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BMC Public Health

SYSTEMATIC REVIEW Open Access

Public health interventions aimed at children aged 5–19 years funded by local authorities in England: a scoping review of economic analyses

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Abstract

Background English Local authorities are responsible for delivering the Healthy Child Programme (HCP), to improve the health and wellbeing of children. Despite the importance of prevention, economic evidence to guide investment is limited, particularly for school-aged children. This scoping review aimed to map UK-based economic evidence relevant to the HCP for children aged 5–19 years, to inform policy and highlight gaps in the evidence.

Methods We searched sixteen databases in December 2023 to January 2024, in addition to citation and key websites searching. Eligible studies included economic evaluations and return on investment analyses of interventions that could be potentially delivered by local authorities under the HCP. Two reviewers screened titles and abstracts, and extracted data on study characteristics, methods, and outcomes. We assessed risk of bias using the Economic Evaluation Bias (ECOBIAS) checklist, synthesised the available evidence descriptively, and presented findings using summary tables and an evidence gap map.

Results We included 39 economic analyses. The most commonly evaluated interventions focused on mental health (12 studies), followed by physical activity (9 studies), healthy eating (4 studies, of which 2 were in combination with physical activity), risk behaviours (4 studies), bullying (3 studies), obesity (2 studies), hearing or vision screening (2 studies), social workers in schools (2 studies) and sexual health, ADHD prevention and improving oral health (each one study). Ten studies reported an incremental cost-effectiveness ratio (ICER), five studies reported either a benefit–cost ratio (BCR) or incremental net monetary benefit (INMB), whilst others described quality-adjusted life years (QALYs), costs or willingness to pay.
In general, robust evidence of the value of these interventions was partial because the interventions and methods of analysis were heterogenous. School nurse delivered services were particularly underrepresented despite their central role in the HCP delivery.

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Conclusions This review highlights the diverse range of interventions available to local authorities and the lack of robust economic evidence to support prioritisation of investment as part of the HCP 5–19 years. Further research should focus on developing more robust evidence of the value of public health interventions in this age group, using economic analysis to enable priority-setting, and addressing the evidence gaps identified.

Keywords Systematic review, Economic analysis, Healthy Child Programme, Public health, Child health

Background

The Health and Social Care Act 2012 [1] gave local authorities in England a statutory responsibility for commissioning public health services. This includes the Healthy Child Programme (HCP), which aims to bring together health, education and.

other main partners to deliver an effective programme for prevention and support [2]. The reforms introduced by the 2012 Act sought to enable a more coordinated local approach to improving population health [3]. The national funding programme supports interventions for both early years (aged 0–5 years) and school aged children (aged 5–19 years). Local authorities can employ a range of different interventions to improve the health and wellbeing of children. Research has demonstrated the overwhelming positive return on investing in early years interventions [4, 5], but there is far less economic evidence relating to how best to improve the health and wellbeing of school-aged children.

Most local government spending on public health (including the HCP) is funded by the public health grant from central government. Over recent years, this grant has declined in real terms, with funding per person reported to be 26% lower in 2025–26 compared to 2015–16 [6]. These reductions have resulted in cuts to some preventative services, particularly in more deprived areas, where cuts to the grant have tended to be greater in nominal terms (although not necessarily proportionally) [6]. Real terms spending on children's public health services has reduced over the last ten years by 25% for children aged 0–5 and 15% for those aged 5–19 years [6].

This trend has recently shifted, with a real terms increase in the Public Health Grant from 2024/25 to 2025/26 [7]. In addition, new guidance has been issued to modernise the HCP, intending to use 'the latest evidence on effective practice and helping to bring councils, the NHS and partners together to achieve priority outcomes for children and families'[8]. There are many ways in which local authorities could potentially improve the health and wellbeing of children through their various functions [9]. Given limited resources, it is important to focus on those interventions that provide the most value per unit of cost, avoiding the false economy of cuts to interventions with a positive return on investment [4] and weighing up the costs of any proposed interventions against the associated benefits to ensure that net health gains are maximised. Identifying and prioritising the best value interventions is a key task for both national and local government.

In this scoping review, we aim to map the existing economic evidence on numerous possible interventions relevant to the delivery of the HCP for 5 to 19 year olds by English local authorities. This will help inform decision making and guide a future research agenda.

Methods

A scoping review was deemed most appropriate for this study, given the breadth of the research question, the wide range of possible interventions, and the current state of the evidence base.

Protocol

Our reporting was guided by the standards of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) [10]. A pre-specified protocol is available through the Registry of Systematic Reviews/Meta-Analyses (reviewregistry1806) [11]. We made one major change to the protocol in that in addition to the methods described we undertook a risk of bias assessment using the Economic Evaluation Bias (ECOBIAS) checklist [12]. This was in response to concerns raised by the reviewers during the full-text screening and data extraction phase.

Inclusion criteria

We first established inclusion and exclusion criteria using the PICOS framework (Table 1). We included recent evidence from economic analyses of interventions that could potentially be provided by the HCP for 5 to 19 year olds (in full or in part) in the UK.

Search strategy

Our searches focused on economic literature from 2015 onwards and were conducted by an information specialist (SG). As there is no one single source for this, we conducted searches in a range of databases, representing education (ERIC, British Education Index, Education Policy and Research Service), economics (EconLit, Research paper in economics (RePEc) -IDEAS), policy and management (Social Policy and Practice, Healthcare Management Information Consortium (HMIC), Social Systems Evidence), social science (ASSIA), nursing (BNI and CINAHL ultimate), psychology (PsycINFO), health promotion (DoPHER, TRoPHI) and health and medicine

Table 1 Inclusion and Exclusion Criteria using PICOS

	Inclusion	Exclusion
Population	Children aged 5–19 years inclusive of 5 and 19 year olds (mixed populations were included where the population were aged 5–19 years or where the population were predominately aged 5–19 years in the case of school-based interventions where a few children may not have reached their 5th birthday)	Children aged 0–4 years and adults aged 20 and over
Intervention	Services provided by local authorities in full or in part or potentially delivered by local authorities under the HCP. Examples include school health services (including school nurses, school nursing services), counselling provided within schools, and physical education/health education in schools (personal, social, health and economic education, sex education and relationship education) delivered by local organisations or professionals other than teachers – for example as extra-curricular activities Other non-school public health-based interventions including parenting programmes, and online education including anti-bullying expert systems such as those delivered in community settings and children's centres	Services provided by the private sector, the NHS and the voluntary sector, such as immunisation, primary and community healthcare, walk-in centres, drop-ins, mobile clinics, private childcare settings and youth clubs, and hospitals, and the youth justice system Services funded by the general schools' budget, including school food and free school meals, and physical and health education provided by teachers Multisystemic therapy, children in custody, care homes, adoption and fostering services or interventions related to juvenile offending and other services under the remit of social care
Comparison(s)	Any or no comparison	None
Outcome	Health outcomes (including quality of life and quality-adjusted life years (QALYs) Return on investment in monetary terms (to the NHS, other public sector services, the taxpayer or society)	Implementation processes Personal satisfaction Educational outcomes with no reference to health
Study Designs	Economic analyses based on systematic reviews and primary research including economic evaluations (cost benefit analysis, cost effectiveness studies, cost-minimization analysis, and cost-utility analysis) and return on investment analyses	Non-empirical research. Discussion papers, opinion pieces, commentaries, letters and editorials. Case series and case reports
Setting	UK	Non-UK
Limits	English language or English language translation available Publication* date 2015 onwards	Non-English language for which a translation is not available Publication* date of 2014 or earlier

*this may be the release or availability date in the case of grey literature or reports

(MEDLINE, Embase) (Supplementary Material: Database search strategies). The search strategy contained just two main facets – the intervention (public health interventions for 5 to 19 year olds) in all databases and the study design (economic analyses) in those databases not limited to economic papers, with the NICE UK geographical search filter applied where available or adapted and applied where unmanageable numbers of records would otherwise have been retrieved.

