

A cost analysis of a sports-based sexual health education programme for adolescent girls in South African schools

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Abstract

Studies have shown that school-based sexual health promotion interventions can improve adolescent sexual and reproductive health outcomes. However, there has been insufficient evidence on the cost and cost-effectiveness of such programmes, driving poor and inconsistent investment and prioritization. This paper analyses the costs of the SKILLZ Health for Girls programme, a sports-based sexual education intervention targeted at adolescent girls in the secondary school environment. Costs were collected alongside a cluster-randomized trial, including 38 secondary schools in Cape Town, South Africa. The analysis was conducted from a provider (multi-sector) perspective and used a mixed-methods costing approach. We developed a cost data collection tool to compile cost information from one-on-one interviews, administrative data and non-participant observations of the intervention. Costs were analysed for 2019, representing a full academic year of programme implementation. The intention-to-treat analysis revealed an average cost per learner per session of \$9.92, and the cost per learner reached was estimated at \$69.43. Sensitivity analysis indicated that these costs were sensitive to the participation rates of the learners who did not complete the intervention. The cumulative cost for the scale-up scenario for the Western Cape Province based on the base-case analysis (maximizing coverage of schools but only including 30% of eligible learners within schools) was estimated at \$5 311 453.00 for a 3-year period, which exceeds the provincial conditional grant allocation dedicated to the human immunodeficiency virus and acquired immune deficiency syndrome (life skills education) for the same period, yet is comparable to the expenditure for a similar donor-funded programme within the province. The study's results will contribute to decision-making for implementing sexual education interventions in schools in South Africa and similar contexts.

Keywords: Adolescent girls, sexual health education, school-based, sports-based, cost

Key messages

- In South Africa and similar settings where gender inequality contributes to sexual ill health, there is a critical demand for evidence on the costs and cost-effectiveness of school-based sexual health interventions—to ensure prioritization and consistent investments towards the health and development of adolescent girls and young women.
- The study found that the cost per learner reached (defined as having met the minimum graduation requirement of seven sessions per learner) was \$69.43 under the intention-to-treat analysis, which was within the range of costs reported in programmes within similar contexts.
- The resource requirement for the scale-up of a sports-based sexual health education programme aimed at adolescent girls in the Western Cape Province is significant and above the current government allocation, yet comparable to similar donor-funded programmes. This highlights the debate on whether governments are spending enough on prevention programmes to deliver the desired health outcomes.

Introduction

Adolescent pregnancy is a global concern and contributes to adverse life outcomes resulting from incomplete education, unemployment and health risks in adolescent girls (United Nations Educational Scientific and Cultural Organization (UNESCO), 2017). This translates to high economic and social costs for the young mother and her child and for broader society (Morris and Rushwan, 2015). High maternal mortality and morbidity among adolescent girls, as well as high rates of sexually transmitted infections, particularly in low- and middle-income countries (LMICs), have revealed the vulnerabilities faced by this segment of the population (World Health Organization (WHO), 2019). Globally, pregnancy, childbirth and abortion complications increase health-care costs and are the leading causes of death in girls in late adolescence (15–19 years of age) (Patton *et al.*, 2009; Neal *et al.*, 2012). This is especially a challenge in sub-Saharan Africa, which has the highest adolescent pregnancy rate in the world (Mekonnen *et al.*, 2019). In South Africa, the rate of adolescent pregnancy is exceptionally high: 9% of women aged 15–17 years and 16% of women aged 15–19 years were found

to have begun childbearing in 2016 (Simbayi *et al.*, 2019). Adolescent pregnancy is a complex social issue with multiple interacting risk factors at different socioecological levels (Chung *et al.*, 2018). Evidence cites lack of knowledge as one of the significant barriers to accessing sexual and reproductive health (SRH) services and one of the key contributing factors to this problem (Jonas *et al.*, 2016).

Investing in the health and development of adolescent girls and young women (AGYW) is not only fundamental for improving the health and well-being of this group but also a strategic move towards achieving the Sustainable Development Goals (Inter-Agency and Expert Group on Sustainable Development Goal Indicators, 2016; UNESCO, 2018). Therefore, adolescent SRH is an area in need of research and evidence-based policies.

Intersectoral action for health is critical for addressing complex public health challenges (WHO, 2018). The education sector has been recognized for its positive and undeniable role in reducing unintended pregnancies and preventing other adverse adolescent sexual health outcomes (UNESCO, 2017). The school environment represents an appropriate setting to improve adolescent SRH through health promotion activities as it allows access to high numbers of adolescents (Mukamana and Johri, 2016; UNESCO, 2018), and its role has been long endorsed by the World Health Organization (Langford *et al.*, 2014). In recent years, school-based health promotion interventions have been widely implemented across the globe (Langford *et al.*, 2014; Pinto *et al.*, 2017). When well implemented, these interventions can promote health and well-being for adolescents (Lima-Serrano and Lima-Rodríguez, 2014). However, their impact can be challenging to anticipate owing to the inherent complexity of health promotion interventions, often consisting of multiple components and requiring collaboration across sectors. In addition, the school environment is a complex system, presenting contextual factors that can influence the implementation of even relatively simple evidence-based interventions (Bergeron *et al.*, 2019). Despite the availability of guidelines and tools, the implementation and evaluation of these interventions remain a challenge (Pearson *et al.*, 2015); consequently, discrepancies between expected and actual programme outcomes are often reported (Ginsburg *et al.*, 2021).

