Chapter 3

The economic case for a shift to prevention

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Key statistics

- **£4 trillion –** The approximate cost of a range of preventable health and social outcomes faced by children and young people over a 20-year period, according to research by Action for Children and the New Economics Foundation.[8]
- **6–10% –** The annual expected rate of return on investment to be achieved by investing in interventions early in life.[122]
- **6% –** The National Audit Office estimate of current government spending on early action, which it estimates has remained relatively static. The report concludes that 'a concerted shift away from reactive spending towards early action has the potential to result in better outcomes, reduce public spending over the long term and achieve greater value for money'.[8]
- **4% –** The percentage of health spending in England in 2006/07 on preventive measures according to Health England research.[8]
- **£149,240 –** The cost of a year's placement for a child in a local authority children's residential home.[123]

Our analysis focuses on the costs of certain health issues that may be preventable to improve outcomes in later life. We look at preterm birth, unintentional injury, child obesity and certain child mental health problems.

- Our analysis estimates the public sector annual costs of preterm birth to age 18 at £1.24 billion and total societal costs at £2.48 billion (including parental costs and lost productivity).
- Based on our analysis, the potential annual long-term cost to society of one major type of injury, severe traumatic brain injury, may be between £640 million and £2.24 billion in healthcare, social care, social security costs and productivity losses.
- Our analysis estimates the long-term costs of child obesity to be £588–686 million.
- Our analysis estimates the annual short-term costs of emotional, conduct and hyperkinetic disorders among children aged 5–15 to be £1.58 billion and the long-term costs to be £2.35 billion.
- A range of strongly evidence-based interventions, already recommended in National Institute for Health and Care Excellence (NICE) guidance, if implemented effectively and at scale could have a dramatic impact, improving children's lives while saving costs to the system.

Introduction

If, as a society, we invest adequately in our children and young people's health and development, we will reap the rewards. If energy and resources are focused on interventions that help to avoid or address challenges early in life – that is, implementing an effective preventive agenda – not only will we improve the lives of children and families, but we will also start to save resources quite quickly. Taking steps to prevent problems before they occur or deteriorate, as the Early Action Taskforce has argued, offers a 'triple dividend – thriving lives, costing less, contributing more'.[1]

It is widely understood that preventing debilitating or catastrophic life events has a profoundly positive effect on people's lives: they live better as well as longer. Despite a wealth of evidence, the challenge has been to translate this logic into action. Tackling preventable physical and mental health problems more effectively would reduce healthcare costs, reduce caring costs borne both formally and informally, and have an impact on working lives with important economic effects. Most public investment is spent on dealing with pressing, acute needs. Of course such needs require immediate action, but their call on society's collective attention may go beyond this. The image of a life or limb saved by state-of-the-art surgery is a powerful one; it speaks to the immensity of our scientific progress, the skill of practitioners and the ability to overcome potential tragedy. By contrast, an incident prevented is more abstract; it is the life path altered, the accident avoided, the potential tragedy averted. We know only about the absence of incidents from statistical charts, not from life stories.

At any time there is a responsibility to invest scarce public resources where they will have the greatest effect. In the current climate of fiscal retrenchment and rising need, particularly in the areas of health and social care, this responsibility has become a necessity. An effective social justice agenda cannot be pursued without taking a step change in society's approach to early action and prevention.

Early action may mean preventing or tackling problems early in life, or it may mean catching an emerging problem early enough to minimise potentially damaging effects. The possible benefits of early action exist in many aspects of public services: the falls clinic that prevents a hip fracture; the smoking cessation service that slows the progression of chronic lung disease; the strategies to support employee mental health that enable people to remain in work. In many fields there is room for more preventive work, for considering even small steps 'upstream' in the way services are delivered.

Public health typically talks about three approaches to prevention:

- primary – universal approaches which tackle the causes of ill health
- secondary – early intervention with those identified as at risk
- tertiary – treatment aimed at avoiding the most damaging consequences of a disease or condition.

The case for early action is particularly compelling for children and young people. As analyses of the life course have shown repeatedly, the seeds of the future are sown early in life,[2] and the way they are nourished will have important implications for their future growth in terms of health, education, employment and many other areas.

In this chapter we make two main arguments:

- Spending on the early years of life should, as the Organisation for Economic Co-operation and Development (OECD) has argued, be seen as an investment which will yield returns in future. Giving children the right platform of physical and emotional health, and cognitive, social and linguistic skills from which to thrive will enhance their lives, help to avoid the human and economic costs associated with adverse childhood and adult experiences (See Table 3.1) and provide a skilled, capable adult population to support a future economy. (See for example the case as made by Greater Manchester in the case study below.)
- In many areas of child health, small shifts in focus towards prevention would have a profound impact on children's lives while also saving money. These financial gains are major in the long term, but even in the short term they represent significant health improvements and cashable savings. There is a wide range of evidence-based practice set out, for example in NICE guidance, which if properly implemented would make a real difference.

Case study

Making the economic case for early investment – the Greater Manchester Strategy 2013–2020

The Greater Manchester Economic Strategy takes an explicit life-course approach, connecting early-years investment and outcomes with future economic growth in the conurbation. The strategy states that:

'40% of children in GM [Greater Manchester] were not 'school ready' when they were assessed towards the end of reception class in 2012. They may well start their school journey on a negative trajectory, with poor social, communication, emotional and behavioural skills meaning they are likely to fall behind from the outset. Without the right support, by the time they are teenagers, these children are more likely to engage in antisocial behaviour, and leave school with poor qualifications, contributing to GM's low levels of economic activity and weak skills base.[3]

Building on Total Place pilots and reconfiguration of services, Manchester is committed to providing a combined universal-targeted early-years offer to increase the potential of its population.

Table 3.1 Could some of these costs be saved? The estimated costs of dealing with a range of health and social problems

	Costs
Youth unemployment	£133 million per week[4]
Youth crime	£1.2 billion per year[4]
Educational underachievement	£22 billon per generation[4]
One year in a children's residential home	£149,240[5]
One year in foster care	£35,152[5]
Admission to inpatient child and adolescent mental health services	£24,482 (median) [120]

As well as the range of reports published in recent years, we draw in particular on a fresh analysis of four major child health challenges: preterm birth, accidental injury, child obesity, and child and adolescent mental health problems, to highlight the potential benefits of a shift to prevention.

From Wanless to Allen: the new canon of evidence for prevention

Whether the focus is on setting children up for co-dependent, supportive, contributory adult lives or ensuring that during their childhood they thrive, the potential benefits of early action are clear. We have reached a tipping point in the policy debate about early action in the last few years; a new canon has emerged, drawing together a wealth of evidence and making this case powerfully (see Table 3.2). The growing evidence base alongside this strong discourse, evident in reports such as those of Derek Wanless, Michael Marmot and Graham Allen, is driving new policy and practice development across different sectors.

