

## Research Article

ISSN: 2573-3877

### Economic Evaluation of School Health Programmes: A Mapping Review (2005-2015)

Fernanda Piana Santos Lima de Oliveira<sup>1\*</sup>, Galba Freire Moita<sup>2</sup>, Efigênia Ferreira e Ferreira<sup>3</sup>, Andreia Maria Araújo Drummond<sup>3</sup>, Andrea Maria Duarte Vargas<sup>3</sup>, Sônia Dias<sup>4</sup> and Zulmira Hartz<sup>5</sup>

#### Affiliation

<sup>1</sup>Fipmoc University Center, Montes Claros, Brazil

<sup>2</sup>Fundaçao Oswaldo Cruz (FIOCRUZ), Brazil

<sup>3</sup>Faculty of Dentistry, Federal University of Minas Gerais, Brazil

<sup>4</sup>NOVA National School of Public Health, Public Health Research Centre, Universidade NOVA de Lisboa and Comprehensive Health Research Center (CHRC), Portugal

<sup>5</sup>Institute of Hygiene and Tropical Medicine (IHMT), New University of Lisbon (UNL), Portugal

\*Corresponding author: Fernanda Piana Santos Lima de Oliveira, Fipmoc University Center, Montes Claros, Minas Gerais, Brazil, Tel: +55 (31) 98449-7715, E-mail: fernandapiana@gmail.com

Citation: Oliveira de FPSL, Moita GF, Ferreira EFE, Drummond AMA, Vargas AMD, Dias S and Hartz Z. Economic evaluation of school health programmes: a mapping review (2005-2015) (2020) Nursing and Health Care 5: 33-40.

Received: Oct 1, 2020

Accepted: Nov 23, 2020

Published: Nov 30, 2020

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#### Abstract

The economic evaluation has gained popularity in recent years but, to be useful, it must be conducted and reported accurately. The aim of this study was to perform a mapping review identifying published articles about economic evaluation of school health programmes, characterizing and qualifying what has been published, and discussing how these studies were conducted. The review was carried out in PubMed for studies published in the past decade. The search strategy included "cost", "economic evaluation", "school health services", "school health", "school health promotion" and "school health program". Thirty-five studies were assessed. The studies addressed ten different countries and cost-effectiveness was the most economic evaluation used. The narrative synthesis gathered the selected studies in nine groups, demonstrating a high heterogeneity of methods and results in the economic analyzes performed. There is evidence that school health programmes can bring benefits to the target population and society. The gathered information in this article can contribute to performing economic evaluation studies and improving programmes.

**Keywords:** Cost, Economic evaluation, School health.

**Abbreviations:** MeSH- Medical Subject Headings, Economic evaluation, SBSP- School Based Sealant Programmes, NASBHC-National Assembly On School-Based Health Care, STDs-Sexually Transmitted Diseases, SBAT-School-Based Asthma Therapy.

#### Introduction

Economic evaluation in health is a tool used by planners to select an option that offers more advantages based on cost and results presented by intervention, programme or policy. Actions, costs, and consequences are analyzed assisting and contributing to the policy-decision process, providing information to new interventions and health technologies, enabling a resource projection to expand the benefits to a wider population [1]. The need for greater resources allocation in public health programmes, combined with the growing technological sophistication, increased the popularity of economic evaluations. According to Moodie, et al. [2] this popularity was due to the need to prove the efficiency of health programmes, providing information to policy makers when allocating resources for intervention proposals. However, economic evaluation should be conducted and reported accurately to contribute in the definition and value measurements of public health interventions. With the increasing number of publications about economic evaluation in health

interventions, the monitoring related to the quality of such assessments became needed. The availability of data obtained from these evaluations has been limited, mostly due to the use of methods that have not been developed for economic analysis in health. Rigorous, high-quality assessments of economic evaluation should become usual, demonstrating conclusively the benefits and merits achieved by public health interventions, and inform the government and community if the investments resulted in any benefit. Among the interventions that need consistent evaluation, there is the School Health Programme. This type of programme consists of an important strategy to enhance learning and the health of children, adolescents and school community. The difficulty in estimating benefits is a challenge for the programmes and to the decision makers, as well as the management of the various funds mainly received from the health and education sectors. Therefore, the aim of this study was to perform a mapping review identifying published articles about the economic evaluation of school health programmes in the past decade, discuss how these studies were conducted and identifying gaps in the literature for further revisions or research to be planned [1-4].