Unintended pregnancies in adolescent girls who attend South African secondary schools remain critically high, despite the country's supportive rights-based framework of laws, policies and guidelines intended to support young people's SRH needs. This includes the long-established partnership between the Department of Health and the Department of Basic Education (DBE), which implemented 'Life Orientation (LO)', a life skills, sexuality and human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) educational programme offered in schools as part of the National Curriculum. This is an important strategy as South Africa has high school enrolment and overall attendance levels. In 2019, secondary school gross enrolment stood at 103%. Although attendance is seen to decrease with increasing age for children >15 years, the attendance rate was 83% for 17 years old in 2018 (Hall, 2019; UNESCO Institute for Statistics, 2022). Life Orientation (LO) focuses on learners in Grades 4–12, and HIV and AIDS life skills education is funded through a conditional grant from the National Treasury through the DBE to all the provinces throughout South

Africa. This grant is meant to cover several activities, which include, among others, training educators and school management teams and governing bodies, co-curricular activities for the provision of comprehensive sexuality education, care and support programmes, and the appointment of learner support agents to support vulnerable learners [The Parliamentary Budget Office (South Africa), 2021].

Due to the unabating challenges, adolescent sexual health has been extensively studied in the country. Various challenges in the current LO offering have been identified and span several elements, including educator behaviour and training, the learners and the curriculum, necessitating continuous improvement of the offering (Koch and Wehmeyer, 2021). As an extension to 'LO', the DBE created a programme called 'Keeping Girls in School (KGIS)' that aimed to support vulnerable female adolescent learners (14–18 years) in no-fee schools. All public schools in South Africa are assigned to five groups called quintiles, from most poor (Quintile 1) to least poor (Quintile 5), indicating the poverty level of the school and the surrounding community. Schools with a quintile ranking of 1–3 are referred to as no-fee schools, and schools within Quintile 4 or 5 are considered fee-paying schools (Arends *et al.*, 2021). The programme offered a comprehensive approach to AGYW's health, delivered through non-governmental organizations (NGOs) and government institutions in 10 districts across South Africa with funding from the Global Fund as part of their programme to reduce HIV incidence in AGYW. The intervention used a combination prevention approach with an SRH component. In the Western Cape Province, KGIS was offered within the City of Cape Town schools as a co-curriculum programme delivered by the Desmond Tutu Health Foundation (DTHF). The core component of the SRH programme was sexual education delivered by health educators. In conjunction with the implementation of this programme, the DTHF ran a cluster-randomized trial, the Goals for Girls (G4G) study. The trial aimed to evaluate the feasibility, acceptability and impact of integrating an in-school classroom-based SRH education programme (KGIS) into an after-school sports-based programme (SKILLZ Health for Girls, herein referred to as SKILLZ) among female adolescent learners. The trial had two arms, KGIS (control arm) vs KGIS plus SKILLZ (intervention arm). SKILLZ is an evidence-based health promotion intervention and a product of Grassroot Soccer, an international adolescent health organization that uses sports as a platform to engage and retain adolescents in health education (Maleka, 2017; Grassroot Soccer, 2021). The programme runs after school and uses interactive sports-based (soccer) lessons to build social and health aptitude in AGYW. An evaluation of a girls-only after-school programme implemented in the community indicated a favourable avenue to improving HIV-related knowledge and added to the evidence supporting the delivery of single-sex interventions (Hershow *et al.*, 2015).

Despite the above efforts to improve SRH educational programmes for AGYW, there is limited literature on the costs and cost-effectiveness of these interventions (Oosterhoff *et al.*, 2018), which is needed to justify the resources required for their implementation. While there is extensive evidence on the effectiveness of sexual education programmes in South Africa, we did not find any economic evidence on these programmes. We, therefore, performed a cost analysis to evaluate the resource requirements for implementing the sports-based

SKILLZ programme within the G4G trial. The objectives of the study were the following:

- (a) To estimate the costs of an after-school sports-based sexual education programme.
- (b) To estimate the costs per session, per learner per annum and per graduating learner per annum.
- (c) To estimate the costs of programme scale-up across no-fee schools in the Western Cape Province.
- (d) To estimate the cost impact of the scale-up from the perspective of the Western Cape Education Department (WCED).

Methods

Study design

Using a combined top-down and bottom-up micro-costing approach and a provider (multi-sector) perspective, all costs were identified, measured and valued at 2019 prices to represent the costs of the SKILLZ programme as implemented within the G4G trial. Costs expressed in South African rands (ZAR) were converted to US dollars (US\$) at an average market exchange rate of R14.45 = US\$1 ([US Dollar to South African Rand Spot Exchange Rates for 2019, 2021](#)). Analysis was undertaken using Microsoft Excel. The eligibility criteria for the G4G trial included being female and a secondary school learner in Grades 8–10, estimated to be between 14 and 17 years old. The study began in January 2018 and ran for 24 months until December 2019. Schools across the Klipfontein/Mitchells Plain health sub-district, a peri-urban area located in Cape Town, Western Cape Province, South Africa, were randomized into either the intervention or the control arm. A total sample size of 2791 learners was recruited from 38 secondary schools (18 intervention and 20 control) in two cohorts over 2 years (termed Cohorts 1 and 2), with a school as the unit of randomization. This cost analysis focuses on Cohort 2, with 761 learners enrolled on the intervention arm in 2019.