Table 3.2 A selection of recent major reports focused on early intervention, early action and prevention, and the costs of intervening later

Year	Report	Key messages
2004	*Securing Good Health for the Whole Population*, Derek Wanless	Without a greater focus on prevention, the NHS as a publicly funded system as we know it will be unsustainable given the range of pressures over the medium term.
2009	*Backing the Future: why investing in children is good for us all*, New Economics Foundation/Action for Children	Of 16 European countries, the UK has the highest estimated 20-year costs of a range of health and social problems, including: productivity losses from 16–19 year olds not in education, employment, or training (NEETs); NHS costs from obesity; costs of crime to the state and wider economy; welfare and health costs of teenage births; welfare and health costs of substance misuse; costs of mental health problems to the state and wider economy; costs of family breakdown to the state; and NHS costs from dealing with the consequence of violence experienced by children. Through a combination of targeted and universal interventions the payback would start to be realised within five years. After 10 years the cumulative return on investment would be £259 billion.
2009	*Public Health and Prevention Expenditure in England*, Health England Report No. 4	In 2006/07 the NHS in England spent an estimated £3.78 billion (4% of total NHS health expenditure) on prevention.
2010	*Fair Society, Healthy Lives: Strategic review of health inequalities in England post-2010*,	Comparing the current situation with one in which the whole population had the same health outcomes as the most affluent 10%, the economic consequences of existing health inequalities are estimated to be more than £30 billion in productivity losses and £20–32 billion in lost taxes and higher social security costs. The costs to the NHS of acute illness, mental illness and prescriptions are estimated to be at least £5.5 billion.
2010	*Grasping the Nettle: Early intervention for children, families and communities*, Centre for Excellence in Outcomes for Children	A 'how to' guide for effective early intervention drawing on a wide range of practitioner expertise. Focus is on early childhood, language development, working with parents, more effective services through better commissioning, partnership working and smarter use of data.
2011	*Early Intervention: The next steps*. An Independent Report to Her Majesty's Government, Graham Allen	Concentrating on social-emotional development, the cost of inaction is high. Well-evidenced interventions can make a difference. Significantly, the Allen Reports have helped to catalyse action on innovative models of investment in early years.
2011	*Early Intervention: Smart investment, massive savings*. The Second Independent Report to Her Majesty's Government, Graham Allen	
2011	*Early Years Interventions to Address Health Inequalities in London – the economic case*, Greater London Authority Economics	Highlighted the mismatch between current patterns of investment and potential returns, with minimal amounts spent in the early years compared with later expenditure. Modelled the cost benefit of a range of early childhood interventions.
2011	*The Triple Dividend: Thriving lives. Costing less. Contributing more*, The Early Action Taskforce	Ten-year funding cycles, early action transition plans, better data on current costs and early action champions in government would strengthen delivery of effective early action across government.
2013	*Early Action: Landscape review*, National Audit Office	Estimated that 6% of government spending funds activity which could be called 'early action'. There is a range of remaining barriers to more widespread early action.

This agenda crosses party political lines; it is not ideologically driven beyond the view that, through the effective implementation of appropriate evidence, we can achieve better outcomes for people and as a consequence deliver better financial outcomes for HM Treasury and the broader economy. The cross-party support for Graham Allen's work and the new All-Party Parliamentary Group for Conception to Age Two – The First 1001 Days are signs of this consensus.[6]

This consensus extends beyond the political sphere. To mark the NHS at 65, PricewaterhouseCoopers published a report on how the NHS could get itself into a 'healthy state' over the next decade. They concluded that there were six major drivers, the first of which was that 'prevention needs to become a reality'.[7]

Policy makers have talked about prevention for many years. The 2000s saw many initiatives which developed the social and physical infrastructure for early intervention, such as the opening of 3,500 children's centres. More recently, a new wave of innovation has focused on developing tools to tackle financial and other systemic barriers to prevention work. These innovations include Total Place, Community Budgets, the Commissioning for Quality and Innovation (CQUIN) payment framework, Payment by Results and social finance models.

Action, inaction and barriers to progress

Despite this swell of activity, early action is far from becoming mainstreamed. A review by the National Audit Office in 2013 found that over recent years only 6% of government activity could be called 'early action'. The review also highlighted a range of remaining barriers to more widespread early action.[8]

Austerity in national and local government and in the health and care system is frequently portrayed as both a threat to and an opportunity for the prevention agenda. The threat is clear. At a time of rising acute need and falling levels of funding, finding new resources to invest in upstream prevention activities is hard. In fact prevention initiatives may be precisely those which may be at greatest risk of losing their funding. For example, a recent survey suggested that two-thirds of councils had cut their funding for child and adolescent mental health services,[9] and the National Children's Bureau estimated that the children's voluntary sector faces cuts of £405 million by 2016.[10]

The opportunity provided by austerity is less straightforward. The extreme asymmetry of resources and needs means 'business as usual' is not a straightforward option and many policy makers, commissioners and providers are considering radical solutions. However, while resource constraints necessarily catalyse action, a range of barriers still exist to implementing prevention approaches effectively. These barriers have been mentioned frequently in the reports highlighted in Table 3.2 and include:

- the perceived time lag between investment and benefit, which means that any savings are not likely to be realised in any given financial or political cycle
- the reality that investments from one budget, department, institution or commissioner may be required to bring benefits to another, limiting budget holders' willingness to take action
- lack of sufficiently compelling evidence that interventions will lead to promised outcomes, and therefore difficulty in passing a 'business case' test
- lack of incentives for different parts of the system to grapple properly with the challenges of shared goals, let alone pooling or aligning budgets
- absence of sufficient data to understand fully the costs of existing approaches and therefore the real costs of inaction
- lack of resources to invest in up-front prevention while acute need is ongoing
- lack of a workforce that understands the benefits of evidence-based practice, has the tools to implement it, and is sufficiently settled and secure to deliver ambitious change
- the many challenges of disinvestment – it is difficult to stop doing those things which may not be working effectively but are part of the accepted local landscape in order to reinvest
- lack of encouraging examples of prevention delivered at population scale which have successfully reduced demand for 'late intervention' services (see case study below for an example).