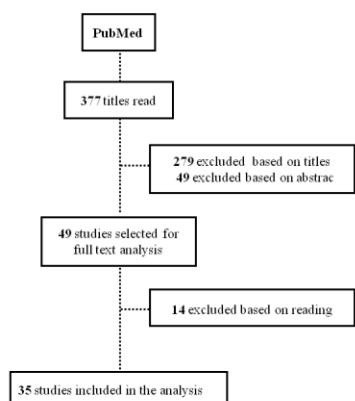
**Citation:** Oliveira de FPSL, Moita GF, Ferreira EFE, Drummond AMA, Vargas AMD, Dias S and Hartz Z. Economic evaluation of school health programmes: a mapping review (2005-2015) (2020) Nursing and Health Care 5: 33-40.

## Methods

A mapping review was carried out in August 2015. We screened the electronic database PubMed/Medline for studies published between August 6th, 2005 and August 3rd, 2015. Keyword and MeSH (Medical Subject Headings) searches were conducted to assess studies that performed an economic evaluation of school health programs. The search strategy included the terms "cost", "economic evaluation", "school health services", "school health", "school health promotion" and school health program. The language was restricted to English, Spanish and Portuguese. The articles selection and analyzes were conducted independently by two reviewers. The first selection was conducted by reading the title and abstract. Articles addressing economic evaluation of school health programmes and carried them out were included and studies that did not perform the economic evaluation and did not approach the topic of interest were excluded (**Figure 1**). Once the studies were selected for final analysis, the following data of each study was extracted: authors, the country where it was performed, intervention identification, type of economic evaluation used and the results through cost and effects measurement adopted (**Chart 1**).

## Results

A flowchart describing the selection process is presented in Figure 1. Initially, 377 citations were identified from the past ten years. Thirty-five studies were qualified for the final review analysis.



**Figure 1:** Flowchart of selection process, 2015.

The studies were performed in United States (57.15%), followed by United Kingdom (8.58%), Australia (8.58%), Spain (5.72%), Canada (5.72%), European countries combined (2.85%), Netherlands (2.85%), Sweden (2.85%), New Zealand (2.85%) and India (2.85%). The type of economic evaluation used by the studies were cost-effectiveness (51.42%), cost-benefit (17.15%), costs (14.28%), two types of economic analyzes combined (14.28%) and cost-consequence (2.85%). The authors, country, type of school health program, and economic evaluation used and the results through cost and effects measurement adopted are shown in Chart 1.

### Chart 1: Selected studies on economic evaluation of school health programmes, 2015

The narrative synthesis gathered the selected studies in nine groups: (1) physical activity, healthy diet and obesity prevention; (2) reducing tobacco use among adolescents; (3) sex education, early pregnancy prevention and sexually transmitted diseases (STDs); (4) mental health and violence reduction; (5) preventive and clinical activities related to dental caries; (6) prevention of childhood asthma; (7) activities in

school-based health centers; (8) partnerships for child health; (9) other studies represented by a single study of each theme such as: children immunization against influenza in schools, excessive sun exposure protection program and gardening and cooking.

## Discussion

The present mapping review was performed to analyse articles published on economic evaluation of school health programmes. The School Health Programmes can provide one of the most effective means available for improving the health. The cost-effectiveness was the type of economic evaluation most used between the studies analyzed.

Phillips, et al. [3] discussed the feasibility and validity of economic valuation techniques to develop priorities in public health programmes. Health promoters and economists use different analyses principles, different methodologies, and this can lead to an adjustment failure between the data provided and the economic evaluation requirements. From the selected studies, twelve were related to physical activity, healthy diet and preventing obesity programmes. Studies support the benefits of childhood obesity prevention programmes through school interventions, affirming the high potential of prevention of the overweight in childhood. Eight studies described not only the complete methodology of the intervention programme but also, how the economic evaluation was performed.