Description of the SKILLZ programme

The SKILLZ programme was adapted from an existing evidence-based, interactive life skills curriculum specifically designed for South African adolescent girls between the ages of 14 and 17 years. Trained young adult female near-peer educators (aged 18–30 years) called ‘SKILLZ Caring Coaches’ ($n = 10$) delivered the curriculum with oversight and support from one master coach, a former coach with at least 3 years of experience working with similar youth programmes within a similar role and context. The overall programme administration and the supervision of the implementation, which included day-to-day running and staff management, were shared responsibilities between the programme administrator and the programme coordinator. Grassroot Soccer arranged both the curriculum design and the training of the coaches. Before implementation, all the coaches went through a 5-day initial training programme, which was followed by weekly facilitation meetings and professional development sessions. The tailored 10-session SKILLZ programme uses 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 topics covered in each of the sessions are presented in [Figure 1](#).

For each school, the sessions were presented over 5 months, equivalent to two school terms. The details that represent the typical SKILLZ session are shown in [Table 1](#). For Cohort 2, the programme’s delivery timing was reviewed and adjusted as part of the dynamic implementation, using experiences from Cohort 1. This was done to optimize the programme and improve attendance. While some Cohort 2 schools opted for an in-school programme, for this analysis, we focus on the after-school programme, which does not present any conflicts with other in-school programmes and educational priorities. Sessions were delivered directly after school, and only one session was delivered at a given school per day. The maximum capacity per coach per session was 20 learners. After each session, free transport was offered to the learners from the school to their homes. To qualify for graduation from the programme, a learner had to complete at least 7 of the 10 sessions.

Cost analysis

We developed a costing framework based on standard costing methods, costing of social and behavioural change health interventions and from examples of costing complex public health interventions and, in particular, NGO-implemented programmes ([Larson and Wambua, 2011](#); [Batura et al., 2014](#); [Drummond et al., 2015](#); [Rosen et al., 2019](#)). Costs were retrospectively estimated for 1 year, the final year of the intervention, which represented a full academic year. Due to several socioecological factors, the programme’s implementation was met with various challenges.

The evaluation of the G4G trial highlighted challenges with implementation fidelity (the degree to which the intervention was implemented as intended) ([Holliday et al., 2009](#)), which were an important mediator of study outcomes, using programme attendance as an indicator of programme performance. Although no impact on pregnancy outcomes was observed in the study, modest differences in STI prevalence and socio-behavioural outcomes were found between the intervention and control groups in Cohort 2, but only for those learners who attended seven sessions or more. These results suggest that an optimized programme may positively impact long-term sexual outcomes. While generating modest risk reduction, such interventions are an essential part of comprehensive strategies which could yield substantial cumulative benefits ([Chung et al., 2018](#)). Notwithstanding, our base-case analysis was performed using the intention-to-treat (ITT) approach (based on initial enrolment, regardless of withdrawal or loss to follow-up), representing intervention implementation under optimal conditions. The ITT approach is the most appropriate form of analysis for randomized controlled trials. It is also suitable for economic analysis ([Ramsey et al., 2001](#)).

Resource use was measured according to the scheduled activities based on the total population of learners enrolled. To understand and define the production process and implementation plan of the intervention, trial standard operating procedure documents were reviewed, one-on-one interviews were conducted with senior members of the G4G research team ($n = 2$) and non-participant observation visits were randomly made to schools in October and November 2019 ($n = 2$). Financial records from the DTHF were also accessed and



Figure 1. Topics covered in the 10-session SKILLZ curriculum

analysed to identify and categorize the expenditures contained therein, representing the different activities.

Through this process, an inventory list of the types of resources utilized was created, and the resources were organized into different cost categories. Costs were classified by phase of implementation (start-up vs post-start-up), resource type (capital vs recurrent) and whether post-start-up recurrent costs were incurred at the site or the above-site level. Start-up costs included all costs incurred from 1 January 2018 to 30 April 2018, including personnel recruitment, equipment procurement and community engagement. Post-start-up costs included programme implementation costs and were based on annual resources required to run the programme in a typical academic year post-start-up. Costs were further classified into capital and recurrent items, as shown in Table 2. In addition to start-up costs, capital costs included initial staff training and equipment. Initial staff training was done immediately after the start-up period and was treated as a capital cost. Initial training costs included trainers, a training venue and training materials. Recurrent costs included personnel (caring coaches, a master coach, a project administrator and a project coordinator), transport (for both staff and participants) and overheads (including administration and ongoing staff development). Transport costs for staff were concerned

with transportation between the DTHF head office and the different schools. Transport was also provided for learners to ensure safe travel from school to their homes, as the programme was provided after school hours. Additionally, post-start-up non-personnel recurrent costs were subdivided into site-level and above-site-level costs.

Site-level was defined as the community and school settings where the programme was offered. Above-service costs were those administrative-level activities used to support the learner-facing and community activities. The examination and inclusion of above-site costs are recommended in parallel with site-level costs (Vassall *et al.*, 2017). The scope of costs excluded any resources used for adapting the programme and those used for research purposes. In addition, the costs of school infrastructure (e.g. school hall or sports field) were excluded.

Once the scope of analysis was defined, a combined bottom-up and top-down micro-costing methodology was employed to measure resource use. For the bottom-up method, self-administered questionnaires were completed by the programme coordinator ($n=1$) and caring coaches ($n=5$). These questionnaires revealed that the total time required to perform a SKILLZ session, including travel time, set-up and clean-up, and the actual session

Table 1. Details of the activities undertaken during a typical SKILLZ session

Opening circle
<ul style="list-style-type: none"> • Gather all girls to welcome them • Review the last SKILLZ practice and share the schedule • Start the session with an energizer • Warm-up stretches and exercises
Opening team time
<ul style="list-style-type: none"> • Split players into teams to do a mindfulness and/or breathing activity • Players check-in with their teammates
Life SKILLZ activity
<ul style="list-style-type: none"> • Bring two teams together and lead the players through the day's activity or game
Closing team time
<ul style="list-style-type: none"> • Closing check-in for each team with their coach • The coach facilitates discussion on the activities of the day and players think about how they have/will apply what they learned to their lives
Closing circle
<ul style="list-style-type: none"> • Player teams come back together as a big group to sing, dance and cheer together