Case study

Reducing demand for late intervention at scale – Triple P in South Carolina

A major trial of a population-based strategy to reduce child harm was published in 2009, showing the benefits of delivering an evidenced-based programme at scale. The Triple P Positive Parenting Program has five tiers, including universal communication and media strategies designed to normalise and de-stigmatise parenting and family support alongside intensive support for families with severely troubled children. The trial targeted 85,000 families with a child aged under 8 in the catchment area and compared outcomes with nine other counties. This involved training a large number of professionals working in family support services, social services, preschool and childcare settings, elementary schools, non-governmental organisations, private sector practitioners, health centres and other community entities having direct contact with parents and families.

The results were equivalent to 688 fewer cases of child maltreatment, 240 fewer out-of-home placements and 60 fewer children with injuries requiring hospitalisation or emergency room treatment in a population of 100,000 children aged under 8.[11]

A new analysis of the benefits of prevention

Despite the wide recognition of the benefits of a shift to prevention, the barriers outlined above remain. In this chapter we consider four areas of child health on which we have carried out a new analysis of the benefits of prevention. We look at:

- preterm birth
- unintentional injury
- child obesity
- child and adolescent mental illness.

These were chosen because they form a major burden of disease in children and young people and they also offer variety both in the types of health problem they represent and in their place across the child's life course. However, it is worth noting that, while helpful conclusions can be drawn about activity within these specific areas, we also intend for this approach to be indicative, highlighting the benefits of a prevention approach which might be applicable to other areas.

The analysis focuses on both the short and long-term costs associated with these health challenges. Long-term costs matter and should influence decision making, but we know that often they do not, with budgets shaping shorter-term horizons. By including short-term costs our intention is to draw policy makers', commissioners' and providers' attention to the benefits which could be accrued even over a relatively short time span such as an electoral or budget cycle, where the economic as well as the health and social benefits will be seen.

Method

The analyses comprised five main steps:

- A **review of the published literature**, considering academic studies and governmental and non-governmental reports in the four areas of child health. We identified these through systematic searches of bibliographic databases (PubMed, EconLit) and targeted searches of websites of governmental and non-governmental organisations nationally and internationally, including guidance by NICE.
- **Development of a conceptual framework** for each area under review, building on the identified evidence (see Figures 3.2–3.5). The frameworks show the pathways followed by each child health area, including the points for early intervention along the pathway, alongside potential outcomes and costs.
- **Further refinement of the literature review** guided by the frameworks (see Tables 3.1–3.4).
- **Analysis of evidence** considered eligible for inclusion. We used the conceptual frameworks to drive the search strategy in each area. Papers were considered for inclusion if they reported findings from a high-income country, were in English and, in the case of interventions, reported outcomes quantitatively. Studies were then assessed as to whether they were high quality, based on a well-defined research question, robust methods and clear findings. An assessment was made about the appropriateness of transferring findings from other countries to the context of England. For example, many of the costs and interventions reported around preterm birth in the USA were difficult to transfer given the differences in healthcare system and specific populations that interventions targeted.
- **Cost calculation –** All costs are given in 2012 current prices (GBP) (see Supporting information tables 3.1-3.4). Public sector costs refer to calculated direct public spending, including health, education, social care and social security costs. Societal costs include estimates associated with lost productivity in adulthood, either through reduced income from employment (both duration and wages) or caring responsibilities, as well as public sector costs.

The availability of data in the different areas of our analysis resulted in differences in the geographies analysed. For pre-term birth we look at England and Wales, for unintentional injury, the UK, for child obesity, England and for mental health, Great Britain. The approach we took to considering costs did not address two important factors:

- The implications for individual and family wellbeing. These are difficult to monetise, particularly in a study which does not consider Quality Adjusted Life Years and Disability Adjusted Life Years.
- Mortality: some of the health issues considered have important mortality dimensions. For example, recent statistics show that in 2011 in England and Wales there were:
  - 1,386 infant deaths caused by immaturity-related conditions[12]
  - 205 deaths among children aged 28 days to 15 years from external causes[13]
  - 141 suicides among 15–19 year olds.[14]

Our findings are shown in Table 3.3. The analysis follows, with data tables and details of studies found in the supporting information at the end of this chapter.

Table 3.3 Estimated annual costs associated with preterm birth, accidental injury, child obesity and certain child mental health problems

Condition	Costs	Definition
		Overall costs
Preterm birth	£1.24 billion	Additional public sector costs for children aged 0–18
	£2.48 billion	Total additional societal costs
Unintentional Injury	£15.5–87 million	Short-term hospital costs of severe unintentional injuries to children
	£640 million–£2.24 billion	Potential long-term societal cost of childhood traumatic brain injury
Obesity	£51 million	Short-term costs of treating child obesity
	£588–686 million	Long-term health and societal costs
Child mental health problems	£1.58 billion	Short-term health, social care and education costs of childhood conduct, emotional and hyperkinetic disorders
	£2.35 billion	Long-term health, earnings, benefits, education and criminal justice costs of childhood conduct, emotional and hyperkinetic disorders
		Costs per child
Preterm birth	£25,920	Additional public sector costs per preterm birth (for children aged 0-18)
	£51,656	Additional societal costs per preterm birth (up to 18 years of age)
Unintentional injury	£2,494–14,000	Short-term health costs of treating severe injury
	£1.43–4.95 million	Potential long-term societal costs of a childhood traumatic brain injury
Obesity	£35	Short-term costs of treating child obesity per obese child
	£585–683	Long-term health costs per obese child growing up to be an obese adult
Child mental health problems	£2,220	Short-term health, social care and education costs per child with mental health problems
	£3,310	Long-term societal costs per child with mental health problems

Preterm births

A preterm birth is defined as a birth at less than 37 weeks gestation. The consequences of being born preterm can be substantial, and can include a wide range of physical, neurodevelopmental, and behavioural sequelae. In 2010/11, more than 7% of live babies were born at less than 37 weeks gestation in England.[15]

Compared with infants born at term, preterm infants tend to have more health problems, which may include higher rates of temperature instability, respiratory distress, apnoea (cessation of breathing), seizures, jaundice and feeding difficulties.[16] They are also more likely to require readmission to hospital. The degree of prematurity is important, with greater prematurity associated with higher risk of hospitalisation, long periods in neonatal intensive care units or special care baby units, serious long-term complications and mortality. Periods of hospital treatment early in life can in themselves give rise to further health problems. However, even those of moderate and late levels of prematurity (32–36 weeks gestation) are at higher risk of short and long-term poor health outcomes or disability. A number of neurodevelopmental and behavioural problems have been associated with being born prematurely, including cerebral palsy, sensory impairments and overall developmental issues, including in areas such as attention, visual processing and academic progress.[16]