Partnerships and involvement of the local community, as well as analysis of the context in which the program will be developed, results in greater impact and sustainability in relation to reducing costs and achieving positive changes in the community, children and their families. Interventions performed during regular school hours and those carried out through the extension of the school day with compulsory participation are more feasible in relation to reach and costs per student than pre and post school interventions. It is important to establish a method of cost-effectiveness analysis, which results in economic estimates, so that the proposed intervention is worth the money spent [2,4-15].

The approaches used should ensure that economic assessments can be compared for the purpose of deciding on the allocation of resources and products. The harmful effects of smoking are well known in the literature. Four studies were related to tobacco, which is responsible for thousands of deaths each year in the world, and a current international action to control its use exists. In recent years, tobacco prevention at school age and in schools programmes are widely adopted and have shown to be effective in reducing consumption and early progression.

All economic evaluation studies presented intervention programmes relatively low-priced to implement and with high gains to the tobacco user health. Prevention programmes of sexual and reproductive health are necessary among adolescents and young adults. The school age mother has strong tendency not to finish her studies, and the babies are more likely to be born with low weight and/or premature. Also, the prevention programmes for Sexually Transmitted Diseases (STDs) in schools are essential to establish safe sexual behavior before an unsafe occur, improving knowledge and attitudes [15-22].

The study by Key, et al. [20] behind the inclusion of social assistance services in school associated with integral health care for adolescent mothers and their children as an effective intervention in reducing early pregnancy. In the Terris-Prestholt, et al. [21] study an economist conducted the data collection, and a timeline was created to allocate the cost per component. The study by Ateka, et al. [22] revealed generous differences regarding the degree of benefits, i.e., the STD prevention program in schools, was more cost-effective for the feminine sex. The behavior issues among children, and young adults create personal and social problems related to criminal activity, illegal substance usage, early sexual initiation and sexually transmitted diseases [23].

