, 223(8), 1345–1355. https://doi.org/10.1093/infdis/jiz667

Quaife, M., Terris-Prestholt, F., Eakle, R., Cabrera Escobar, M.A., Kilbourne-Brook, M., Mvundura, M., Meyer-Rath, G., Delany-Moretlwe, S. & Vickerman, P. 2018. The cost-effectiveness of multi-purpose HIV and pregnancy prevention technologies in South Africa. *Journal of the International AIDS Society*, 21(3). https://doi.org/10.1002/jia2.25064

Remme, M., Vassall, A., Lutz, B., Luna, J., & Watts, C. 2014. Financing structural interventions: going beyond HIV-only value for money assessments. *AIDS*, 28(3), 425–434. https://doi.org/10.1097/QAD.0000000000000076

Roberts, A.D., Barnabas, R.V., Abuna, F., Lagat, H., Kinuthia, J., Pintye, J., Bochner, A.F., Forsythe, S., Gomez, G.B., Baeten, J.M., John-Stewart, G. & Levin, C. 2019. The role of costing in the introduction and scale-up of HIV pre-exposure prophylaxis: evidence from integrating PrEP into routine maternal and child health and family planning clinics in western Kenya. *Journal of the International AIDS Society*, 22(S4). https://doi.org/10.1002/jia2.25296

Rositch, A.F., Cherutich, P., Brentlinger, P., Kiarie, J.N., Nduati, R. & Farquhar, C. 2014. HIV infection and sexual partnerships and behaviour among adolescent girls in Nairobi, Kenya. *International Journal of STD & AIDS*, 23(7), 468–474. https://doi.org/10.1258/ijsa.2012.011361

Sarkar, S., Corso, P., Ebrahim-Zadeh, S., Kim, P., Charania, S. & Wall, K. 2019. Cost-effectiveness of HIV prevention interventions in sub-Saharan Africa: a systematic review. *eClinicalMedicine*, 10, 10–31. https://doi.org/10.1016/j.eclinm.2019.04.006

Siegler, A.J., Mouhanna, F., Giler, R.M., Weiss, K., Pembleton, E., Guest, J., Jones, J., Castel, A. et al. 2018. The prevalence of pre-exposure prophylaxis use and the pre-exposure prophylaxis-to-need ratio in the fourth quarter of 2017, United States. *Annals of Epidemiology*, 28(12), 841–849. https://doi.org/10.1016/j.annepidem.2018.06.005

Tricco, A.C., Lillie, E., Zarin, W., O'Brien, K.K., Colquhoun, H., Levac, D., Moher, D., Peters, M.D.J. et al. 2018. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Annals of Internal Medicine*, 169(7), 467–473. https://doi.org/10.7326/M18-0850

UNAIDS. 2016. *HIV prevention among adolescent girls and among young women: putting HIV prevention among adolescent girls and young women on the fast-track and engaging men and boys*. Geneva: Joint United Nations Programme on HIV/AIDS, UNAIDS.

UNAIDS. 2019. *Women and HIV: a spotlight on adolescent girls and young women.* Geneva: UNAIDS. https://www.unaids.org/sites/default/files/media_asset/2019_women-and-hiv_en.pdf

UNAIDS. 2021. *Global HIV & AIDS statistics – 2020 fact sheet*. UNAIDS. https://www.unaids.org/en/resources/fact-sheet [2023, November 20].

Walensky, R.P., Jacobsen, M.M., Bekker, L.G., Parker, R.A., Wood, R., Resch, S.C., Horstman, N.K., Freedberg, K.A. & Paltiel, A.D. 2016. Potential clinical and economic value of long-acting preexposure prophylaxis for South African women at high-risk for HIV infection. *The Journal of Infectious Diseases*, 213(10), 1523–1531. https://doi.org/10.1093/infdis/jiv523

Wanga, V., Peebles, K., Obiero, A., Mogaka, F., Omollo, V., Odoyo, J.B., Morton, J.F., Bukusi, E.A. et al. 2021. Cost of pre-exposure prophylaxis delivery in family planning clinics to prevent HIV acquisition among adolescent girls and young women in Kisumu, Kenya. *PLOS ONE*, 16(4), e0249625. https://doi.org/10.1371/journal.pone.0249625

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