In addition, we conducted forward and backward citation searching using CitationChaser for each included publication. We also searched key websites as we anticipated that much of the material would be published as reports or grey literature (Supplementary Material: Database search strategies). We entered records into an Endnote library to remove duplicates and then imported them into Covidence for screening. Two of five reviewers (SG, VD, TM-B, KB, AC-A) screened each title and abstract independently with any discrepancies resolved by discussion and a third reviewer where necessary. Full-text screening followed a similar procedure.

Data extraction

One reviewer extracted data in Covidence, and this was checked by another reviewer, with disagreements resolved by discussion and consensus. Extracted data included study characteristics (region, aim, study design, study analysis), study population (number of participants, age restrictions in years), interventions evaluated (description, type, comparator), economic data (outcomes, perspective, time-horizon, discounting) and a descriptive summary of the findings. In addition, data regarding clinical effectiveness and cost-effectiveness were extracted (including quality-adjusted life years (QALYS), incremental cost-effectiveness ratios (ICERs), returns on investment (ROI), and benefit–cost ratios (BCRs), see Table 2 for definitions).

Risk of bias

Risk of bias assessment of the included studies is not generally required in a scoping review [13], but owing to serious limitations in some studies identified during screening and data extraction, we undertook quality

Table 2 Glossary of economic terms

Benefit–cost ratio (BCR): a ratio of health benefits to costs, with both valued in monetary terms. A value greater than 1 implies that benefits exceed
costs, and higher values imply better value Incremental cost-effectiveness ratio (ICER): compares the cost-effectiveness of two alternatives (intervention and control) to a threshold value. Lower ICER values imply better value, and those below the threshold willingness to pay for a QALY (in the UK NHS this is often £20,000) are deemed cost-effective. If the intervention generates no (or negative) QALYs and positive costs, it is viewed as 'dominated'. If it saves money (or has zero costs) and positive health outcomes, it is viewed as 'dominant'
Incremental net monetary benefit (INMB): values health benefits in monetary terms using a threshold willingness to pay (e.g. 1 QALY gained = £20,000), then subtracts cost differences to provide a single metric. A value greater than zero is deemed cost-effective
Quality-adjusted life year (QALY): combines both the quantity (length) and quality of life into a single value. One QALY represents one year of life in perfect health. If a person's health is less than perfect, the QALY score is less than 1. A utility score of zero represents death
Social return on investment (SROI): includes a broad range of outcomes, valued in monetary terms, to create a ratio of return on investment. A value greater than 1 implies that benefits exceed costs, and higher values imply better value
Discounting: valuing costs and benefits which occur in the future at a lower rate than those which occur at the present. NICE guidelines recommend that costs and health outcomes should be discounted at 3.5% per year

assessment to provide a more comprehensive mapping of the literature and lessons for future research. We used the ECOBIAS checklist, which was developed in accordance with best practice guidelines in the field of health economics [12]. This checklist comprises 22 items. The first 11 evaluate general bias in health economic evaluations. The second set evaluate risk of bias of the model specifications in economic evaluations and consist of three subdomains, that is, structure of the model (four items), data (six items) and consistency (one item). This approach differs from other checklists, which may focus on reporting quality or broader good practice guidelines that are not primarily focused on bias. At the same time as undertaking the ECOBIAS assessment an experienced health economist (DA/LH) provided an overview of the methodological limitations and listed up to four methodological weaknesses that were not necessarily covered by the assessment tool.

Analysis

We present descriptive tables of the characteristics of the studies and their risk of bias assessment, with evidence gaps highlighted. Since this is a scoping review, we did not undertake any formal synthesis, instead presenting a narrative summary of the study findings. We use a heat map of the available evidence and a boxplot to represent the relationship between the conclusion (cost-effective or not) and the ECOBIAS composite score (measuring study quality). This approach allows us to compare results and investigate whether higher quality studies differ in their conclusions to lower quality studies.

Results

Database searching, citation searching and browsing the websites identified a total of 7,323 records before removing duplicates (Fig. 1). In total, we screened 4,868 unique records at the title and abstract stage in Covidence, assessing 479 full-text studies for eligibility. Thirty-nine studies were deemed to meet our inclusion criteria. Thirty-seven were identified from the database searches with one additional study from website searching and another additional study from citation searching.

Characteristics of the included studies

The most commonly evaluated interventions focused on improving mental health in children (12 studies), followed by those aiming to increase physical activity (9 studies), healthy eating (4 studies, of which 2 were in combination with physical activity), reducing risk behaviours (4 studies), combating bullying (3 studies), preventing obesity through lifestyle skills training (2 studies), hearing or vision screening (2 studies), social workers in schools (2 studies) and Attention Deficit/Hyperactivity Disorder (ADHD) prevention, improving sexual health and improving oral health (each one study) (Table 3: characteristics of included studies).

Study design

Study designs included economic analysis based on data from randomized controlled trials (RCTs) (28), before and after studies (2), matched case controls (1), audit data (1) and synthetic controls (1). Seven studies used modelling approaches (including social return on investment and decision models) (7). Ten studies reported an incremental cost-effectiveness ratio (ICER), a further five studies reported either a benefit–cost ratio (BCR), or incremental net monetary benefit (INMB), whilst others reported QALYs, costs or willingness to pay. Nineteen studies reported discounting, mostly commonly using a rate of 3.5%, although for some studies the time horizon was less than 12 months (range 6 weeks to a lifetime).

Setting

Most of the studies were undertaken in England (29 studies), seven stated they were conducted in the UK without further detail, two were in Wales (one of which was also in England), one in Northern Ireland and a further one in Northern Ireland and Scotland.

Participants

Whilst all the interventions were aimed at children between aged 5 to 19 years old, 19 studies were aimed at primary school age (generally aged 5 to 11 years), 19 at