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Groups	Authors/ Country	Program Evaluated	Analyses Type	Results
				Evidence
Physical activity, healthy diet and obesity prevention	Sharma, et al. [13]	Food cooperative in schools to increase access, continuity and education in the consumption of fruits and vegetables.	Cost effectiveness	Collaboration with the food bank allowed access to fresh produce at a minimum cost of \$ 4.31 / family / week, and the parent survey showed significant improvements in home-eating practices ( $p <0.05$ ).
	Reznik, et al. [12]	Physical activity in the classroom for kindergarten and first grade students.	Cost effectiveness	Students in the intervention group gave a significantly greater number of steps than the controls ( $p = 0.0048$ ). The proportion of overweight students was higher in the control group ( $p = 0.07$ ). Estimated intervention costs \$ 1,500 USD for a school year.
	Babey, et al. [14]	School programs to increase physical activity	Cost effectiveness	Two programs were significantly superior in scope and cost per student: extending the school day with compulsory attendance of physical education and offering breaks of short physical activity (10 minutes) during regular classroom hours.
	Beets, et al. [9]	Programme that include physical activity and educational support after classes for elementary school students, including lunch breaks.	Cost benefit	The study resulted in a savings of 24.5% in healthy snacks, and improved snack quality, but was unable to cope with the price barriers associated with vegetables, was not sustainable.
	Pil, et al. [5]	A method to estimate the cost-effectiveness of the x-intervention: a obesity prevention program in European preschools.	Cost effectiveness Cost benefit	The proposed model resulted in estimates of long-term savings and health benefits at participating schools relative to non-participants, as well as guiding other cost-effectiveness analyzes of childhood obesity prevention programs.
	Rush, et al. [6]	Program to improve overall health and reduce the weight of school children.	Cost effectiveness Cost benefit	The program proved to be cost-effective when compared to similar interventions and is likely to be cost-effective when compared to health care and prevention activities funded by the local government health system.
	Moodie, et al. [2]	Programme of a healthy diet, physical activity, and healthy weight promotion in primary and preschools.	Cost effectiveness	The intervention cost AUD0.34M (\$0.31M; \$0.38M) annually, and resulted in savings of 547 (104; 1209) BMI units and 10.2 (0.19; 21.6) DALYs. This translated to modest cost offsets of AUD27 311 (\$1803; \$58 242) and a net cost per DALY saved of AUD29 798 (dominated; \$0.26M).
	Gesell, et al. [7]	Physical activity After School Programme (ASP) (childhood obesity).	Cost effectiveness	Linear latent growth models suggested that the average difference between the two groups of children at week 12 was 14.7 percentage points in moderate-vigorous physical activity ( $P < .001$ ). Cost analysis suggested that children attending traditional school-based ASPs-at an average cost of \$17.67 per day-would need an additional daily investment of \$1.59 per child for 12 weeks to increase their moderate-vigorous physical activity by a model-implied 14.7 percentage points.
	Ohinmaa, et al. [4]	Programmes of nutrition and physical activity in health promoting schools.	Cost	The annual public funding to implement and maintain CSH totaled \$344,514, which translates, on average, to \$7,830 per school and \$22.67 per student. Grants, donations and fundraising were mostly locally acquired. The value of volunteer support was estimated to be equivalent to the value of grants, donations and fundraising combined.
	Moya Martínez, et al. [8]	Physical activity programme during free time at school.	Cost effectiveness	The intervention costs totaled 125,469.75€, representing 269.83€/year/child. The usual after - school care was estimated at 844,56€/year/child. Intervention children showed a decrease in triceps skinfold thickness (-1.25mm, 95% CI: -1.82 to -0.67; $P <.001$ ). Intervention children with body mass index (BMI) between the percentiles 25 and 75 showed a decrease in the percentage of body fat (-0.59%; 95% CI: -1.03 to -0.67; $P<.001$ ), and those with a BMI>P75 showed a decrease in triceps skinfold thickness (-1.87mm; 95% CI: -3.43 to -0.32; $P<.001$ ), and percentage of body fat (-0.67%; 95% CI: -1.32 to -0.01; $P<.05$ ).
	Moodie, et al. [10]	Programme of after school activities for the community.	Cost effectiveness	For 1 year, the intervention cost is Australian dollars (AUD) 40.3 million (95% uncertainty interval AUD 28.6 million; AUD 56.2 million), and resulted in an incremental saving of 450 (250; 770) DALYs. The resultant cost-offsets were AUD 3.7 million, producing a net cost per DALY saved of AUD 82,000 (95% uncertainty interval AUD 40,000; AUD 165,000). Although the program has intuitive appeal, it was not cost-effective under base-case modeling assumptions.
	Gelli, et al. [11]	Food education programme.	Cost effectiveness	The average yearly expenditure per child, standardized over a 200-day on-site feeding period and an average ration, excluding school-

