



Review Article

A systematic review on economic evaluations of school-based lifestyle interventions targeting weight-related behaviours among 4–12 year olds: Issues and ways forward



Marije Oosterhoff^{a,*}, Hans Bosma^b, Onno C.P. van Schayck^c, Silvia M.A.A. Evers^{d,e},
Carmen D. Dirksen^a, Manuela A. Joore^a

^a Department of Clinical Epidemiology and Medical Technology Assessment (KEMTA), Maastricht University Medical Centre MUMC+ / Care and Public Health Research Institute (CAPHRI), KEMTA, P. Debyelaan 25, P.O. Box 5800, 6202, AZ, Maastricht, the Netherlands

^b Department of Social Medicine, Care and Public Health Research Institute (CAPHRI), Faculty of Health, Medicine and Life Sciences, Maastricht University, Social Medicine, P.O. Box 616, 6200, MD, Maastricht, the Netherlands

^c Department of Family Medicine, Care and Public Health Research Institute (CAPHRI), Faculty of Health, Medicine and Life Sciences, Maastricht University, Family Medicine, P.O. Box 616, 6200, MD, Maastricht, the Netherlands

^d Department of Health Services Research, Care and Public Health Research Institute (CAPHRI), Faculty of Health, Medicine and Life Sciences, Maastricht University, Health Services Research, P.O. Box 616, 6200, MD, Maastricht, the Netherlands

^e Trimbos, Netherlands Institute of Mental Health and Addiction, Trimbos, P.O. Box 725, 3500, AS, Utrecht, the Netherlands

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ABSTRACT

Current guidelines for economic evaluations do not provide specific recommendations for the evaluation of school-based lifestyle interventions. This study examined and discussed the key aspects in the design of economic evaluations on school-based interventions targeting weight-related behaviours among 4–12 year olds. The PubMed and CRD databases (NHS EED) were searched. Grey literature was identified from reference lists and websites of relevant organizations. Full economic evaluations on school-based interventions targeting physical activity, sedentariness, or diet were selected. Key aspects included the objective, audience, intervention, comparator, population, type of analysis, perspective, costs, outcomes, and time horizon. Information was also extracted on measuring and valuing costs and outcomes, linking and extrapolating outcomes, and the maintenance of intervention effects. The 23 included studies reported on cost-effectiveness (CEAs) ($N = 12$), cost-utility (CUAs) ($N = 9$), social cost benefit (SCBA) ($N = 2$), and social return on investment (SROI) ($N = 1$) analysis.

The usual practice comparator was generally not clearly defined. The SROI analysis was the single study that included outcomes in other persons than the child. Healthcare costs ($N = 14$), productivity costs ($N = 4$), and costs to the household ($N = 3$), or education ($N = 2$) sector were examined. The outcome in trial-based CEAs consisted of a variety of weight-related measures. Seven distinctive models were used to extrapolate health and/or productivity costs. To enhance the usefulness of economic evaluations on school-based lifestyle interventions in allocating public health budgets, transparent reporting on key aspects, broadening the scope of economic evaluations, and standardizing the measurement, valuation, and extrapolation of costs and outcomes should be improved.

This study was conducted in Maastricht, the Netherlands.

1. Background

Physical activity, dietary, and sedentary behaviours are important determinants of overweight and obesity, and play a critical role in children's physical (Eisenmann, 2007; Wilkie et al., 2016), mental (Biddle and Asare, 2011; Chen et al., 2014), and cognitive health (Fedewa and Ahn, 2011). Numerous school-based interventions are

being developed to prevent unhealthy weight-related behaviours and the negative consequences in childhood and in later life (Craigie et al., 2011; Deshmukh-Taskar et al., 2006; Lim et al., 2012; De Bourdeaudhuij et al., 2011; Langford et al., 2014; Sobol-Goldberg et al., 2013). However, limited financial resources are available for funding, so policymakers need to be able to select those interventions that offer value for money. Moreover, governments and local decision-makers are

* Corresponding author.

E-mail address: marije.oosterhoff@mumc.nl (M. Oosterhoff).

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confronted with the question how much money should be allocated to prevention in youth which will come at the expense of other interventions. Economic evaluations are crucial for informing and supporting these decision-making processes.

Various guidelines have been developed to provide direction on the design of economic evaluations. For example, health economic guidelines provide recommendations on the various elements of an economic evaluation (*International Society for Pharmacoeconomics and Outcomes Research, 2016*) and the reporting of these aspects (*Husereau et al., 2013*). Health economic guidelines are however focused on medical interventions in adult populations and are therefore not fully applicable for the economic evaluation of childhood lifestyle interventions. Another type of guidance are the guidelines on social cost-benefit analysis (SCBA) (*Posner and Adler, 2006; HM Treasury, 2013; Koopmans et al., 2016*). This type of analysis has originally been used by the public sector for studying environmental and infrastructural projects. So far, it remains unclear whether these guidelines are suitable for the evaluation of school-based lifestyle interventions. To design an economic evaluation, key aspects need to be defined, including the objective, audience, target population, and the intervention and comparator(s) that are being addressed. Other elements are the perspective, type of analysis, costs, outcomes, and time horizon of the economic evaluation (*Drummond et al., 2015; Fox-Rushby and Cairns, 2005*). School-based lifestyle interventions are increasingly focused on the so-called whole-school approach, which is aimed at combining intervention components (e.g. education, policies, physical environment) and engaging with multiple stakeholders (*Langford et al., 2014*). It is likely that these interventions affect a wide range of costs and outcomes, including those that fall beyond health. Moreover, these costs and outcomes are accrued by different stakeholders or sectors (*Flego et al., 2014; Frew, 2016; Weatherly et al., 2009; Wolfenstetter, 2011; de Salazar et al., 2007; Dirksen and Evers, 2016*). It can therefore be challenging to define the scope and the key aspects of an economic evaluation. Previous studies have found that the designs of economic evaluations on childhood interventions differ, particularly with regard to the perspective and the included cost categories (*Doring et al., 2016*). The design of an economic evaluation is also determined by the measurement and valuation of costs and outcomes, the methods for linking intermediate outcomes, and the extrapolation of outcomes and intervention effects beyond the range of data. This can be difficult due to a lack of evidence on the decay of intervention effects (*Flego et al., 2014*) and the issues related to measuring childhood outcomes such as health-related quality of life (HR-QoL) (*Frew, 2016; Dirksen and Evers, 2016*).