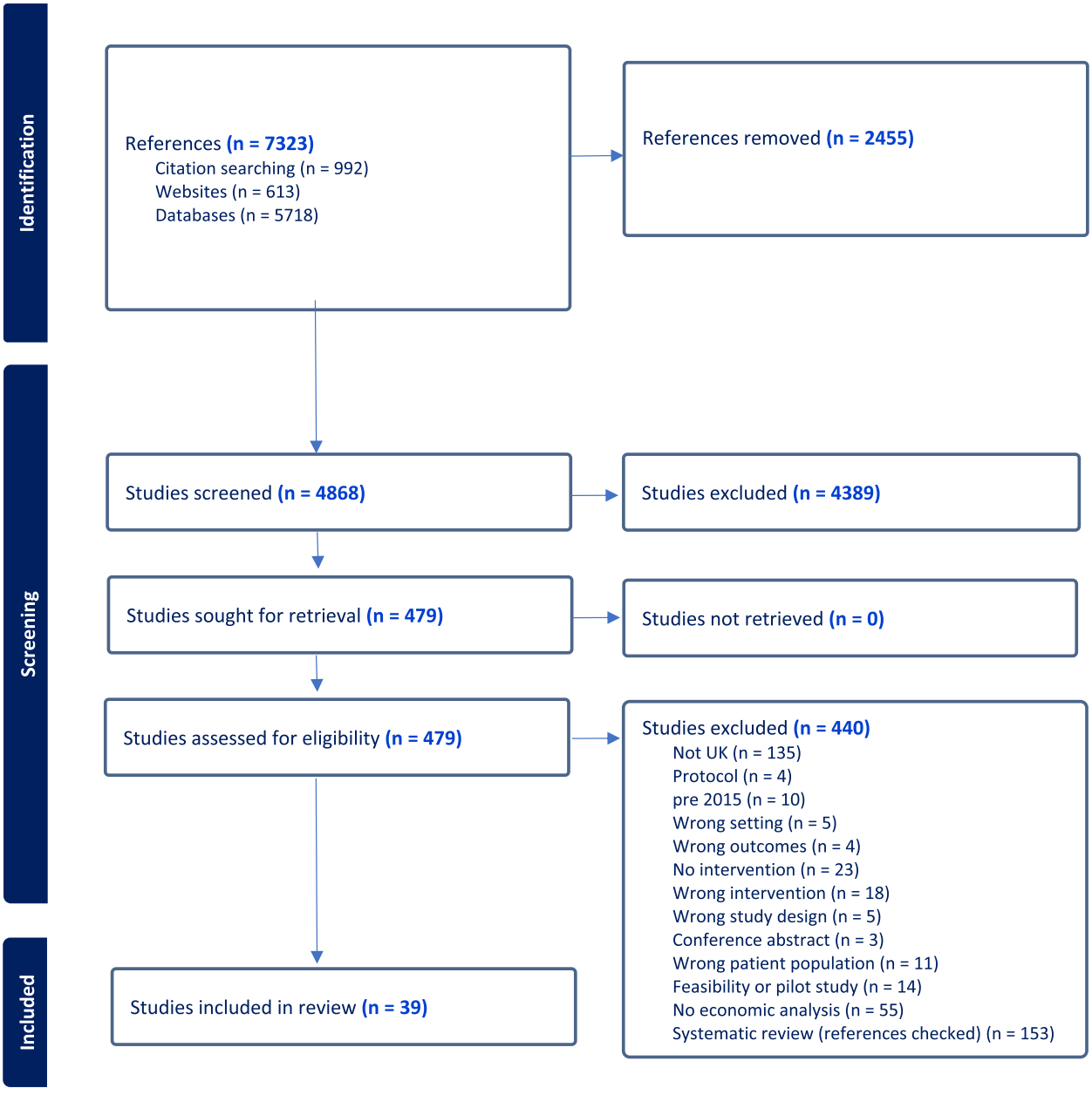


Fig. 1 Flow diagram for included studies

secondary school age (generally aged 11 to 18 years) and one both secondary and primary. Few if any studies are likely to include 19 year olds. Not all studies reported the number of participants; of those RCTs and before and after studies that did report them, the numbers varied from 115 to 277,835. The number of hypothetical participants in the modelling studies ranged from 100 to all residents in England.

Types of interventions

Mental health interventions (n = 12)

The interventions focused on improving children's mental health tended to be either lesson- based [14–22]—mostly delivered by teachers—or some form of counselling [23–26].

Evidence from the eight studies on lesson-based interventions to improve children's mental health was mixed. Headstart [22] and the Good Behaviour Game [20] were found not to have any impact on mental health. A study of the PATHS programme [14] also showed no impact, but in a later study by Turner et al. 2020 [19] it was deemed to be potentially cost-effective, although there was considerable uncertainty around this conclusion.

Some programmes were deemed potentially cost-effective – specifically the Roots of Empathy programme (ICER: £9,571 per QALY) [15], the Teacher Classroom

Table 3 Characteristics of Included Studies

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Discount rate	Time Horizon
Mental Health – Lesson based interventions										
Berry et al. 2016 [14]	Birmingham, England	RCT	4–7 years old	2203 pupils from 29 schools and 1801 pupils from 27 schools	PATHS lesson materials and teacher guidance to develop pupils' skills in five main areas: self-awareness, managing feelings, motivation, empathy and social skills	Usual Practice	NA	Not possible to conduct a cost-effectiveness analysis owing to the lack of impact	NA	12 months
Connolly et al. 2018 [15]	Northern Ireland	RCT	8–9 years old	695 and 583	Roots of Empathy consists of 27 lessons, which are based around a monthly classroom visit from an infant and parent to develop children's social and emotional understanding, promote prosocial behaviours, decrease aggressive behaviours, and increase children's knowledge about infant development and effective parenting practices	Usual Practice	NR	Cost-effective. ICER: £9571 per QALY gained (95% CI -£87,776 to £106,676). It was found that ROE had an 83.1% chance of being cost-effective at the £20,000 per QALY threshold and a 90.1% chance at the higher threshold of £30,000	1.5% (sensitivity analysis 3.5%)	5 years (sensitivity analysis 3-year timeframe)
Ford et al. 2019 [16, 17]	South-West of England	RCT	4–9 years old	1037 pupils from 40 schools and 1038 pupils from 40 schools	Teacher Classroom Management training delivered to groups of 12 teachers over 6 full days over a 6-month period to enhance teacher management skills and improve teacher–pupil relationships, to assist teachers to develop effective individual and group behaviour plans to enable proactive classroom management, to encourage teachers to adopt and promote social and emotional regulation skills and to encourage teachers to strengthen positive teacher-parent relationships	Usual Practice	NR	£16,000 per QALY at 9 months, £10 per QALY at 18 months, treatment as usual is dominant at 30 months. At a willingness-to-pay threshold of £20,000 per QALY, the probability of TCM being cost-effective is 61% at 9 months and 80% at 18 months but drops to 5% at 30 months	3.5%	30 months
Lordan et al. 2019 [18]	England	RCT	11–15 years	2236 pupils at final analysis and 1301	Healthy Minds curriculum—an amalgam of 14 separate educational modules targeted at improving HRQoL, which include elements on building resilience, navigating social media, looking after mental health, developing healthy relationships and understanding the responsibilities of being a parent	Usual Practice	NR	NR but cost effective. QALY gain of 0.055 QALYs in a pessimistic scenario and 0.235 QALYs in an optimistic scenario. If this was achieved at £100 per pupil, the cost per QALY ranges between £1,811 and £426	NR	4 years

Table 3 (continued)

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Discount rate	Time Horizon
Turner et al. 2020 [19]	Greater Manchester, England	RCT	7–9 years old	2676 from 23 schools and 2542 from 22 schools	PATHS curriculum. Each participating class received curriculum packs containing lessons (and some supplementary send-home activities) built around four conceptual units (emotional understanding, self-control, social problem-solving, peer relations and self-esteem)	Usual Practice	Incremental Net Benefit of introducing PATHS was £5.56 per child (95% CI – 14.68 to 25.81)	NR but the mean incremental cost of the PATHS curriculum was £32.01 per child and mean incremental quality-adjusted life-years (QALYs) were positive (0.0019; 95% confidence interval [CI] 0.0009–0.0029).Assuming a willingness-to-pay threshold of £20,000 per QALY, the expected incremental net benefit of introducing the PATHS curriculum was £5.56 per child (95% CI – 14.68 to 25.81), and the probability of cost effectiveness was 84%	3.5%	2 years
Humphrey et al. 2022 [20]	Greater Manchester, West and South Yorkshire, and the East Midlands, England	RCT	6–7 years old	1174 and 1051	The Good Behaviour Game is a universal behaviour management intervention. Its core components are classroom rules, team membership, monitoring behaviour and positive reinforcement. The Good Behaviour Game is delivered by teachers who receive initial training and ongoing coaching	Usual Practice	NR	NR but there was no evidence that the Good Behaviour Game improved any outcomes. The Good Behaviour Game study resulted in estimated implementation costs of £275.68 per child. The cost-consequences analysis indicated that the Good Behaviour Game does not provide value for money	NR	24 months