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				level costs, was US\$21.59. Fortified biscuits providing the least costly option of about US\$11 per year. Transportation and logistics costs were the main drivers for the high costs.
Reducing tobacco use among adolescents	Brown, et al. [17]	Programme to prevent tobacco use among young people.	Cost effectiveness	The results show that the costs per quality-adjusted life-year added, due to averted smoking, was \$2057, even without including averted medical costs. If ignore student time, cost-effectiveness improves by roughly 10%. To put the cost-effectiveness of this smoking prevention program into context, it is over 24 times more cost-effective than dialysis in the USA, which costs \$50 000 for a life-year.
	Hollingsworth, et al. [16]	Program to reduce tobacco use.	Cost effectiveness	The programme cost of £32 (95% CI = £29.70–£33.80) per student. The incremental cost per student not smoking at 2 years was £1,500 (95% CI = £669–£9,947). Students in intervention schools were less likely to believe that they would be a smoker at age 16 years (odds ratio [OR] = 0.80; 95% CI = 0.66–0.96).
	Hormigo Amaro, et al. [19]	Scholar smoking prevention programme.	Cost benefit Cost effectiveness	Assuming an effectiveness of 1%, the program would achieve a total benefit of 1,558,311.46. The healthcare benefits per prevented smoker were 1997.57, and the indirect benefits per prevented smoker were 21,260.80. Given the total cost of the school-based program (68,526.03), the cost-benefit ratio was 22.74. The benefits of school-based tobacco prevention programs, in terms of healthcare costs and productivity losses avoided, are far greater than the costs.
	Vijgen, et al. [18]	Programme to prevent tobacco use.	Cost effectiveness	Intervention costs per averted smoker: representing the short-term cost effectiveness of the different interventions, €2300. Intervention costs per life year/QALY gained; €14 100/€15 400. Intervention costs plus savings in the future costs of smoking-related diseases per life year/QALY gained, €11 200/€12 200. Intervention costs plus the total difference in future health care costs per life year/QALY gained, €18 200/€19 900.
Sex education, early pregnancy prevention and sexually transmitted diseases (STDs)	Key, et al. [20]	Programme to prevent teenage pregnancy.	Cost benefit	Subsequent births were more common in the comparison group (33%) than among subjects (17%) ( $p = .001$ ), and survival curves were significantly different ( $p=0.007$ ) (hazard ratio=2.5). Cost savings were calculated as \$19,097 per birth avoided or \$5,055 per month.
	Ateka, et al. [22]	Sexually transmitted disease (STD) prevention programme in public schools.	Cost effectiveness	The program was cost saving for female and cost-effective for male participants when ethnicity adjusted HIV prevalence was used with the assumption of best case scenario. It remained cost-effective for female but not for male participants in the base case scenario. Using the unadjusted HIV prevalence, the program was only cost-effective for female participants in the best case scenario.
	Terris-Prestholt, et al. [21]	Sexual health programme for adolescents.	Cost	The 3-year economic costs of trial implementation were \$879,032, of which ~70% were for the school-based component. Costs of initial development and startup were relatively substantial (~21% of total costs); however, annual costs per school child dropped from \$16 in 1999 to \$10 in 2001. The incremental scale-up cost is ~1/5 of ward trial implementation running costs.
Mental health and violence reduction	Kuo, et al. [24]	Mental health programme for adolescents.	Cost effectiveness	Cost-effectiveness was estimated to be \$416.90 per successful linkage when 5% of students screened positive, and \$106.09 when 20% screened positive.
	Foster, et al. [23]	Reduction of violence among children programme.	Cost effectiveness	The analyses suggest that the likelihood of cost-effectiveness for reducing conduct disorder for those most at risk approaches 70%. This finding depends on a series of assumptions, such as the discount rate used to measure future program costs and benefits. A sensitivity analysis suggests that a 3% rate would produce very similar results.
Preventive and clinical activities related to dental caries	Bertrand, et al. [27]	Simulation of types sealant application programme at school.	Cost effectiveness	A publicly funded program in the public sector was more cost-effective than a universal, publicly funded, private practice. However, the most cost-effective option varied, depending on the incidence of caries and the proportion of children identified as being at high-risk for caries.
	Bailit, et al. [25]	Dental care programme at school.	Cost	The program is financially feasible in states when the ratio of Medicaid fees is 60.5% of mean national fees. Of the 13 states examined, one-third have adequate Medicaid fees to support the program.
	Sköld, et al. [28]	Combination of results of studies related to dental caries prevention programs. Fluoride Varnish Treatment (FVT) and	Cost benefit	The FVT program had a better outcome in reducing approximal caries than FMR, and costs were lower. The FVT was expected to result in cost containment compared to controls 3 years after the end of the preventive FVT program. The ratio benefits to costs