(excluding preparation time) varied significantly from a minimum of 1 h 50 min to a maximum of 3 h 50 min (Table 3). The time estimates fluctuated according to the school's properties, including location and configuration. On average, the total time was 2 h 48 min (median of 2 h 50 min). The average contact time with the learners per SKILLZ session was 1 h 7 min, with the longest session lasting 90 min and the shortest 45 min. The average waiting time per school was 19 min. The average travel time from the head office to the school varied from 30 to 40 min depending on the distance to the particular school (an average of 34 min). In addition, interviews with staff from Grassroot Soccer ($n=2$) enabled an estimate of initial training costs based on the average number of coaches typically trained during the 5-day initial training period.

In contrast, the top-down method was used to allocate the remaining costs, as indicated in Table 2. For this method, we followed the six-step methodology for costing NGO-implemented programmes described by Larson and Wambua (2011). We reviewed the G4G study financial records and organized the itemized expenditures into different categories.

Once all resources were identified and measured, various methods were employed to value these as economic costs. All start-up and capital costs incurred in 2018 were adjusted for inflation to 2019 prices using the average consumer price index and converted to 2019 US dollar prices. Start-up costs were treated as capital costs. For all capital costs, we assumed a useful working life of 2 years, which was the duration of the trial. We annualized them using a 3% discount rate (i.e. an annualization factor of 1.914), as this is the rate generally applied in global health evaluations (Basu and Ganiats, 2016). Financial costs were converted into economic costs by including volunteer costs, reflecting the next best use of these resources. Volunteers participated in community-level activities and were given a stipend used in the analysis as the value of their time. The time for all personnel was valued using *de facto* wages and fringe benefits from the financial records. To determine the cost per hour of staff time, we divided the annual salary by the annual hours, taking into consideration

Table 2. Main cost categories and methodology

Cost categories	Cost subcategories	Costing methodology
Start-up costs		
	Assets (computers and laptops)	Top-down micro-costing
	Equipment	Top-down micro-costing
	Furniture and fittings	Top-down micro-costing
	Administration support	Top-down micro-costing
	Community activities	Top-down micro-costing
	Advertising	Top-down micro-costing
Post-start-up costs		
Capital costs		
	Computers and laptops	Top-down micro-costing
	Staff training	Bottom-up micro-costing
	Other equipment	Top-down micro-costing
Recurrent costs		
Personnel costs		
	Master coach	Bottom-up micro-costing
	Coaches	Bottom-up micro-costing
	Programme administrator	Bottom-up micro-costing
	Programme coordinator	Bottom-up micro-costing
Above-site level costs		
	Computer consumables	Top-down micro-costing
	Administration and support	Top-down micro-costing
	Network and costs	Top-down micro-costing
	Meetings	Top-down micro-costing
	Consultant fees	Top-down micro-costing
	Continuous development	Top-down micro-costing
Site-level costs		
	Maintenance activities	Top-down micro-costing
	Community activities	Top-down micro-costing
	Advertising and promotion	Top-down micro-costing
	Transport costs	Top-down micro-costing

the total working hours for the year 2019 and adjusting for annual leave days ($n=20$), sick leave days ($n=10$) and public holidays ($n=12$). We then multiplied these hourly costs by the number of hours worked on the project for each personnel type. At the start of the project, caring coaches were employed on a 6-h workday, but for Cohort 2, after optimizing the programme, the workday was extended to 8 h for all personnel. This extension was made to accommodate travel time and preparation before the sessions. We could not ascertain the amount of time required for preparation; as a result, this was omitted from the analysis.

Table 3. Length of time spent on SKILLZ programme activities

Average school visits per day and time per SKILLZ school visit in minutes					
Travel from head office to school 34.00	Waiting time at school 20.00	Set-up 17.00	Intervention time 68.00	Clean-up 16.00	Avg. schools visited per day 1.8
Total time per session SKILLZ session per coach per school 2.8 h			Actual time as the percentage of maximum hours per coach per day 70%		

Once all cost components were measured and valued, we estimated the total annual cost of implementing the intervention. Annual equivalents for start-up and capital costs were calculated as categorized from expenditure records. These costs were annuitization and divided equally between Cohort 1 and 2 intervention schools, with nine schools included in each cohort. These costs were then added to the post-start-up costs, which were only estimated for 2019 (the base year for the analysis). Personnel costs, measured and valued separately, were also added to calculate the annual total cost. Once the annual total cost was obtained, this was further allocated by the unit of service into a cost per session, a cost per learner per annum and a cost per learner graduating per annum as expected according to the prescribed intervention activities. This approach enabled an understanding of the resource requirements for delivering the intervention as intended.

Sensitivity analysis

The socioecological setting diminished the SKILLZ intervention's implementation fidelity, resulting in discrepancies between expected and actual programme performance. For this reason, we conducted a per-protocol analysis as a sensitivity analysis to investigate how the programme attendance rates affected costs. A per-protocol analysis is based on a subgroup of participants in the ITT population who completed the intervention without deviations from the protocol requirements (Tripepi *et al.*, 2020). To model the robustness of the base-case scenario results to changes in implementation fidelity, we conducted a series of one-way deterministic sensitivity analyses to unpack the variation in the cost per learner. This method can assess the sensitivity of a study's results to a variation of one or more parameters. In one-way sensitivity analysis, the value of each parameter is varied while holding all other parameters constant (Limwattananon, 2008). We determined an empirical average cost per session across all schools.