Estimates of the proportion of preterm infants who have long-term problems vary. A model used by Mangham et al. predicted that 4.2% of all preterm (i.e. <37 weeks gestation) survivors in England and Wales would have a severe disability at age 18. This rises to 7.9% for those born at less than 28 weeks gestation.[17] Saigal and Doyle reported that 25% of the most premature infant survivors may have substantial neurological morbidity.[16] A study by Platt et al., published in 2007, examined data from 16 European countries and found that the prevalence of cerebral palsy may be decreasing for preterm infants but, in the absence of more recent data, it is unknown whether this trend has continued.[18]

Costs associated with preterm birth

In the study mentioned above, Mangham et al. estimated the costs of preterm birth throughout childhood in England and Wales. They modelled the various stages that could

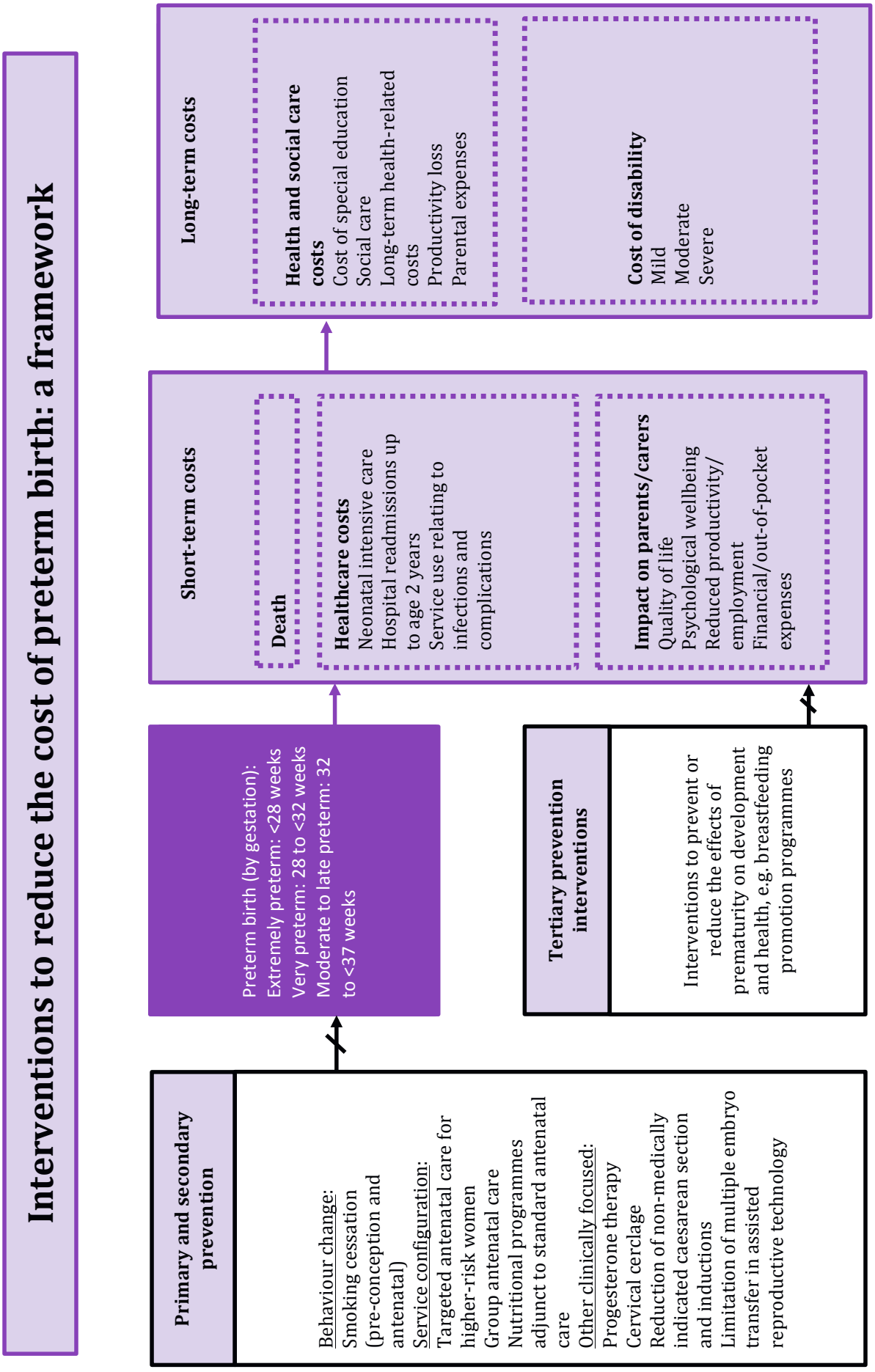


Figure 3.1 Preterm birth: a framework for costs and prevention

follow a preterm birth, including death, discharge or admission to neonatal care, which was used as a proxy for neonatal complications. Similarly, for those surviving to age 2, pathways included different stages from no disability to severe disability. The costs were discounted by 3.5% after the first year of life. Using a similar model, Petrou and Khan (2012) estimated the wider societal costs of preterm birth, including health and social care, education, parental expenses and lost productivity.[19] We used these two studies as the principal sources for estimating costs.

Based on Mangham et al.'s study, we estimate the additional public sector cost associated with preterm birth up to age 18 at £1.24 billion.[17] The vast majority of this cost, some £1.22 billion, is accumulated in the early years of childhood, from birth to age 2, with 92% of the cost accrued during the neonatal period (first 28 days of life).

Healthcare costs associated with preterm birth during the first two years of life are largely attributable to initial infant hospitalisation. The mean additional cost for preterm survivors' neonatal period has been estimated at approximately £24,000 per infant compared with an infant born at term. By comparison, the mean additional cost for delivery for a preterm infant compared with a term infant is £360, and £1,000 for the period between discharge and age 2.[17]

The long-term costs (up to age 18) associated with preterm birth include those related to healthcare, but also to social care, education, income and productivity losses incurred by parents and wider society. Together, these can be referred to as societal costs. Petrou and Khan found that in all categories of prematurity, societal costs are higher for preterm infants compared with babies born at term, with the greatest mean cost per preterm survivor among the most premature infants (≤ 27 weeks).[19] Drawing on their study, we estimate the mean societal costs of care for the most premature infants (<27 weeks) at £172,156, which is almost three times that attributable to a child born at term (£58,521) and twice that for a child born between 32 and 36 weeks' gestation (£75,484). Overall, the incremental societal cost per preterm child (gestational age <37 weeks) surviving to age 18 is estimated to be £51,656. Based on these costs, we estimate the total incremental societal costs associated with preterm birth to be £2.48 billion in England and Wales. As this is inclusive of costs beyond public sector costs, it is higher than the estimate above of £1.24 billion for public sector costs. The estimates used to derive the societal and the total public sector costs reported here draw on similar data sources, and the societal costs are likely to be inclusive of public sector costs, although costs are measured in different ways in the two papers.