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		Fluoride Mouth Rinsing (FMR).		were 1.8:1 for FVT and 0.9:1 for FMR.
	Scherrer, et al. [26]	Dental sealant programme in public schools.	Cost benefit	For direct or indirect supervision, it is optimal to have only 1 dentist or no dentists. For general supervision, it is optimal to have the dentist and dental assistant to come on separate days to screen. The cost savings for adding an assistant and chair averaged over all of the program sizes and travel distances ranged from 4.50% (SE=0.89) to 10.94% (SE=0.56). Significant cost savings also result from reducing the required supervision level (8.72% [SE=1.61] to 29.96% [SE=1.67]). The cost of the practice act for the state of Wisconsin for 2003 was from \$83,041 to \$346,156, significantly more than its annual budget.
Prevention of childhood asthma	Noyes, et al. [29]	Therapy-based program for asthma in schools.	Cost effectiveness	The study demonstrates that the school-based asthma therapy program could be an economically effective program for children aged 3 to 10 years attending preschool or elementary school in a city school district, at the cost of \$10/symptom-free day
	Tai, et al. [30]	Preventive programmes for childhood asthma based on clinical care at school.	Cost benefit	The costs of nurse staffing were estimated at \$4.55 billion compared to the estimated medical savings of \$1.69 billion. In contrast, estimated total savings for opportunity costs of work loss and premature death were \$23.13 billion.
	Atherly, et al. [31]	Asthma educational Intervention program, designed to be adopted and implemented in a school environment.	Cost effectiveness	The program cost approximately \$3.9 per asthma attack-free day gained, on par with pharmaceutical interventions, suggesting that may be a cost effective asthma intervention. The results suggest that school-based interventions aimed at asthma, properly implemented and administrated, are an appropriate use of societal resources.
Activities in school-based health centers	Guo, et al. [32]	School-Based Health Centers (SBHC)	Cost benefit	The net social benefits of the SBHC program in 4 school districts were estimated at \$1,352,087 over 3 years. We estimated that the SBHCs could have saved Medicaid about \$35 per student per year.
	Schlitt, et al. [33]	School-Based Health Centers (SBHC)	Cost	Nineteen states reported allocating a total of \$55.7 million to 612 SBHCs in school year 2004–2005. The two most common sources of state-directed funding for SBHCs were state general revenue (\$27 million) and Title V of the Social Security Act (\$7 million). All but one of the 19 states have a program office dedicated to administering and overseeing the grants, and all mandate data reporting by their SBHCs. Sixteen states have established operating standards for SBHCs. Eleven states define SBHCs as a unique provider type for Medicaid; only six do so for the State Children's Health Insurance Program.
Partnerships for child health	Crowley, et al. [36]	Promotion School-Community-University Partnerships to Enhance Resilience (PROSPER).	Cost	Illustrated how costs vary over time depending on the primacy of certain activities (e.g., team development, facilitator training, program implementation), and describes how the PROSPER model cultivates a complex resource infrastructure and provides preliminary evidence of systemic efficiencies.
Children immunization against influenza in schools, excessive sun exposure protection program and gardening and cooking	Eckermann, et al. [35]	Gardening and cooking program for students.	Cost effectiveness	Participating schools had better choices and eating habits among students ( $p=0.024$ ) in relation to control, the multiplier impact of the investment was 5.07, 100% of schools continued the program after 2 years with an average of 17% expansion.
	Reynolds, et al. [39]	Educational Programme conducted in early childhood Child-Parent-Center (CPC).	Cost benefit Cost effectiveness	The preschool program provided a total return to society of \$10.83 per dollar invested (net benefits per participant of \$83,708). Benefits to the public (other than program participants and families) were \$7.20 per dollar invested. The school-age program had a societal return of \$3.97 per dollar invested and a \$2.11 public return. The extended intervention program (4 to 6 years of participation) had a societal return of \$8.24 and public return of \$5.21.
	Schmier, et al. [37]	Child immunization programme against influenza in school.	Cost-consequence	Studies suggest that school programs are cost-neutral after the peak influenza season and are cost-effective during the flu season.
	Kyle, et al. [38]	A program that teaches children how to protect themselves from excessive sun exposure.	Cost benefit Cost effectiveness	Economic analysis indicated that if the program continues through 2015 at current funding levels, then it should avert >50 premature deaths, nearly 11000 skin cancer cases, and 960 quality-adjusted life-years among its participants. For every dollar invested, between approximately \$2 and \$4 in medical care costs and productivity losses are saved, depending on the funding scenario.

Chart 1: Selected studies on economic evaluation of school health programmes, 2015.