The objective of this study is to examine the key aspects in the design of economic evaluations on school-based interventions targeting weight-related behaviours among 4–12 year olds, to discuss the main issues, and propose ways forward.

2. Methods

2.1. Search strategy

A systematic literature review was employed to review peer-reviewed and grey literature reporting on economic evaluations of school-based lifestyle interventions. The reporting of this systematic review is based on the PRISMA guidelines (*Moher et al., 2015*). A review protocol does not exist. Following the recommendations by *Alton et al. (2006)* for retrieving economic evaluations, electronic searches were completed in MEDLINE (via PubMed) and National Health Service Economic Evaluations Database (NHS EED). The databases were searched from inception up to March 2017 (MEDLINE). The NHS EED was updated until 31st March 2015. Electronic searches were based on recommendations for preparing systematic literature reviews and developing search strategies (*van Mastrigt et al., 2016; Schardt et al., 2007*). Search terms were related to school-aged children (population), health promotion and policy (intervention), and health economic evaluations

(outcomes). Citation checking was carried out on the included studies, and hand searches were performed on the reference lists of included studies and previous reviews (*Flego et al., 2014; Frew, 2016; Doring et al., 2016; Schwander et al., 2016*). Grey literature was searched by screening the reference lists, Google Scholar, and websites of the relevant organizations. Details of the search strings are provided in Table A.1 (Supplementary materials).

Study selection.

Two reviewers independently screened titles and abstracts (MO and MJ). If information about eligibility criteria could not fully be obtained from the abstract the full-text was screened. Disagreements about study inclusion were resolved by discussion between the reviewers. Studies were eligible based on the following criteria:

1. The study included the assessment of a school-based intervention. We defined a school-based intervention as an intervention that is, solely or in addition to other settings, situated in the school setting. Studies were also included when the intervention was situated in the after-school setting (e.g. community, after-school care, home clubs) and children were recruited from schools.
2. Participants were children between 4 and 12 years of age as this age range corresponds to the Dutch primary school setting. Studies were also eligible if the interventions targeted 4–12 year olds, and younger or older children simultaneously.
3. The study was classified as a full economic evaluation, comparing two or more interventions in terms of both costs and effects. This included cost-effectiveness analyses (CEA), cost-utility analyses (CUA), cost-benefit analyses (CBA), and cost-minimization analyses (CMA), as well as societal cost-benefit analyses (SCBA) and societal return on investment analyses (SROI).
4. Interventions had to target lifestyle behaviours of children. In this review we focused on physical activity (PA), dietary and sedentary behaviours. Together, these lifestyle behaviours play an important role in the development of overweight and obesity among children.

2.2. Data extraction

Data extraction was conducted by one reviewer (MO) and independently checked by a second (MJ). A standardized template was developed to guide data extraction. General study characteristics (authors, year of publication, country of study) were extracted. Key aspects were examined by extracting information on the objective, audience, intervention, comparator(s), target population, type of analysis, perspective, costs, outcomes, and time horizon (*Fox-Rushby and Cairns, 2005*). Interventions were described by the intervention components, objectives, setting, and intervention duration. Studies were classified as a CEA, CUA, CBA, CMA, SCBA, SROI, or any combination. In line with *Drummond et al. (2015)*, cost consequences were categorized as healthcare costs, cost in other sectors, patient and family costs, and productivity costs. Costs in other sectors included costs to the education sector, household and leisure sector (informal care, social care, leisure time and voluntary work), and criminal justice system (*Drost et al., 2013*). Outcomes were categorized into 1) outcomes on PA, diet, and sedentariness; 2) weight-related outcomes (anthropometrics); 3) other health-related outcomes; 4) outcomes beyond health; and 5) spillovers to other persons than the child.

Furthermore, data was extracted on measuring and valuing costs and outcomes, linking outcomes, extrapolating outcomes over time, and the maintenance of intervention effects.

Because it is unclear whether the current guidelines for economic evaluations are fully applicable for school-based lifestyle interventions (see Introduction), we did not identify a ‘quality standard’. For the identification of issues, we compared the key design aspects of the included studies to the recommendations that were given on these key aspects in both the Dutch health economic guideline (*Zorginstituut Nederland, 2015*), and in the guidelines for social cost-benefit analysis

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