In considering disability as a specific longer-term outcome of preterm birth, severe disability among preterm children (affecting approximately 4.2% of surviving preterm infants) aged 2 to 18 accounts for around 10% of the total public sector costs of severe disability among children. This equates to approximately £60.5 million per year. Mild disability affects a larger proportion, 18.5% of surviving preterm infants, and is associated with a total cost of £91.6 million.

Preventing premature births and improving outcomes for premature babies

Interventions can either target prevention of preterm birth or seek to improve life-long outcomes following preterm birth. Interventions are both clinically and behaviourally focused, including encouraging mothers' smoking cessation and breastfeeding. The most recent high-quality study on interventions to prevent preterm birth in developed countries identified the top five interventions as: smoking cessation, progesterone therapy, cervical cerclage, reduction of non-medically indicated caesarean delivery and induction, and limitation of multiple embryo transfer in assisted reproductive technology.[20] The study estimated that full implementation of all five interventions could lead to a reduction in preterm birth of 2% annually in the UK.

We consider here two important public health interventions: breastfeeding, which can reduce the risk of infection associated with prematurity, and smoking cessation, which can reduce the risk of prematurity. These interventions confer a much broader range of benefits to children and mothers, beyond addressing prematurity or its consequences, though we do not consider these here.

For preterm infants, the benefit of breastfeeding is most often associated with reducing the risk and severity of necrotising enterocolitis (NEC), an infection predominantly affecting preterm infants which can cause sepsis and death.[21] For example, in England, from 2007 to 2009, 27% of preterm infants admitted to neonatal units who were born at <28 weeks gestational age were estimated to have been treated for NEC. Of these, 67% died.[22] A systematic review of breastfeeding promotion interventions in neonatal care units examined the effectiveness of an intervention which involved increasing staff contact to encourage breastfeeding to reduce treatment costs of NEC and sepsis.[23] Based on US data, the review suggested an incremental total cost of about £670 for infants whose mothers did not receive the intervention; this applied to very small infants (500–999 g, which is typical of infants born at <28 weeks gestational age). The intervention group incurred a substantially lower cost (mainly attributable to lowered NEC and sepsis). Costs considered included that of the intervention (at £138 per infant), treatment of NEC and sepsis, length of inpatient stay in level I, II or III neonatal units and lifetime cost of disability.

Smoking cessation during pregnancy has been associated with reducing the risk of preterm birth. A recent systematic review suggested that interventions to reduce smoking by pregnant women could result in approximately 6% fewer women continuing to smoke.[24] Furthermore, among all women receiving a smoking cessation intervention, there could be a reduction of about 15% in preterm birth and low birth weight.[24] (If only high-quality studies were considered, the reduction in preterm births was only 3%.)

In the UK around 26% of mothers smoked in the 12 months before and/or during pregnancy.[25] Using the prevalence rate of preterm birth in England of 7.6%, and an estimated incremental annual cost to the public sector of £26,058 per preterm infant (derived from Mangham et al. (2009)) we estimate potential savings from smoking cessation interventions of up to £3.1 million. The costs of implementing and running this intervention were not available.

There are limited data on the effectiveness of interventions other than breastfeeding or smoking cessation, such as improved nutrition or antenatal care.[26,27] However, it is important to set this lack of evidence against some of the context within which interventions are being implemented. For example, women who are at higher risk of preterm birth are frequently also least likely to receive routine antenatal care. Also, while the overall evidence of effect of, for example, targeted antenatal programmes may not be sufficient, some interventions may be more promising than others. These include group antenatal care, prevention programmes targeting women with clinical risk factors for preterm birth, and nutritional programmes as an adjunct to standard antenatal care.[28]

Unintentional severe injury in childhood and early adolescence

Injury constitutes a major cause of death and disability for children in England. We focus on the large majority of childhood injuries which are unintentional, defined by NICE as 'predictable and preventable'.[29]

In England, in 2011/12 unintentional injury resulted in approximately 135,000 admissions to hospital among children and adolescents aged 0–14,[30] and about 6,000 children were hospitalised for at least three days because of severe injury (estimates from Hospital Episode Statistics (HES)[31] and Office for National Statistics (ONS)[32]).

The causes of injury are diverse and risks vary with age: the main causes of unintentional injury are road traffic injury (RTI) (pedestrian injury in particular), drowning, poisoning, falls and burns.[33] RTIs increase with age, while burns and scald injury are more prominent among the youngest children.[33] In addition to age, children from deprived backgrounds or living in urban areas, and boys are more likely to suffer injury than children from more affluent backgrounds or living in rural areas, and girls.[34] Severe injuries are associated with a range of health and psychosocial problems in both the short term and long term. These problems include post-traumatic stress,[35] physical disability,[36] cognitive or social impairment,[37] and lower educational attainment and employment prospects.[37] Severe paediatric injury may also place a significant psychological burden on families and carers.[38]

Costs associated with childhood injury

There have been few estimates of the economic costs associated with unintentional childhood injury. The cost estimates used below are not specific to children, but represent the average cost of injury per case.

The estimates in this section are based on children under 15 years old, due to available data. Extending the analysis to 16–24 year olds would show even greater significance, particularly in relation to RTIs. Estimates have then been multiplied by injury prevalence rates among 0–14 year olds. Prevalence rates for 2012 were derived from HES data[31] and ONS population estimates.[32]

We focus on severe injury only, because the costs associated with this kind of injury are better documented than those for mild and moderate injury. Although definitions may vary across studies, severe injuries are systematically associated with at least one contact with the hospital. We therefore do not include the costs associated with minor or moderate injury treated in primary care, or by general practitioners, physical therapists or pharmacists.