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Kuo, et al. [24] evaluated the cost-effectiveness of a school-based mental health triage programme, to identify children in need of specific interventions. Cost effectiveness was calculated by assessing overall costs per successful screening link. However, the costs associated with increasing the use of services and long-term effectiveness was not included. Foster, et al. [23] analyzed the cost-effectiveness of an intensive intervention programme with multiple components for the prevention of aggressiveness in young children, with early identification and treatment. The study estimated costs for overheads, and the program has proven to be cost-effective mainly for untreated and higher-risk populations, which are particularly costly to society. The studies that evaluated programmes of preventive and clinical activities related to dental caries were conceptual and exploratory. Bailit, et al. [25] used national and international data to estimate expected revenues and expenses for the school-based programme operation in different states, aiming to reduce the disparities in access to dental care, examining their financial viability related to refund rates of a health plan. Scherrer, et al. [26] evaluated the cost-effectiveness of the School-Based Sealant Programmes (SBSP) in which different sizes of programmes were modeled with various restrictions over the practice to compare its efficiency. Bertrand, et al. [27] simulated a public funding programme of dental sealants in both the public and private sectors and compared these hypothetical situations. Skold, et al. [28] analyzed two studies on a prevention program using fluoride varnishes and a prevention program using fluoride mouthwash and combine the results with a longitudinal study of caries development in a normal dental care setting in schools.

Asthma is one of the most common chronic childhood diseases causing morbidity symptoms, impact on quality of life, limitations of physical activities, no attendance in schools and loss of working days by the caregivers of the children with the disease. The studies on prevention programmes for childhood asthma had different methodologies. Noyes, et al. [29] examined the cost-effectiveness of the School-Based Asthma Therapy (SBAT) programme in comparison to the usual care, and the administration of preventive medication was performed. Tai and Bame [30] examined the cost-effectiveness of a prevention programme for childhood asthma based on clinical care at schools, using eight public databases to calculate the costs of the implementation and the potential savings in reducing the acute emergency and ambulatory. Atherly, et al. [31] discussed an educational intervention programme on asthma, designed to be adopted and implemented in the school environment. All these authors considered that other studies are necessary to justify if these programmes results in benefits to compensate the additional expenditure, suggested that these programmes are profitable from a social perspective, i.e., by measuring all costs and results incurred for society.

The School-Based Health Center-SBHC provide essential primary care for students within the schools. Due to its location, they allow overcoming barrier access such as transportation, lack of service providers, insurance coverage and parents working schedules and commitment [32]. Schlitt, et al. [33] explored the current status of the role of SBHCs, the evolution, and expected impact on long-term sustainability. Guo, et al. [32] analyzed the cost-effectiveness of SBHCs having as a primary outcome the health care total cost per student. The authors considered SBHCs cost beneficial to both health system and society, and should be seen as a health service delivery model to help address the disparities in health access. There is evidence in the literature related to the success in achieving partnerships aimed at improving the wellbeing of children and the adequacy of investments. This partnership can be performed in different ways between schools and universities, schools and community, schools and executives, among others [9,34-36]. Crowley, et al. [36] described the financial and economic cost to install the Promotion School Community University Partnerships to Enhance Resilience (PROSPER) and reported that costs vary over time depending on the priority of certain activities, and the definition of what is essential and necessary to the successful programme implementation.

One study presented a successful partnership programme through the involvement of the community in a gardening and cooking programme, with positive multiplier impact and return of the initial investment [35]. Evaluating multiplier impacts from investment on related community activity over time are suggested as significant evidence of program health effects on targeted groups of individuals in assessing community network engagement and ownership, dynamic impacts, and program long term success and return on investment [35]. Different studies performed economic evaluations in diverse themes. Schmier, et al. [37] performed a cost-consequence analysis of immunization against influenza in schools using data from a controlled clinical trial. The results showed that immunization reduces disease among children and adults and is cost saving to society. Kyle, et al. [38] evaluated a programme that teaches children how to protect themselves from excessive sun exposure. They affirm that it is worth educating children on the subject and that the programme is cost-effective and cost-benefit with modest impacts on behavior but with a significant reduction in incidence and mortality from skin cancer. Interventions with early childhood programmes provide evidence as the most cost-beneficial. Many studies reported that the programmes total cost were used for evaluation, but did not specify which were included and excluded, and how they were measured. Most of the studies mention costs related to the material used and time spent, and only a few describe administrative expenses and include costs related to the research construction and technical assistance. Some included costs related to volunteer time and donated resources, social costs, and opportunity losses. There were a great variety of research methods used such as interviews, questionnaires, telephone calls, secondary data analyses, estimates, epidemiological modeling using mathematical models (DALY and QALY), among others, to determine whether the programmes could be considered cost effective compared to existing alternatives [39].