Table 3 (continued)

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Discount rate	Time Horizon
Kuyken et al. 2022 [21]	UK	RCT	11–14 years old	3678 pupils from 43 schools and 3572 from 41 schools	School-Based Mindfulness Training. The programme aims to teach mindfulness skills that support young people's resilience, using a combination of psychoeducation, class discussion and brief mindfulness practices. The SBMT involves 10 manualised, structured lessons, normally delivered over one school term	Usual Practice	NR	NR but mean cost of the SBMT intervention was £70.73 per student. Differences between trial arms in both costs and QALYs were small in adjusted analyses (adjusted mean difference in cost £6.84, 95% CI – £128.04 to £141.72; adjusted mean difference in QALYs 0.012, 95% CI – 0.015 to 0.038). SBMT had a high probability of cost-effectiveness (83%) at a willingness-to-pay threshold of £20,000 per quality-adjusted life year	NR	1 year
Cattan et al. 2023 [22]	Blackpool, Cornwall, Hull, Kent, Newham, and Wolverhampton	Synthetic control	Secondary school Pupils	NR	HeadStart. Each LA used the funding to offer a different bundle of interventions primarily intended to increase wellbeing and reduce onset of mental health problems which also aimed to benefit academic outcomes in the long-term. Five broad categories: -Whole school wellbeing promotion interventions -Child-focused targeted interventions to improve mental health difficulties and wellbeing (Individual or group sessions) -School staff training or supervision -Parent/carer interventions -Online support	Synthetic control group	NR	NR but HeadStart did not have a significant impact on absenteeism (authorised or unauthorised) or attainment	NR	8 years of preintervention data and 3 years of intervention data
Mental health – counselling-based interventions										
Stallard et al. 2015 [23]	Bath and North-east Somerset, and Swindon and Wiltshire, England	RCT	9–10 years old	School staff led (472), Health staff led (489), Control (401)	FRIENDS programme a cognitive-behavioural therapy programme that develops skills to counter the cognitive, emotional and behavioural aspects of anxiety delivered over 9 consecutive weeks	Usual Practice	NR	Not cost-effective. ICER: £−14,617 (3407 to −2243). Dominated by usual care	NA	6 months

Table 3 (continued)

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Discount rate	Time Horizon
Little 2018 [24]	UK	Social return on investment model	4–11 years old	4548 from 251 schools	One-to-one counselling in primary schools delivered by Place2Be	None	Every £1 invested in the service in 2016/17 results in benefits of £6.20 in terms of improved long-term outcomes. 1:5 for teachers and 1:7.3 for parents	NR	3.5%	Truancy, exclusion up to age 16. Crime up to age 26. Smoking, depression, employment and wages up to age 60
Cooper et al. 2021 [25]	Greater London area, England	RCT	13–16 years old	167 and 162 pupils in 18 schools	School-based humanistic counselling—counsellors use various techniques, including active listening, empathic reflections, and inviting young people to express underlying emotions and needs. Sessions were delivered individually, face-to-face, and lasted for 45–60 min. They were scheduled weekly for up to 10 school weeks, with young people able to terminate counselling before this time point	Usual Practice	NR	NR but the probability that the intervention will be considered cost-effective compared with pastoral care as usual exceeds 50% at a willingness to pay of £222 per one point improvement on the Young Person's Clinical Outcomes in Routine Evaluation and exceeds 90% at a willingness to pay of £630	NA	24 weeks
Barnardo's 2022 [26]	Swindon, England	Before and after study	11–18 years old	154 closed pair Goals Based Outcomes (GBO) cases and 178 closed pair Outcome/Child Outcome Rating Scale	Mental Health Support Teams consisting of Education Mental Health Practitioners (EMHPs) which provided 1–2-1 CBT interventions	Usual Practice	For every £1 invested in the programme, the benefit to the government and the wider economy is around £1.90 (GBO £2.3, ORS/CORS £1.4, Average £1.9)	NR but cost per user supported £4,780 (GBO), £4,135 (ORS/CORS). Benefit per user £11,083 (GBO), £5,812 (ORS/CORS)	NR	NR
Physical Activity – exercise programmes										
Jago et al. 2016 [27]	Bristol, England	RCT	Girls in Year 7	571 (284, 287)	Bristol Girls Dance Project: after-school dance programme for 20 weeks	Usual Practice	NR	Not cost-effective. No QALY gained ICER -£48 (95% CI -£49 to -£47)	0%	12 months

Table 3 (continued)

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Discount rate	Time Horizon
Gc et al. 2019 [28]	UK	Markov model	Hypothetical cohort of adolescents aged 16 years	10,000	Simple after-school intervention and more complex multicomponent intervention	Usual Practice	NR	Partially cost-effective. After-school intervention incremental QALY = 0.004, multicomponent intervention incremental QALY = 0.002 (unclear if statistically significant) After-school intervention: ICER £11,486. Multicomponent intervention: ICER £68,056	3.5%	65 years (lifetime)
Breheny et al. 2020 [29]	South of Birmingham, England	RCT	4–11 years old	1,670 (850, 820)	The Daily Mile - 15-min walk in lesson time	Usual Practice	NR	Partially cost-effective. No QALYS gained in boys, but QALY gain in girls at an ICER of£7,455 per QALY	NR	12 months
Physical Activity – multifaceted interventions										
Adab et al. 2018 [30]	West Midlands, England	RCT	Year 1 pupils aged 5–6 years	1,392 (660, 732)	West Midlands ActiVe lifestyle and healthy Eating in School children – activities, workshop and visits to football club over 12 months	Usual Practice	NR	Not cost-effective. No evidence of effectiveness (QALY gain 0.03 not statistically significant) ICER: £46,083	3.5%	30 months
Harrington et al. 2019 [31]	Midlands, England	RCT	School Girls 11–14 years old	1,752, (867, 885)	Girls Active – teachers review provision, attend training, and promotion of activity	Usual Practice	NR	Not cost-effective. QALYs not reported but not effective at increasing physical activity ICER: NR	3.5%	14 months
Jago et al. 2021 [32]	Avon, Devon and Wiltshire, England	RCT	Year 9 girls	1,219 (602, 617)	PLAN-A intervention—a peer led program with train the trainer sessions over 10 weeks	Usual Practice	NR	Not cost-effective. Not effective at increasing physical activity (measured in QALYs) ICER: NR	NA	12 months
Corder et al. 2021 [33, 34]	Cambridgeshire and Essex, England	RCT	Year 9 students (13–14 years old)	2,862 (1543), 1319)	GoActive – a peer-led programme over 12 weeks	Usual Practice	INB -£10.70 (95% credibility interval -£252 to £229)	Not cost-effective. No QALY gain ICER: NR	3.5%	2 academic years
Healthy Eating And physical activity										