All cost studies are based on British data, with the exception of two studies.[39,40]

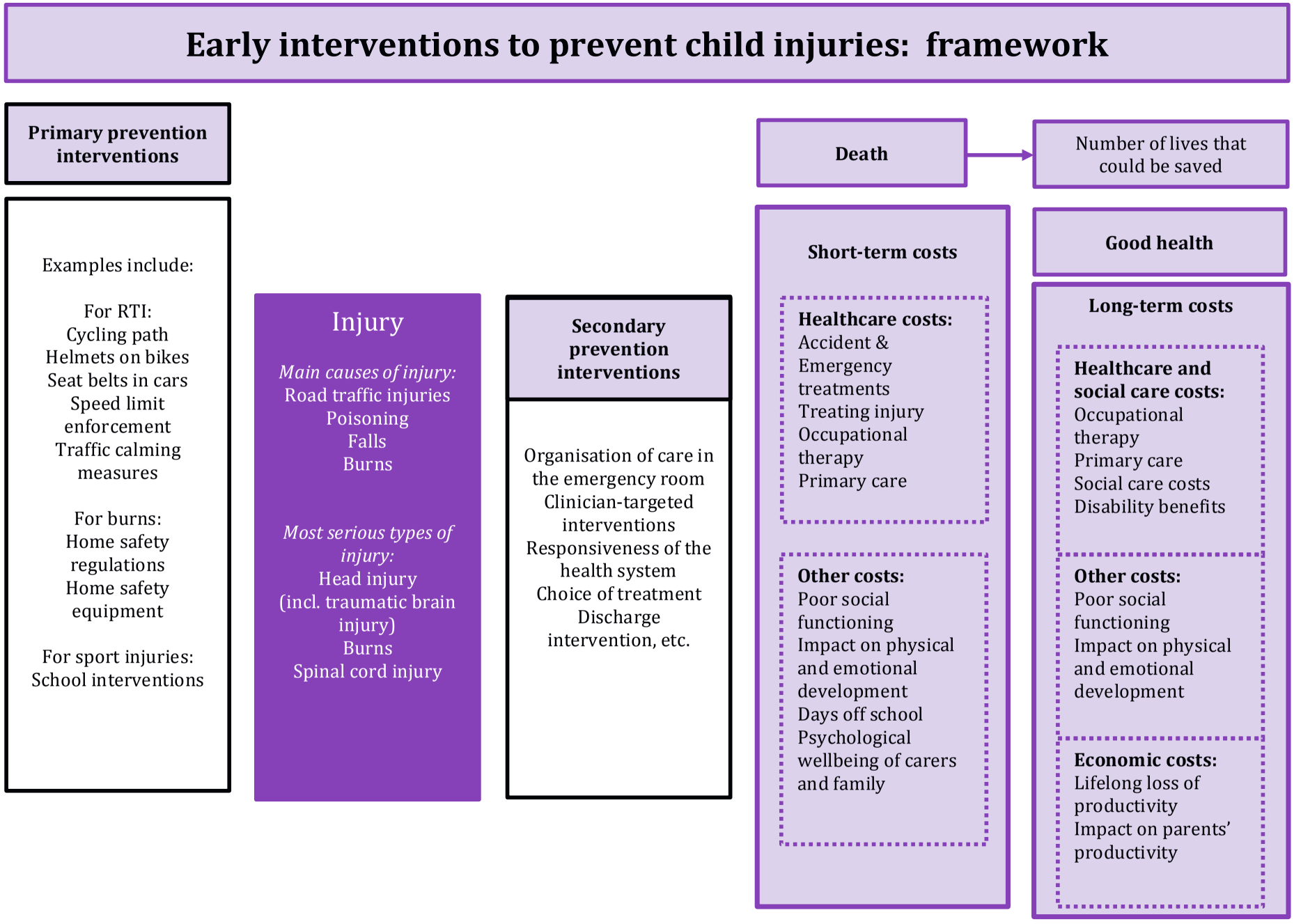
Short-term cost estimates

The average cost for Accident & Emergency treatments leading to admission is £146 per patient, and £66 for minor injury services leading to an admission. This would correspond to a minimum total Accident & Emergency cost of about £9 million for unintentional child injury per year in England.

In addition, we estimate the total hospital costs for treating severe childhood injuries requiring inpatient stay at between £16 million and £87 million (estimates of average injury cost range from £2,494 per case for an average injury (all types)[41] to £14,000 per case for an RTI injury[42]). RTIs alone were estimated to cost about £31 million in short-term medical costs in 2012.

Short-term healthcare costs incurred by injuries depend on the type and severity. For example, in a small study based in the South West Regional Paediatric Burns Service in Bristol, the average cost of inpatient treatment for a major third degree burn (covering 30–40% of the body), including high dependency unit care, has been estimated at about £65,800.[43] These costs include theatre time, bed time, medications and fluids, dressings, invasive procedures, therapy services and investigations from admission to discharge. In a study evaluating the impact on healthcare cost of mild traumatic brain injury (TBI) in the USA, Rockhill et al. found a 75% increase in mean total healthcare costs compared with a matching cohort of young people and adolescents who were not victims of such an injury.[44]

Figure 3.2 Unintentional injury: a framework for csts and prevention



Long-term cost estimates

Selected severe injuries are associated with long-term healthcare costs. For example, costs for traumatic brain injury incurred in childhood have been estimated at £268,000 per patient over the lifetime.[45]

Other long-term consequences of sustaining severe injuries in childhood can involve lost productivity and reduced lifetime earnings because of fewer employment opportunities. For example, one Australian study[39] modelled the cost of a severe TBI over a lifetime, and estimated that the costs to society are about £1.43 million per patient, including healthcare costs, social care costs, productivity costs, carer costs, social security costs and lost taxes. Despite the fact that those costs are specific to the Australian system and do not focus on children, they give an indication of the financial burden of severe injury. Similarly, calculations by Wright et al. and adapted by the Child Accident Prevention Trust show that the lifetime cost of a severe paediatric TBI can add up to as much as £4.9 million, including medical costs, educational costs, government benefits and missed employment opportunity. There were about 450 cases of paediatric TBI resulting from unintentional injuries in the UK in 2003.[46] This potentially amounts to total societal costs of £640 million–£2.24 billion. Focusing on a less common type of injury, paediatric spinal cord injury, Anderson and Vogel found, in one study of 195 adults in the USA who sustained a spinal cord injury at age 18 or younger, that they were less likely to be in employment compared with the general population of the same age (at 50% and 80% employment respectively).[47]

Preventing childhood injuries

Home and road safety are two of the priorities defined by NICE public health guidance to prevent unintentional injuries in childhood.[48,49]

Road safety

The use of cycling helmets has been associated with a 63–88% reduction in the risk of head, brain and severe brain injury for all ages of cyclists involved in accidents.[50] The facts that only 17.6% of children were wearing helmets in 2008 in Great Britain,[51] and that about 10% of severe TBIs in children aged 0–14 are attributable to cycling injuries,[49] suggest that interventions promoting the use of helmets have the potential to reduce the number of severe TBIs in children.

The introduction of speed cameras has been linked to a reduction in car crashes of between 8% and 49%, and a reduction in RTIs and deaths of between 11% and 44%.[52] Although the review from which these data were drawn was about the impact of speed cameras on injuries in the general population, it is reasonable to assume that children would be likely to benefit from such interventions. These studies did not estimate economic costs.