Moreover, we modelled an extreme-case analysis based on best- and worst-case scenarios using the average attendance per session for best- and worst-performing schools. In addition, we performed a public sector scenario based on the ITT analysis, in which transport for staff and learners was treated as a research cost. In this scenario, we assumed that the equipment to run the sessions was available at each school. It was also assumed that staff used public transport to get to the participating schools and learners used existing means of transport from school after attending a session.

Costs of scaling up the SKILLZ programme

We assessed the financial implications of increasing the programme coverage by performing a scale-up analysis. As the

SKILLZ programme was implemented as a research project, we defined three scale-up scenarios for the Western Cape Province over 3 years (2022–24) at varying coverage levels, in alignment with the DBE's 5-year basic education sector plan, titled 'Action Plan to 2024: Towards the Realisation of Schooling 2030' (South Africa National Department of Basic Education, 2020). The sector plan provides guidance on the department's priorities for establishing and developing a South African schooling system. The objectives of our scale-up analysis were to model the total cost of scaling up the intervention and compare the three different scenarios. We adapted the methods from another study of sexual education programmes (UNESCO, 2011). The scale-up analysis was constructed using the results from the ITT analysis and based on the cost per learner reached. Two variables were used to model the scenarios, i.e. (1) scale-up to reach a higher percentage of eligible schools and (2) scale-up to reach a higher percentage of eligible learners within these schools. Projections for future costs were made using 2019 prices; consequently, we did not discount.

Scenario 1

This scenario demonstrated what a large-scale expansion of the SKILLZ programme in no-fee schools would cost, with high coverage of schools and high coverage of learners within these schools. We assumed that the WCED would provide the programme as a mandatory part of the curriculum in the province. We used 2020 data from the Western Cape Province to construct the scenarios. In 2020, there were 384 public high schools and 80 combined schools, and a total of 385 454 high school pupils in Grades 8 to 12 (Western Cape Education Department (WCED), 2021). The South African school system is characterized by inequality of resources (Amnesty International, 2020). We, therefore, assumed that two-thirds of these schools, and correspondingly two-thirds of the total number of pupils in the Western Cape Province in 2020, would be in the no-fee category. From this, we estimated that 115 000 girls would be between the ages of 14 and 17 years (250 learners per school), representing 30% of the total population of high school pupils. We assumed a linear increase in coverage, with the same increase in coverage ($n = 102$) year-on-year. The programme would be introduced to 102 no-fee schools annually, and a total of 306 high schools (including combined schools) would be covered by 2024. We assumed that enrolment would be at 80% per school. This scale-up scenario is quite considerable and likely idealistic, but we intended to demonstrate the impact a scale-up to cover the entire province would have on costs.

Scenario 2

This scenario represented low coverage of schools with high coverage of learners within schools, thus promoting efficiency.

We determined the cost impact if there were an increase in programme uptake in the current schools to reach 80% before starting implementation in any new schools. The increase in coverage of schools would follow a linear process, with an additional nine schools per year (2022–24).

Scenario 3

We determined the cost impact of high coverage of schools and low coverage of learners in this scenario. The focus is on expansion into new schools at a rate that would ensure 80% school coverage with a 30% learner coverage within these schools to accommodate the highest risk cluster for sexual ill health.

Results

A total of 761 learners from nine schools allocated to the intervention arm were enrolled in the programme in 2019, with 10 SKILLZ coaches and 1 master coach delivering the sessions. The programme coverage (expressed as the number of learners that attended at least one session as a percentage of the total number of learners enrolled) was an average of 72%

across all the schools. A total of 379 sessions was expected across all nine schools for the 761 learners, with a capacity of 20 learners per coach. Each session was expected to be run by more than one coach per school to accommodate all the learners while observing the maximum capacity per coach. Direct programme costs for the year 2019 are presented in Table 4.

The total 1-year cost of the SKILLZ programme was estimated to be \$75 183.59.

Start-up and capital costs for 2019 accounted for 4% and 2%, respectively. The unit cost for the initial 5-day training course was \$240.31 per SKILLZ coach and \$2643.38 for 11 coaches. The total recurrent operational costs for programme delivery and maintenance (excluding personnel) accounted for 82% of the overall costs, as shown in Figure 2. Above-site delivery site costs accounted for 37% (\$22 951.82) of these recurrent operational costs, and almost half of the above-service delivery site costs were administration and support costs. Of the 63% (\$38 490.05) of total operational costs, which represented costs concerned with the site-level delivery of the intervention, 74% were transport costs for both staff and participants, which amounted to 53% and 21%, respectively.

The total personnel cost for learner-facing activities for the intervention for 2019 was \$8944.60, only accounting for 12% of the total programme costs for 2019. Table 5 details the annual cost to company per personnel type from which we worked out unit costs per session. These costs were calculated as total hours worked multiplied by the cost per hour. Hours worked were based on the average SKILLZ session of 2.8 h. The average coach’s salary plus benefits was \$3.40 per hour (based on an annual salary of \$6247.18 in 2019 USD, including 6% for benefits). The average time worked by each caring coach to deliver the intervention (under the ITT scenario) per year was estimated at 101 h at the cost of \$359.

Table 4. Total costs for the SKILLZ programme according to the phase of implementation

Cost measure	Average cost
Start-up costs (annuitized)	3029.56
Post-start-up costs	
Capital costs (annuitized)	1767.58
Recurrent costs	
Recurrent costs (excluding personnel)	61 441.87
Personnel costs	8944.60
Total costs per full year of implementation	75 183.59

All costs are presented in US\$.