Table 3 (continued)

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Discount rate	Time Horizon
Kalita et al. 2022 [35, 36]	UK	Markov model	Hypothetical cohort of 100 adolescents with a mean age of 13 years	100 (100, NR)	Engaging Adolescents in Changing Behaviour programme – education, training teachers and an app (LifeLab Plus)	Usual Practice	NR	Cost-effective. QALY gain of 0.0085 (unclear if statistically significant) ICER: £14,367	Costs 3.5%, QALYs 1.5%	20 years (5, 10, 30 and 40 years)
Lawlor et al. 2016 [37]	Bristol and North Somerset, England	RCT	Children in year 4 (8–9 years old) at recruitment	2,221 (1064, 1157)	Active for Life Year 5 – teacher training and materials for 16 lessons over median 18 weeks	Usual Practice	NR	Not cost-effective. QALYs not reported but not effective at increasing physical activity ICER: NR	NA	12 months
Healthy Eating										
Belot et al. 2016 [38]	England	RCT	6–7 and 9–10 years old (year 2 and 5)	962 (24:365:356)	Incentive scheme for pupils to choose fruit and vegetables at lunchtime. Two group, individual and competition (group of 4)	Usual Practice	NR	NR	NA	6 weeks
Jones et al. 2016 [39]	England	Social return on investment model	Primary and secondary	60,000 children (Kirklees: 40,445 pupils; Calderdale: 21,280)	Food for Life seeks to promote a 'good food culture' through supporting practical delivery and influencing public decision-making	Some schools not engaged acted as comparator	Social value created for every £1 of investment (SROI ratio) was £1:3.70, for Calderdale and £1:5.12 for Kirklees Overall, this provided a SROI ratio of £4.41	NR	3.5%	3 years
Risk Behaviours										
Conner et al. 2019 [40]	Leeds and Stafford, England	RCT	11–12 years old	6155 (3436:2719)	Smoking prevention. Adolescents engaged with motivational materials and then completed implementation intentions sheets in relation to the target behaviour (Not smoking—intervention condition, completing homework—control condition)	Completing homework	NR	£99 per ever smoker avoided at age 15–16 years; After sensitivity analysis, ICER is £205 per smoker avoided at age 15–16 years	3.5%	4 years

Table 3 (continued)

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Discount rate	Time Horizon
Coulton et al. 2022 [41]	England	RCT	14–15 years old	443 (210:233)	Screening and brief alcohol intervention—consisted of feedback of screening results and raising awareness of how many units of alcohol were contained in commonly consumed drinks, an exploration of a typical drinking day to identify behaviours that may be the focus of change, exploring personally relevant risks of alcohol consumption, identifying motivational factors, exploring confidence to change, barriers and facilitators of behaviour change, developing an action and coping plan for changing drinking behaviour	Usual practice	NR	The cost-effectiveness acceptability curve indicates that there is only a 20% probability that the intervention is cost-effective at a willingness to pay threshold of £20,000 to £30,000	NA	12 months
Segrott et al. 2022 [42]	Wales	RCT	10–14 years old	Intervention, 361 families, (461 adults, 477 children) Control 354 families (457 adults, 454 children)	Substance misuse prevention. Strengthening Families Programme10-14 addresses risk and protective factors within the family environment known to shape later substance use behaviours. It comprises seven weekly sessions each lasting 2 h	Usual practice	NR	Incremental cost-effectiveness ratio of -£19,652 – the intervention arm was dominated	NR	24 months
Sumnall et al. 2017 [43]	Northern Ireland	RCT	12–13 years old	11,316 (5749, 5567)	Heavy alcohol drinking prevention. STAMPP had two components: 1. a school-based alcohol harm reduction curriculum delivered in two phases over 2 years, 2. a brief parental intervention designed to support parents in setting family rules around drinking	Usual Practice	NR	NR	3.5%	33 months
Bullying										
Bonell et al. 2019 [44, 45]	South East England	RCT	11–12 years old	6667 (2873, 3087)	Schools were provided with (1) a social and emotional curriculum, (2) all-staff training in restorative approaches, (3) an external facilitator to help convene an action group to revise rules and policies and to oversee intervention delivery and (4) information on local needs to inform decisions	Usual Practice	NR	£13,284 per QALY (95% confidence interval -£32,175 to £58,743) at 2 years and £1875 per QALY (95% confidence interval -£12,945 to £16,695) at 3 years	3.5%	2/3 years

Table 3 (continued)

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Dis-count rate	Time Horizon
Clarkson et al. 2019 [46, 47]	England	Before and after study	7–11 years old (year 3 to 6)	4090 eligible, 3720 pre test, 3612 post test data	KiVa comprises a whole school curriculum and a targeted intervention implemented when bullying is identified. Features that differentiate it from other antibullying programmes include (i) concrete materials for pupils, teachers, and parents; (ii) a virtual learning environment to reinforce learning; and (iii) exercises to enhance empathy, self-efficacy, and support victimized peers	None	NR	NR	NR	12 months
Stanley et al. 2023 [48]	UK	Matched Control	6–7 and 9–10 years old	1553 (803, 750)	Speak Out Stay Safe aims to increase children's awareness and understanding of the full spectrum of child violence and abuse and enable them to seek help from a trusted adult. The programme utilises a child-appropriate format incorporating film, cartoons, narrative, stickers and discussion. Children are informed about different types of abuse and harm including neglect, physical abuse, sexual abuse, emotional abuse and bullying and about Childline	Usual Practice	NR	NR	NA	6 months
Obesity										
Robertson et al. 2017 [49]	West Midland, UK	RCT	Children and families with children aged 6–11 years old	115 families (56, 59)	Families for Health version 2–10-week community programme including lifestyle information. Both parents were invited, together with all overweight and non-overweight siblings in the target age range. The programme emphasises parenting skills, relationship skills, and emotional and social development, and combines this with information about lifestyle, all of which are key to implementing and maintaining behaviour change	Other programmes (varied by locality)	NR	Not cost-effective. No QALY gain, 0.83 vs. 0.83; mean difference 0.0009 ICER £552,175	NA	12 months

Table 3 (continued)

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Discount rate	Time Horizon
Wyatt et al. 2018 [50]	Devon, England	RCT	9–10 years old	1,324 (676, 648)	The Healthy Lifestyles Programme–drama-based lifestyles week, goal setting and activities during 3 school terms	Usual Practice	NR	Not cost-effective. QALYs not reported but not effective at increasing physical activity ICER: NR	3.5%	30 years (follow-up 24 months)
Hearing/sight screening										
Fortnum et al. 2016 [51]	Nottingham, England	Decision model	4–6 years old	315 (75, 240)	School Entry Screening of hearing	No screening	NR	QALY gain in no screening arm: 35.9, QALY gain in pure tone screening device arm: 35.21, QALY gain in HearCheck device arm: 35.16. Cost: No screening. Total cost £182,332, Incremental cost PTS £27,304, HC £32,990. No screening dominants both screening methods	3.5%	4 years
Horwood et al. 2021 [52]	South of England	Audit	4–5 years old	5706, 5630	Visual acuity screening by school nurse. The visual acuity screen is part of other school entry health checks, and each nurse is based in a small number of schools, so they will test many fewer children's VA per session and per year. There is no rescreen option, so all children not passing the screen are referred	Visual acuity screening by orthoptist	NR	NR	NR	NR
Social workers in schools										
Stokes et al. 2023 [53]	Greater Manchester, England	RCT	Secondary School children	164 schools (82, 82)	Supervision of designated safeguard leads	Usual Practice	NR	NR	NR	19 months
Adara et al. 2023 [54]	England	RCT	11–18 years old	277,835 (140,680, 37,208)	Social workers are embedded within schools to undertake statutory social work with children and families, with the aim of safely reducing the need for children to receive children's social care services	Usual practice	NR	ICER £126,281 (−678,691; 426,129.3). Additional cost of £126,281 to prevent one Sect. 47 enquiry, standardised per year per 1000 students. Not cost-effective	NR	22 months