Home safety

A systematic review of the impact of home safety interventions found such interventions to be effective in increasing the proportion of families with home safety equipment.[53] Families who received the interventions were as a result 1.4 times more likely to have safe hot water temperatures and were better equipped against fire (1.8 times more likely to have functional smoke alarms and twice as likely to have a fire escape plan). Participating families also tended to store dangerous products in a safer place (about 1.5 times more likely to store medicines and cleaning products safely) and were 2.7 times more likely to have safer electrical sockets. These interventions have the potential to reduce injuries among children. Little is known about the cost-effectiveness of the various home interventions, and only a few studies conducted an economic evaluation of injury prevention initiatives. Among them, King et al.[40] evaluated the cost-effectiveness of home safety assessments and provision of injury prevention information packs in Canada. The intervention group reported an injury rate 25% lower than the control group. They estimated a cost of £303 per injury prevented (cost of the intervention minus direct healthcare costs). In the UK, Phillips et al.[54] evaluated the cost-effectiveness of introducing bath thermostatic mixer valves in social housing to prevent bath scalds. On the basis of this evaluation they reported that every £1 spent on thermostatic mixers would save £1.41 in healthcare costs.

Child obesity

Obesity is defined as excess body fat accumulation that may impair health.[55] It is measured by means of body mass index (BMI), an index of weight-for-height (kg/m^2), with an adult with a BMI greater than or equal to 30 classified as obese. This classification is not easily transferable to children, however, because children's BMI changes as they grow.[56] In the UK, the classification of a child as obese is determined on the basis of a growth chart and defined as a BMI greater than or equal to the 95th percentile for age.[57]

The prevalence of child obesity in England rose steadily until the mid-2000s, with some stabilisation of rates thereafter. In 2011, prevalence among boys aged 2–15 was 16.6%, up from 11.1% in 1995; among girls of the same age obesity prevalence in 2011 was 15.9% (12.2% in 1995).[58] However, although there is an indication, overall, of child and adolescent obesity levelling off, this has varied by population groups, and there is evidence that obesity levels among children and adolescents of low socio-economic status have continued to rise.[59]

Child obesity has been associated with a wide range of health and psychosocial problems in childhood.[60] These include respiratory disorders, high blood pressure, sleep apnoea (interrupted breathing during sleep) and musculoskeletal disorders,[61] with evidence also pointing to an elevated risk of developing type 1 or type 2 diabetes.[63,62] Obese children are also more likely than non-obese children to experience psychological or psychiatric problems, including low self-esteem, depression, conduct disorders, and reduced school performance and social functioning,[63,64,65] and it is plausible that these associations operate in both directions.[64]

A recent analysis of hospital admissions for obesity-related diagnoses among 5–19 year olds in England found these to have more than quadrupled since 2000, from 93 per million children to 414 per million in 2009.[66] The majority of admissions were for conditions where obesity was mentioned as co-morbidity, that is, hospital care was directed at addressing associated conditions rather than obesity itself; the most common reasons for admission included sleep apnoea, asthma and complications of pregnancy.

Child obesity is also linked to poorer health outcomes in adulthood.[67] Thus, between 50% and 75% of those who are obese as children or adolescents are likely to grow into obese adults.[63,68,69] Also, co-morbidities developed in obese children, such as type 2 diabetes, are likely to progress more rapidly and to lead to earlier presentation of adult-life complications such as cardiovascular disease.[61] There is evidence that childhood BMI is associated with type 2 diabetes, hypertension and coronary heart disease in adulthood;[70] however, it remains uncertain whether child obesity increases adult morbidity and mortality independently of adult BMI.[71]

Costs associated with child obesity

Compared with adult obesity, work that has sought to assess the economic costs associated with child obesity is still emerging.[72] A review of nine recent studies of the economic burden of child obesity in different countries reported that most, but not all, found elevated or excess healthcare costs for obese children.[75] Importantly, studies vary in design and approach to estimating costs and it is therefore difficult to generalise findings across countries.[73]

Analyses presented here build on work undertaken in the UK, specifically the 2011 report by the Greater London Authority (GLA) on child obesity in London.[74] That report drew on an earlier report by the 2004 House of Commons Select Committee on Health.[75] Costs considered by the 2004 report include:

- the direct costs of treating obesity, namely GP consultations, hospital admissions and day cases, outpatient attendance and prescription drugs
- the direct costs of treating the consequences of obesity, using the same range of cost items for a range of diseases and complications that are most often linked to obesity such as type 2 diabetes, hypertension, myocardial infarction, stroke, selected cancers and osteoarthritis, among others
- the indirect costs as a result of loss of earnings attributable to premature mortality, incapacity and sickness.[78]

Neither of the reports produced estimates specific to child obesity; the GLA therefore estimated those by apportioning the costs for adults to children aged 2–15.[74]

Here we use estimates from these reports to estimate the short- and long-term healthcare costs as well as the long-term non-healthcare costs that can be attributed to child obesity in England.[74,75]

Short-term cost estimates

Based on estimates provided by the GLA,[77] and assuming that one obese child in London will incur the same costs as one obese child in the rest of England (at £34.50 per annum in 2012), and that healthcare costs remain constant over time, we estimate the total current cost of publicly funded treatment of child obesity and its associated consequences in England at £51 million per year.*