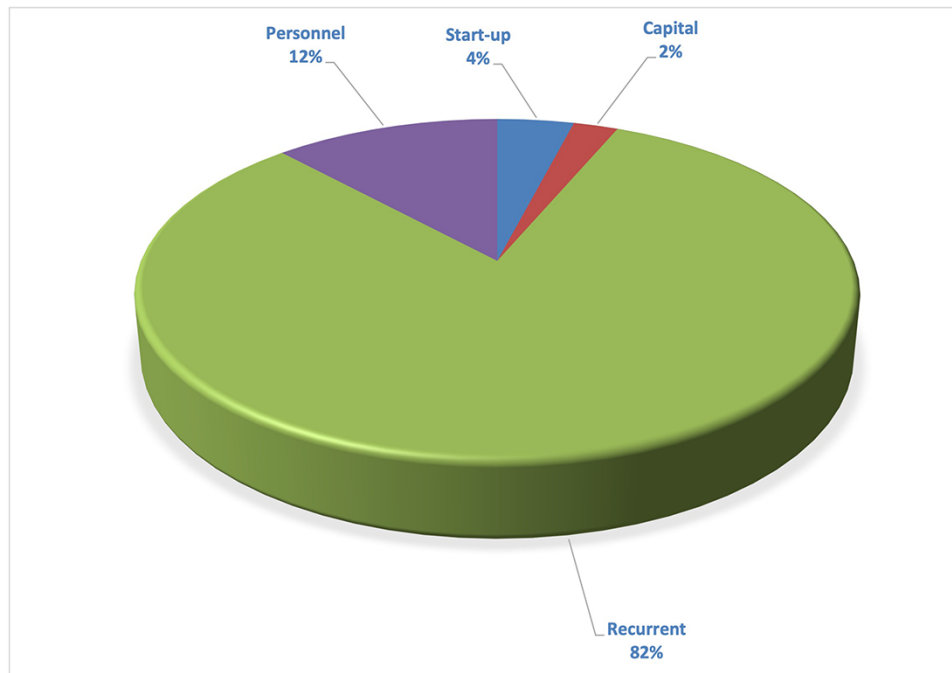


Figure 2. Distribution of the total programme costs

Table 5. Personnel cost per year and per session (2019)

Personnel type	Annual cost to company	Unit cost per hour 2019 USD	Cost per session (direct/oversight)
Caring coach	6 247.18	3.55	9.94
Master coach	19 059.35	10.83	3.03
Project coordinator	39 877.80	22.66	6.34
Project administrator	26 937.22	15.31	4.29
Total costs	92 121.55	52.34	23.60

All costs are presented in US\$.

The cost per session consisting of 20 learners was \$198.37. The cost per learner per session was estimated at \$9.92, and the cost per learner reached (met the minimum graduation requirement of seven sessions per learner) was estimated at \$69.43. Costs per completed curriculum were projected at \$99.19. The cost per school is estimated at \$8353.73.

Sensitivity analysis

Attendance rates per session across all intervention schools were lower than expected, at an average of 47% across all sessions for all the schools. Of the average 84 learners expected per session across all schools, only 38 were in attendance. Due to the capacity of 20 learners per coach, four coaches were expected to run the sessions per topic in each school. Instead, only two coaches ran a session to accommodate the number of learners present. As a result, only 172 of the 379 expected sessions took place. The total annual cost for these 172 sessions was estimated at \$70 298.28, which translated to an average cost per session of \$408.71 and an average cost per learner per session of \$21.51. The average cost per learner reached was \$150.58, and the cost per learner per curriculum completed was \$215.11. These results are presented in a tornado diagram in [Figure 3](#).

The best-performing school had a 72% attendance rate across all sessions, at an estimated \$29.88 per learner per session, while the worst-performing school had an attendance rate of 26% at \$81.64 per learner per session. In the public sector scenario, the costs per learner per session and learner reached were \$6.33 and \$44.29, respectively, and the cost per school was estimated at \$5329.38. [Figure 4](#) shows the difference in unit costs for each scenario.

Scale-up analysis

For Scenario 1, the total cumulative number of adolescent girls reached would be 204 000. The total cost for learners who have completed the curriculum would have accumulated to \$21 245 811.98. For Scenario 2, with each school comprising an estimated 250 eligible learners, the accumulated number of learners in the programme would be 18 000 at the end of 2024. The total accumulated cost would be \$1 874 630.47. In Scenario 3, the total accumulated costs at the end of 2024 for accumulative 76 500 learners reached would amount to \$5 311 453.00. [Figure 5](#) illustrates the cumulative learners reached and cumulative total costs for the three scenarios, adapted from the analysis by [UNESCO \(2011\)](#).

Cost impact analysis of provincial scale-up

The KGIS programme, which focused on AGYW, was funded under the Global Fund AGYW initiative as part of the

ZAF-C Grant, which ended in March 2019 ([Mathews et al., 2020](#)). We, therefore, assume that the DBE would adopt the SKILLZ programme. The estimated amount allocated to the conditional grant in the Western Cape Province towards the HIV and AIDS life skills education programme amounted to \$4 762 346.36 from 2019 to 2021 before COVID-19-related reductions [[Government Communication and Information System \(South Africa\), 2020](#)]. Implementing the SKILLZ programme under Scenario 3 through this conditional grant would require an additional 12% of the total allocated amount. For this reason, we compared the resource requirement for SKILLZ against the expenditure from the Global Fund grant allocated to the Western Cape Department of Health as part of the ZAF-C grant. An amount of \$12 756 343 was spent over a 3-year period (2016–19), which covered the implementation of prevention programmes for AGYW in and out of school. The cost of Scenario 3 represents 42% of the above total 3-year expenditure, notwithstanding exchange rates and inflation changes.