The authors of this review found, in the included studies distributed worldwide, the same evidences in the study of Aratani, et al. [40] who discuss about evidence of the effectiveness of health promotion programmes for adolescents regarding behavioral changes and improvements in health outcomes, as well as assessing the costs and benefits of these programmes in the United States. The article focuses on the discussion of high quality programmes in the reproductive health area; obesity prevention; mental health and the use of substances including the tobacco; and prevention of unintentional injuries (accidents) and violence. It mentions the main studies identified in the literature that address evidence on avoidable costs of health problems in adolescents and the cost-effectiveness of the health promotion programmes and policies. The programmes discussed in the article were not developed exclusively in the school; they were also developed in communities and clinics, presenting effective results regarding changes in health risk behaviors and in the development of healthy habits. Regarding the cost-effectiveness issue, the programmes are generally likely to be highly cost-effective, however, programmes have many cost variations, are heterogeneous in its purposes, study design, scenario composition, making difficult to perform a synthesis by hard evidence.

The authors stated that there are efforts to evaluate these programmes in recent years even considering the challenges related to the difficulty and cost related to these assessments due to the large sample size, the need for sophisticated methodologies to isolate the effect of the intervention and the long-term follow-up. They also affirmed that there is a strong justification for increasing investments in health promotion for children and adolescents in the reproductive health areas, obesity prevention, mental health and substance use, trauma and violence, resulting in a significant decrease in morbidities in these areas. A few studies, in this mapping review, describe sensitivity analysis due to estimates analyses for costs and discount rates.

According to Contandriopoulos, et al. [15] two important points that should be addressed in the economic evaluation studies are the update of costs and effects of the programme from time to time and the

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sensitivity analysis. They are essential to measure the uncertainty impact on the results obtained, certifying its strength and testing its external validity. Guidelines to evaluate the quality of the economic evaluations studies have been published in the literature, to standardize a methodology that could facilitate comparison between the studies.

The published studies used different approaches to performing economic evaluations, which made the results difficult to compare. However, the use of these guidelines are not simple and requires an expert methodological and technical knowledge. The authors Caffray and Chatterji [41] described the development and testing of an effective and practical Internet-based cost survey designed by the authors of the National Assembly on School-Based Health Care (NASBHC) to capture the costs of school based-health programmes.

The economic evaluation can be conducted from several points of view, whether is the target population, investor or society. This perspective will determine which costs should be considered to achieve the result [15].

The study showed that several forms were used in the estimation and decision of which cost should be included in calculations (direct, indirect, fixed, variable), with a lack of clarity about which perspective in the evaluation was performed. Although a high heterogeneity was presented in the selected studies, they still can contribute with the economic evaluation knowledge in school health programmes. There is an issue related to the selection method to perform an economic evaluation of health since it is not a property or a service, but a condition. Some health problems affect other people than those directly affected and, there is uncertainty about the occurrence of diseases. All these factors lead to uncertainties of the complicated solution, concerning to the resource amount that should be allocated to health, which services should be prioritized and financed, and who would be the beneficiaries [15].

It is necessary for an economic evaluation of credibility to precise definition and description, within a methodological accuracy that sustain their results. When executed with quality, they can help decision makers to choose programmes that save resources and future costs, also provide a projection of possible benefits.

## Conclusion

The selected studies in this mapping review showed different methods, presentation of included and excluded costs and consequences. Some studies did not contain an explicit identification of the intervention, perspectives used for the analyzes, appropriate discounts for programmes that were meant for future periods, sensitivity analysis, incremental cost-effectiveness analysis, and also presented generalized results. This study was limited to present a synthesis of knowledge and relevant aspects to be considered in the economic evaluation of school health programmes since there are significant variations in conducting such evaluation. There is evidence that school health programmes can bring benefits to the target population and society.

## Compliance with Ethical Standards

**Ethical Approval:** This article does not contain any studies with human participants or animals performed by any of the authors.

**Funding:** This research was supported by CAPES Foundation, Ministry of Education of Brazil, Brasilia- DF, 70.040-020, Brazil (BEX:10349/14-6); CNPq and FAPEMIG.

**Conflicts of interest:** none

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