Table 3 (continued)

Study	Region	Study design	Participant details	No. of participants (intervention and control)	Intervention	Comparator	Benefit–cost ratio (BCR), Return on Investment (ROI) or Incremental Net Monetary Benefit (INMB)	QALY gained and Incremental cost-effectiveness ratio (ICER)	Discount rate	Time Horizon
Sexual health										
Lohan et al. 2022 [55]	UK	RCT and decision model	13–14 years old	6556 (3198, 3358)	If I were Jack: prevention of unplanned pregnancy. Evidence-based, theory-informed, user-endorsed intervention designed to engage especially with teenage boys and intended to increase both teenage boys' and teenage girls' intentions to avoid an unplanned pregnancy and to promote positive sexual health	Usual Practice	20-year period is likely to lead to a cost saving of £9·89 per adolescent receiving the intervention compared with existing RSE	Intervention is dominant over 20 years–cost saving and QALY increasing	3.5%	20 years
ADHD										
Sayal et al. 2016 [56]	Nottinghamshire. England	RCT	4–8 years old	Parent = 76, teacher = 169	Parent only: The programme was delivered to groups of parents in three 2-h sessions over consecutive weeks. Parent + teacher intervention: This intervention comprised the parent-only intervention plus an additional 1.5-h group session delivered by the research team to Reception Year to Year 3 teachers	Usual Practice	NR	The incremental cost per one-point improvement in the ADHD index was £29 for the parent-only intervention and £134 in the combined intervention	NA	6 months
Oral Health										
Kay et al. 2018 [57]	UK	Decision model	5–12 years old	NR	Two separate interventions: fluoride varnish and supervised tooth brushing among 5- and 12-year-olds in England at high risk of oral disease (those living in relatively deprived areas). One study took place in nurseries, one had teachers trained by dental hygienist, other was unclear	Unclear	NR	NR	1.5%	Lifetime

Management training programme (£16,000 per QALY at 9 months, £10 per QALY at 18 months) [16, 17], the Healthy Minds curriculum [18] and School-Based Mindfulness Training [21]. Again, the authors reported considerable uncertainty and dependence on the economic assumptions made and time horizon used. For example, apparent early cost-effectiveness of the Teacher Classroom Management training programme was not sustained by 30 months [16, 17].

Of the four evaluations on counselling in schools, one reported positive returns on investment (Place2be—one to one counselling) [24]. CBT from Mental Health Support Teams [26] and an evaluation of school-based humanistic counselling [25] demonstrated a lack of evidence with mixed results. The FRIENDS programme was found not to be cost effective (it was found to be both less effective and more costly than usual care) [23].

Obesity (n = 2)

A study of a community educational programme engaging families, the Families for Health programme [49] found that the intervention was neither effective nor cost-effective for the prevention and management of obesity in children aged 6–11 years compared with usual care with an estimated ICER of over £500,000 per QALY. The other obesity prevention study, of the schools-based Healthy Lifestyles Programme [50] also reported the intervention not to be cost-effective, as outcomes were not improved.

Physical activity

Exercise programmes (n = 3)

Of the exercise class or programme interventions aimed specifically at children, two were after school – the Bristol Girls Dance project [27] and an economic model based of an after school intervention and multicomponent intervention [28], and one was in lesson time – the Daily Mile [29]. The Bristol Girls Dance project was reported to result in no increase in QALYs and higher cost, so usual practice was dominant [27]. A review-based economic model (which included the Bristol Dance project among the interventions modelled) [27] reported an ICER of £11,486 for a simple after school intervention and an ICER £68,056 for a multicomponent intervention [28]. The intervention in lesson time (the Daily Mile) was only cost-effective for girls [29]. These studies were all found to have serious or potentially serious limitations in the ECOBIAS assessment, mostly related to lack of detail in reporting.

Multifaceted interventions (n = 4)

The 'PLAN A programme' [32], 'GoActive' [34], 'Girls Active' [31], and 'WAVES – the West Midlands ActiVe lifestyle and healthy Eating in School children' [30] focused largely on physical activity classes or teacher training that also included other behavioural elements such as 'parent-interactive homework', 'educational component', 'an app' or 'social support provision'. The studies found no evidence of effectiveness or cost-effectiveness.

Healthy eating and physical activity (n = 2)

The programmes aimed at healthy eating and physical activity were 'Active for Life Year 5' [37] and 'LifeLab Plus' [58]. 'Active for Life Year 5' [37] was not found to be cost-effective whereas in the case of 'LifeLab Plus' [58] the intervention (including an app and educational visit to a university hospital) had an ICER of £14,367 when taking a societal perspective.

Healthy eating (n = 2)

One RCT evaluated incentive schemes for school lunches, aiming to increase children's willingness to choose and consume fruit and vegetables at lunchtime through rewards such as stickers [38]. This was not a full economic analysis, and it was unclear whether or not the intervention was cost effective.

An economic analysis of Food for Life, an invention that aims to promote a good food culture through supporting practical delivery and influencing public decision-making, reported a positive return on investment (ROI), of £4.41 return in social value for every £1 invested [39].

Risk behaviour (n = 4)

Two studies intervened around alcohol behaviours. One RCT found a screening and brief alcohol intervention for 14- to 15-year-olds not to be cost effective [41]. Another cluster RCT of the Steps Towards Alcohol Misuse Prevention Programme (STAMPP), a school and community-based programme aiming to reduce heavy alcohol drinking in 12- to 13-year-olds, found the intervention to be partially cost effective, as there was some evidence for it reducing heavy episodic drinking [43].

The Strengthening Families Programme, aiming to prevent substance misuse in 10- to 14-year-olds was evaluated in a pragmatic RCT [42]. The primary outcome measure was alcohol use, and the programme was not found to be not cost-effective – the intervention was less effective and more costly than usual practice.

A smoking prevention intervention delivered by teachers was evaluated using a cluster RCT [40]. It was found to be cost effective, with an ICER of £99 per ever smoker avoided at age 15–16 years, although this cannot be compared against programmes in other areas as they did not estimate QALYs.

Bullying (n = 3)

Three anti-bullying interventions were assessed, the Learning Together programme [45], KiVa ("Against bullying") [46, 47] and the Speak Out Stay Safe (SOSS) programme [48]. Whilst the Learning Together programme [45] was deemed to be cost effective (with some uncertainty, and reported ICERs of £13,284 (95% CI -£32,175 to £58,743) at 2 years and £1,875 (95% CI -£12,945 to £16,695) at 3 years), cost-effectiveness of the other two programmes was unclear.