Discussion

In this study, we calculated the 1-year cost of implementing the SKILLZ programme, a sports-based sexual education intervention in Cape Town, South Africa. Reducing the rates of sexual ill health among AGYW is a vital policy outcome due to the associated economic costs ([Paton et al., 2020](#)). Although school-based SRH programmes are broadly accepted as an effective approach to reducing high-risk sexual behaviour among adolescents ([Mason-Jones et al., 2016](#)), many ministries of education are reported to implement SRH programmes without adequate understanding of the resource requirements, which negatively influences sustainability ([UNESCO, 2011](#)). Other challenges to the effective implementation of SRH education programmes in LMICs include a lack of economic evidence, which results in insufficient funding allocated to such programmes ([UNESCO, 2019](#)). In addition, stakeholders from the sectors involved in collaborative action in LMICs operate under resource-constrained environments.

Notwithstanding, co-financing these programmes could contribute to effective public investment and aid in overcoming economic sectoral inefficiencies ([McGuire et al., 2019](#)). Through this analysis, we hope to promote intersectoral collaboration by providing evidence to support and facilitate intersectoral action for health in LMIC settings. Moreover, this paper presents a methodological approach to quantifying the costs of implementing a school-based intervention.

In South Africa, where unintended pregnancies are a significant public health challenge, contributing to high levels of school drop-out ([Hartnack, 2017](#)), the school has become the primary means of promoting SRH education for school-going young people ([Francis, 2010](#); [Ngabaza and Shefer, 2019](#)). Notwithstanding this positioning, the goal of successfully implementing sexual education within secondary schools in the country has been undermined by various challenges ([Swanepoel and Beyers, 2019](#)). Due to the urgent need for empowering youth and preventing sexual ill health, the topic of school-based SRH education has become a key focus in South African research ([Swanepoel and Beyers, 2019](#)). There is a critical demand to increase and improve



Figure 3. Results of one-way sensitivity analysis (tornado diagram)

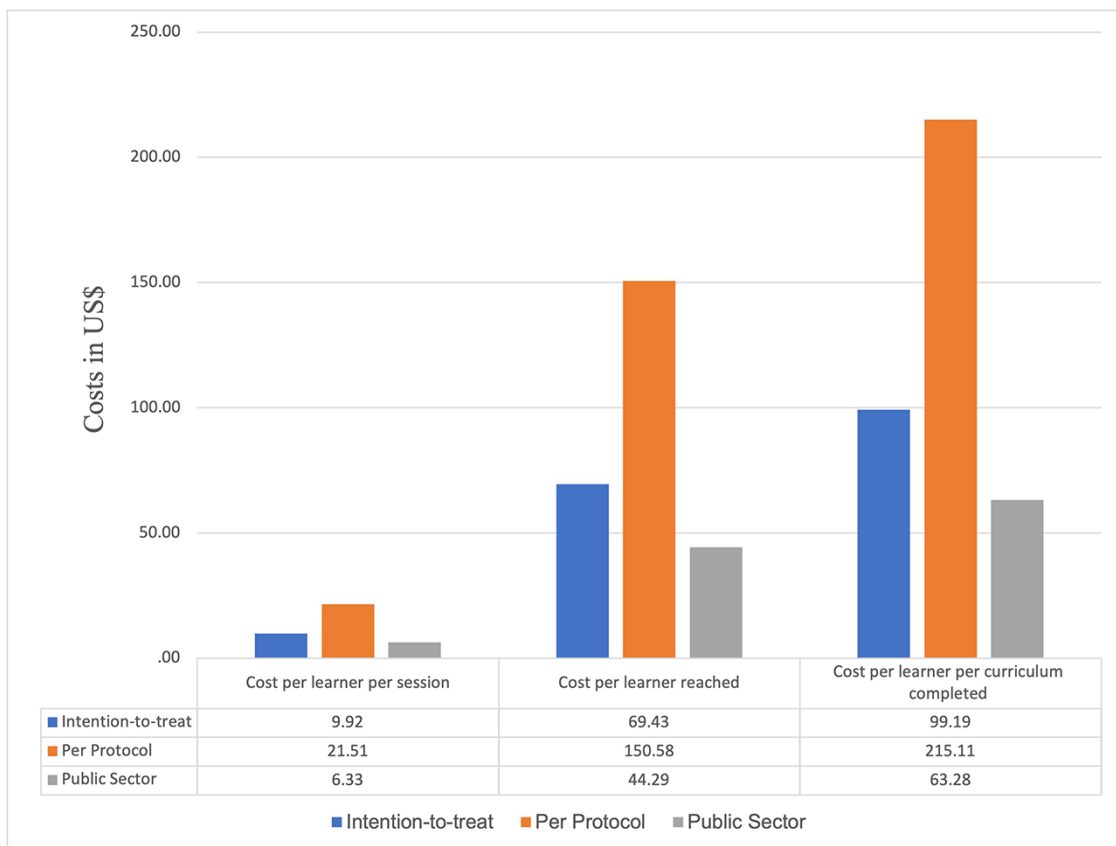
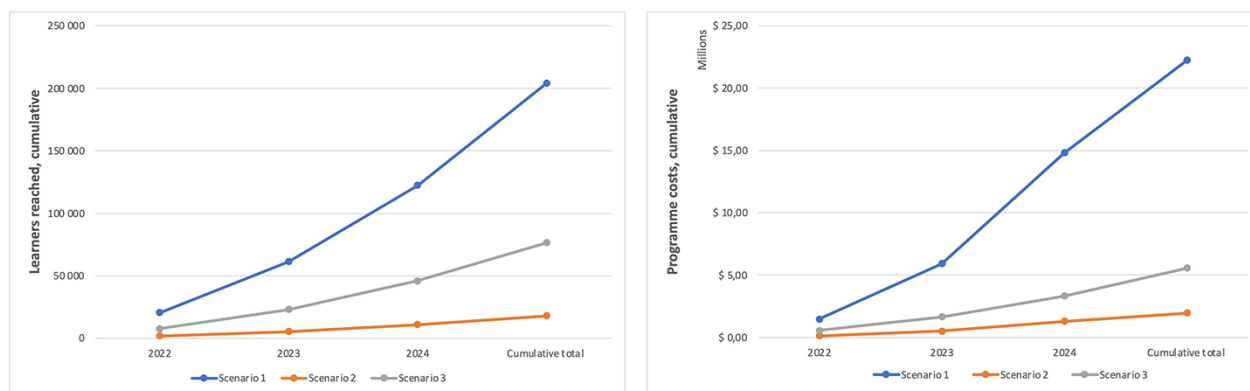


Figure 4. Comparison of costs between scenarios

the provision of SRH education across schools nationally (Ngabaza and Shefer, 2019). Consequently, effectiveness and efficiency elements are critical for advancement in this area.

To our knowledge, this is the first cost analysis evaluating a school-based SRH education programme in our context, specifically one examining the cost of a sports-based



Scenario 1: high coverage of schools, and high coverage of learners
 Scenario 2: low coverage of schools with high coverage of learners
 Scenario 3: high coverage of schools, and low coverage of learners

Note: Scale-up scenarios and associated costs. Adapted from UNESCO. (2011). Sexuality Education Programmes in Six Countries Full Report. <http://unesdoc.unesco.org/images/0021/002116/211604e.pdf>

Figure 5. Cumulative learners reached and cumulative total costs for each of the scenarios

behavioural intervention for adolescent girls in a school setting.

Transport costs were the main cost driver for these operational costs. In South Africa, where gender-based violence against women and children is endemic, providing safe transport home for adolescent girls is critical for an after-school programme (Mathews *et al.*, 2015). To prevent underestimation of costs for public health intervention, classifying the above site against site-specific costs is one of the critical considerations (Sohn *et al.*, 2020). In our analysis, above-site costs accounted for just over a third of the total recurrent operational costs; almost half were administration and support costs. This might be important for scaling up the intervention as this might require more administration to increase the coverage to all schools in the Western Cape, should the programme remain a co-curricular offering. The cost per session and per learner was sensitive to the participation rates of the learners who did not complete the intervention. This highlights the need to invest in ongoing implementation support and to understand the processes at play during programme implementation to attend to the complexities brought by both the intervention and the context (Darlington *et al.*, 2018; Sims-Gould *et al.*, 2019). A socioecological analysis could be used to better understand situational factors that limit behavioural change.

Nevertheless, if the WCED adopted the programme, it might be integrated as a curricular component of the secondary school curriculum instead of a co-curricular intervention. Due to the compulsory nature, a curricular programme could improve learner participation and address barriers preventing successful implementation (McClinton Appollis *et al.*, 2021). In addition, the public sector scenario in the sensitivity analysis was the least costly, showing a 36% decrease from the base-case cost. The integration within the school programme would offer the most potential for scale-up and sustainability. The cost-share of personnel in the programme is surprisingly low. This could be advantageous for scale-up under the WCED if they choose to continue to use the peer coaches and not rely upon contested teacher time and attention. The cost per learner reached of \$69.43 under

our ITT analysis was within the range of costs reported in similar programmes. The costs per learner reached in pilot sexuality education programmes implemented in Kenya and Indonesia were \$50 and \$160, respectively (Kivela *et al.*, 2013). The resource requirements for the scale-up of the SKILLZ programme across all Western Cape Province schools to 30% of eligible learners at each school exceeded government funding. Still, they were comparable to donor funding on similar provincial programmes. This highlights the debate on whether governments are spending enough on prevention programmes to produce the desired health outcomes.

Limitations

In interpreting the results of our study, some limitations should be considered. While we followed rigorous methods for collecting costs, some costs were based on financial records and site visits documented within routine programme operations and not explicitly for our cost analysis. Moreover, costs were incurred as part of a trial different from the real-world implementation costs.

Conclusion

Despite limitations, this study demonstrated how a cost evaluation could be applied to a behavioural intervention targeting school-going adolescent girls. Such assessment can contribute valuable information to public health researchers and professionals that appraise and evaluate community-based health promotion interventions.

Data availability

The data sets generated during the study are available from the corresponding author upon reasonable request.

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Author contributions

F.B. and S.C. made substantial contributions to the conception, design and data analysis, management and interpretation of study results. L.G.B., C.P. and C.C. contributed to the work's conception and interpretation of results. F.B. further did the data collection and created the first draft of the manuscript. All authors (F.B., C.P., C.C., L.G.B. and S.C.) critically reviewed the article and read and approved the final manuscript.

Reflexivity statement

The authors are all female and represent different disciplines and levels of seniority. While two authors specialize in economic evaluation, three have expertise in adolescent health. All the authors are locally based and have extensive experience conducting quantitative research in South Africa.

Ethical approval. Ethical approval for the trial (HREC REF: 138/2018) and the cost analysis (HREC REF: 045/2020) was granted by the Human Research Ethics Committee of the University of Cape Town.

Conflict of interest statement. The authors declare that they have no conflict of interest.

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