Screening (n = 2)

School entry hearing screening programmes delivered by school nurses were not found to be cost-effective, as they are dominated by a no-screening strategy (no screening was both less costly and equally or more effective) [51].

The cost-effectiveness of school-entry visual acuity screening by school nurses as opposed to orthoptists was assessed in one study [52]. For the orthoptist delivered service, the false positive screening referrals cost the NHS £910; while for school nurse delivered service, false positive referrals cost £6,300. The orthoptist-delivered screening (ODS) was more cost-effective compared to the school nurse-delivered screening (SNDS), primarily due to its superior diagnostic accuracy, reduced false-positive rate, and lower downstream costs.

Social workers in schools (n = 2)

Two RCTs evaluated the impact of social workers in secondary schools, one through the supervision of safeguarding leads delivered by a designated social worker [53] and the second with social workers embedded in schools [54]. Neither found evidence of cost-effectiveness.

Sexual health (n = 1)

An intervention delivered by teachers to increase teenagers' intentions to avoid an unplanned pregnancy and to promote positive sexual health—'If I were Jack'—was found to be cost-effective [55, 59]. Taking account of health-care costs, the total mean incremental cost of the intervention compared with standard relationships and sexuality education was an additional £2.83 (95% CI – £2.64 to £8.29) per student. Decision modelling indicated that the intervention could result in 379 (95% CI 231–477) fewer unintended pregnancies, 680 fewer STIs (95% CI 189 to 1647), and 10 QALYs (95% CI 5 to 16) gained per 100,000 young people over a 20-year time horizon, with an overall cost saving of £9.89 (£4.83 to £15.60) per young person.

ADHD prevention (n = 1)

A cluster RCT found that there was no significant improvement in the primary outcome (ADHD index) for a brief school-based group programme for parents of children aged 4–8 years at risk of ADHD. The combined intervention, however, reduced parent-reported hyperactivity symptoms, although the result was marginal (p = 0.05) and the parent-only intervention improved parental mental health (p = 0.009). This study suffered from sparse reporting of the economic analysis but reported that the intervention was found to be partially cost effective [56].

Oral health (n = 1)

This was only one economic evaluation relating to oral health [57], examining two interventions, fluoride varnish and supervised brushing among 5 and 12 year olds in England at high risk of oral disease (those living in relatively deprived areas). The setting tended to be nurseries or schools. The authors concluded that, while there was some uncertainty, both may be cost-effective interventions, under a wide range of scenarios, with a cost of £55 per child for supervised tooth brushing and £100 per child for fluoride varnish application.

Risk of bias

The results of the assessment of the risk of study bias using the ECOBIAS checklist are presented in supplementary Table 1. Studies with unclear cost-effectiveness results had a higher risk of bias, with lower ECOBIAS scores (median = 11.5) than other studies (Fig. 2). Similar composite scores were observed in studies that demonstrated to be cost-effective (median = 24) or not cost-effective (median = 22). We identified the main weakness(es) of each study (which included poor reporting where applicable) and categorised each paper as having minor limitations, potentially serious limitations, and serious limitations (supplementary Table 2). Sixteen of the studies had more than minor limitations.

A heat map depicting the results of the studies (cost-effective or not) according to level of limitations and type of intervention is shown in Table 4. Only one study had serious limitations, this reported the intervention to be cost-effective. Of the 15 studies with potentially serious limitations, three indicated cost-effectiveness. Of the 23 studies with only minor limitations, five found the intervention to be cost-effective. There is no strong pattern in severity of limitations and finding the intervention to be cost-effective or not.

Discussion

Recent UK government commitments include a 'shift from sickness to prevention' [60] and a pre-election pledge to make children 'the healthiest generation ever' [61]. These ambitions are challenging, particularly in the face of apparently declining physical and mental health of children [62], increasing numbers of children living

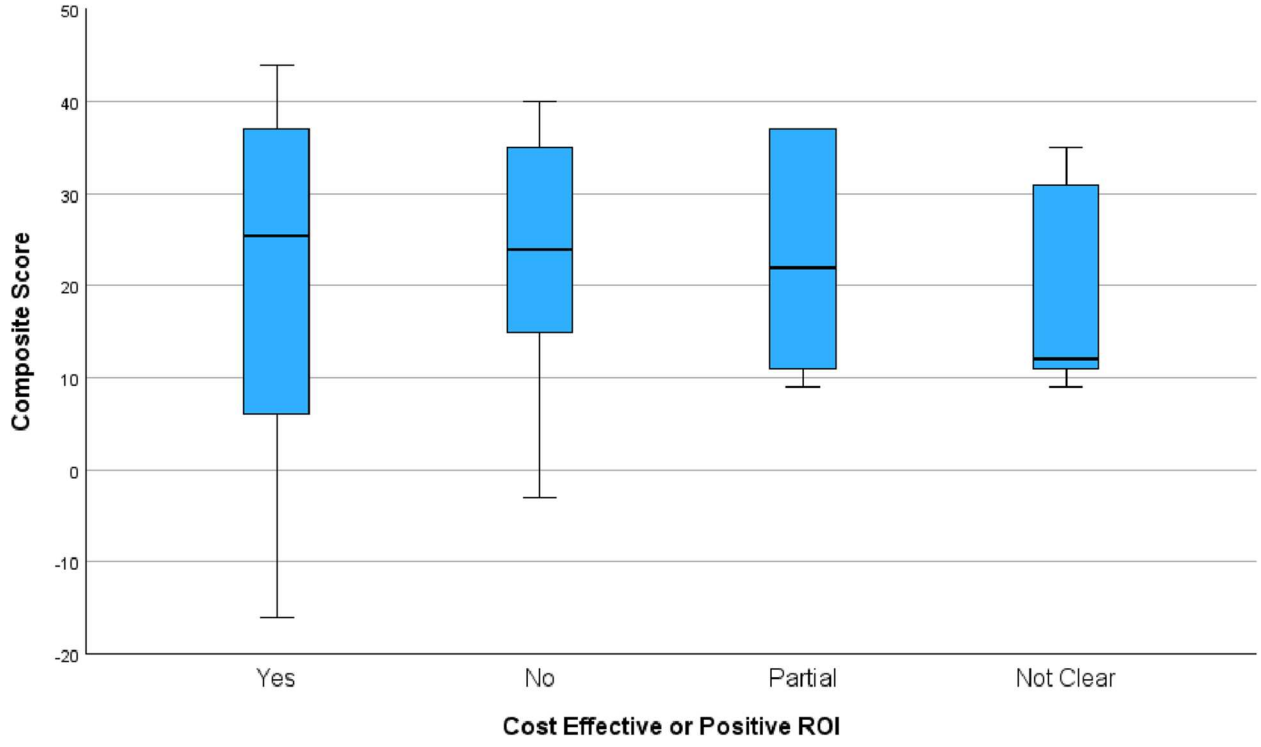


Fig. 2 Box plot showing median composite ECOBIAS score. Footnote: Yes – indicates the study found the intervention to be cost effective or have a positive return on investment (ROI) value. No – indicates the study found the intervention to not be cost effective or not have a positive return on investment (ROI) value. Partial – indicates that the study found the intervention to be cost effective or have a positive ROI under certain conditions or in particular subgroups (for example, one study found the intervention to be cost-effective for girls but not boys). Not clear – indicates that we were unable to establish if the study found the intervention to be cost effective or not

in poverty [63] and long-term pressures on public health budgets [64]. Numbers of school nurses have fallen steadily over recent years [65], despite their key role in delivering the HCP for children aged 5–19 years. In this context, identifying cost-effective interventions to promote health and prevent ill-health in school-aged children is critical.

We identified 39 studies that assessed the economic value of a wide range of interventions that local governments could decide to implement to increase health and wellbeing in children aged 5–19 years old. The evidence was variable, which may, in part, reflect the heterogeneity of the interventions included. This review evaluated a broad spectrum of interventions targeting children and adolescents aged 5 –19 years in England and the UK, focusing on outcomes across mental health, obesity, physical activity, risk behaviours, oral health, and other domains.

Mental health interventions made up many of the included studies, with mixed evidence of their value. Lesson-based interventions, such as the PATHS programme and School-Based Mindfulness Training, showed promising but uncertain results due to varying assumptions and time horizons. Counselling interventions provided inconsistent evidence, with only Place2Be's one-to-one counselling demonstrating positive returns on investment.

Interventions targeting obesity and physical activity often failed to demonstrate benefits sufficient to justify their costs, with only the Daily Mile showing promise, and this was only for girls. Multifaceted programs, despite their comprehensive approaches, did not yield significant benefits, potentially due to implementation challenges or insufficient intensity.

Whilst a smoking prevention intervention proved successful, it may be that other population-level interventions that rely less on individual choices may be more cost-effective, such as legislation on marketing, sales and taxation [66, 67].

Many other factors may contribute to results of the individual studies. Most of the interventions were delivered by schools, and frequently by teachers. We found no UK-based economic studies of the range of activities of school nurses. Some studies in the US have argued that school nursing roles are cost-effective [68–75], but both the school and health systems in the US are very different from the UK. Two of our studies found that school nurses providing school entry screening, for hearing and visual acuity, was not cost-effective, but school nurses clearly provide many other services to children. The

Table 4 Heatmap of studies categorised by level of limitations in methods and cost-effectiveness

Intervention Group	Serious Limitations	Potentially Serious Limitations	Minor Limitations	Number Cost Effective	Total
Improving mental health	+ (1)	+ (2)—(2)	+ (1) – (3) ± (3)	4	12
Preventing obesity		-(1)	-(1)	0	2
Increase physical activity		- (4) -/+ (2)	-(1)	0	7
Healthy eating and physical activity			+ (1) NC (1)	1	2
Healthy eating			+ (1) NC(1)	1	2
Reducing risk behaviours			+ (1) –(2) ± (1)	1	4
Combating bullying			+ (1) NC(2)	1	3
Hearing or vision screening			-(2)	0	2
Social workers in schools		-(1) NC(1)		0	2
Improving sexual health		+ (1)		1	1
ADHD prevention		± (1)		0	1
Improving Oral health			NC (1)	0	1
TOTAL	+ (1)	+ (3) – (8) ± (3) NC (1)	+ (5) – (9) ± (4) NC (5)	9	39

+ study indicates cost-effectiveness,—study does not indicate cost-effectiveness, ± study indicates cost-effectiveness in some subgroups or scenarios

NC Not Clear (Number of studies)

interventions which did show some evidence of cost-effectiveness or positive return on investment are services that school nurses have skills to deliver or support (e.g. improving sexual health behaviours, promoting pro-social behaviour and mindfulness).

From the evidence reported here, we are reluctant to infer clear policy and practice recommendations. Relative to other areas of public health, we found evidence to be heterogeneous and sparse. Previous reviews[76, 77] have synthesised evidence on early-years interventions, finding good evidence supporting many of the activities delivered through the HCP (aged 0–4), although evidence gaps remain. Evidence to support (or not support) activities to promote health and wellbeing in school-aged children is comparatively lacking, particularly when accompanied by economic analysis.

Research recommendations

This review underlines a significant gap in the economic evidence base for school nursing based activities, which is important given the time constraints on school nurses and the wide variety of activities which they could undertake. A recent survey of school nurses [7] revealed a general view that because of the time they spend on supporting children and young people on child protection and child in need plans 'they are unable to fulfil their wider public health role and use their expertise as public health nurses to promote, protect, prevent, and intervene early to support improved health outcomes for children and young people'. The survey also found declining numbers of school nurses, with varied caseloads – on average in England a school nurse looks after 4,000 children, but this ranges from 2,850 in the Northwest and West Midlands to over 9,000 in the Southwest.

There were other notable gaps in the economic evidence of interventions that come under the umbrella of the 5–19 HCP public health initiative, including other school-entry health checks such as tests of progress in speech and language, and measuring weight and height as part of the National Child Measurement Programme (NCMP). These checks provide important information to education and health professionals, as well as important national data on children's health. In addition, there was only one study on sexual and reproductive health despite the age range of the inclusion criteria (up to 19 years).

Strengths and limitations

This study syntheses studies of the value of various interventions for school-aged children at a time when local authorities face constrained resources and must make

evidence-informed investment decisions. To our knowledge, this is the only review to address the economic evidence relevant to the HCP for 5–19 year olds.

A key strength of our review is the comprehensive search strategy we employed, covering multiple sources—including sixteen databases, web sources and grey literature. We also carried out rigorous screening and data extraction, using two independent reviewers. Although this is a scoping review, we applied a risk of bias tool and provided a narrative summary of the limitations of the included studies to guide readers to the quality of the underlying economic evidence.

The wide range of included interventions is both a strength and limitation. On the one hand, it enables policy makers and researchers to quickly identity areas where economic evidence exists and where it is lacking. On the other hand, the heterogenous nature of the interventions – and the diverse measures used to report costs and benefits – made synthesis challenging and precluded us from undertaking a full systematic review.

Despite our broad and systematic approach, it is possible that we missed relevant studies. Some evaluations may have been undertaken internally and are not in the public domain. Additionally, we limited our inclusion criteria to studies conducted in the UK. While this was appropriate for our research focus, there may be some evidence from outside the UK that may be applicable to a UK context.

The quality of the included studies was another limitation. One study had serious methodological issues and a further 15 of the 39 studies had potentially serious limitations. As shown in supplementary Table 2, certain topic areas – such as the promotion of physical activity – had particularly weak evidence, with 6 out of 7 studies rated as having potentially serious limitations.

Finally, the results of all the included studies are likely to be sensitive to various factors, including the assumptions made, the cost and benefit perspective taken, and the time horizon chosen.

Conclusions

This scoping review demonstrates both the wide range of interventions on which local authority public health teams could choose to allocate resources, and the potential difficulties they face in making prioritisation decisions. While a wide range of outcomes were targeted (such as mental health, physical activity, healthy eating and risk behaviours) evidence of cost-effectiveness was limited and often uncertain. Local authorities are responsible for investing in the health of school-aged children but have partial evidence of mixed quality to inform their choices. An improvement in the evidence base for school nurse activities, who deliver health promotion to all school-aged children and young people, is particularly warranted.

Supplementary Information

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Supplementary Material 1.

Authors' contributions

SG contributed to study design, literature searching, title, abstract and full-text screening, data extraction, data analysis, writing the first draft of the manuscript, and subsequent revisions of the manuscript. AC, VD, TM-B, KB contributed to the abstract and full-text screening, data extraction. VD contributed to the analysis. KB contributed to the project management and funding acquisition. CB, LH and DA contributed to the ECOBIAS assessment. All authors read and approved the final manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Not applicable.

Competing interests

The authors declare no competing interests.

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