Long-term cost estimates

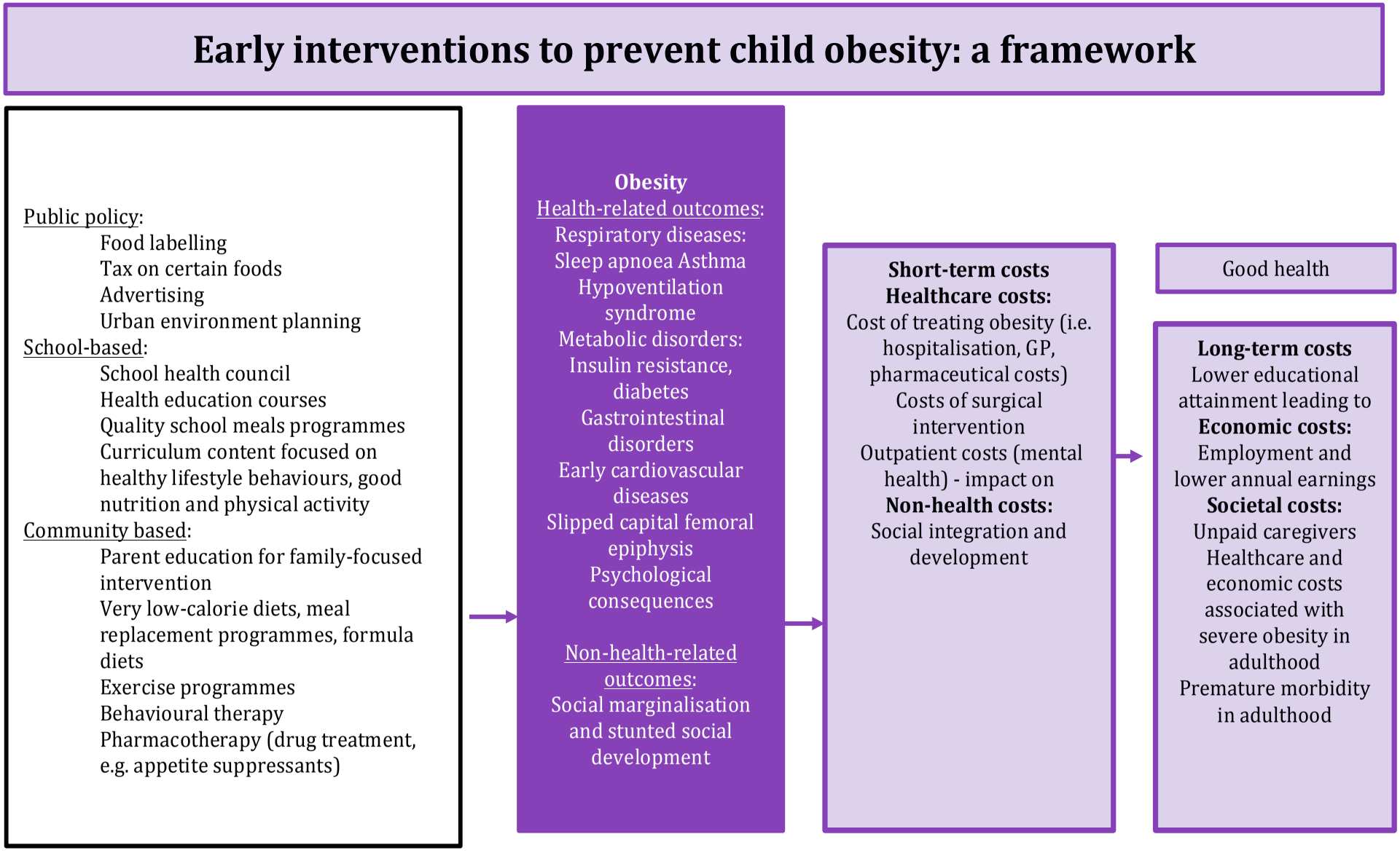
The long-term healthcare costs that can be attributed to child obesity in England are estimated to range between £172 million and £206 million. The lower figure draws on the healthcare costs of treating adult obesity and its associated consequences as estimated by the 2004 House of Commons report,[75] which translates[68] into a cost of £179 per obese adult. The higher figure is derived from the current average medical treatment cost of one obese adult in London estimated by the 2011 GLA report (£205).[74] For both estimates we assume that 68% of the obese child population aged 2–15 in 2012 will grow into obese adults,[71,76] and that treatment costs remain constant over time.

The long-term non-healthcare costs that can be attributed to child obesity in England are estimated to range between £416 million and £480 million. The lower figure draws on the long-term non-healthcare costs for obese adults as estimated by the 2004 House of Commons report,[75] which translates into a cost of £414 per obese child. The higher figure builds on the GLA report, which assumed that the long-term non-healthcare costs of an obese adult constitute about 2.3 times the direct treatment costs, equating to £479 per obese adult. As above, for both estimates we assume that 68% of the obese child population aged 2–15 in 2012 will grow into obese adults.

Our estimates update those derived in earlier analyses of child and adult obesity in England and therefore are subject to the same limitations as described in some detail by the GLA and House of Commons reports.[74,75] Ideally, estimates would have taken account of actual health service utilisation patterns of obese children, differentiating those related directly to treatment of obesity and those related to the consequences of obesity, and data on lost earnings and productivity because of incapacity or sickness absence that can be more directly attributed to child obesity rather than inferred from adult obesity. A recent analysis of current trends of adult obesity in the UK projected the medical costs associated with treating obesity-related diseases to be £648 million annually in 2020, but rising to £1.9–2 billion per year in 2030.[77]

* It is important to note that these figures might already present an upper range of current healthcare costs of child obesity in England, as underlying estimates draw on direct costs of treating obesity and the consequences of obesity (such as type 2 diabetes) among adults. Alternatively they may underestimate, as they do not reflect the large number of child health problems for which obesity may be an underlying cause.

Figure 3.3 Child obesity: a framewrk for costs and prevention



Preventing child obesity and its consequences

Given the multifaceted and complex nature of the causes of obesity that interact at different levels, there is no single best intervention to address child obesity. Programmes to prevent obesity in children are mainly aimed at modifying behaviours related to diet and exercise, and the evidence that is available has identified school-based interventions as being among the most promising approaches.[78,79] Increasing evidence also points to the possible impact of interventions targeting early life, such as *in utero* and infancy, including breastfeeding,[80] although better understanding is still needed about the aetiology of obesity to target intervention efforts more effectively.[81]

We focus here on findings from two recent evidence reviews of the effectiveness of interventions for preventing obesity in children. A systematic review by Waters et al. considered interventions targeting diet and nutrition or exercise and physical activity, and found that programmes were effective at reducing fat levels, although not all individual interventions were effective and studies varied greatly.[79] The best estimate of effect on BMI was of a reduction of 0.15, kg/m^2 and the evidence was strongest for programmes targeted at children aged 6–12. For example, for a preschool child aged 3.7 years with a BMI of 16.3, programme effect would equate to a reduction in average BMI of 1.6%; whereas for a child aged 14 with a BMI of 16.3, the effect would correspond to reducing average BMI by 0.4%. The authors noted that while effect sizes might appear small overall, they would lead to important reductions at population level if sustained over several years. Of interventions considered, those combining dietary and physical exercise components were found to be more effective than isolated programmes.

The authors cautioned that, because of the wide range of interventions considered by studies, it is not possible to distinguish which specific components contributed most to the beneficial effects observed. They identified a range of most promising strategies, typically based in the educational or school setting. The review did consider costs, but the authors were unable, based on available cost data, to assess the level by which interventions were affordable and cost-effective.

The conclusions by Waters et al. were confirmed in a more recent comparative effectiveness review of child obesity prevention programmes.[78] Of a total of 124 included intervention studies, 84% were school based, although frequently with components implemented in other settings such as the community. The review found strong evidence that school-based combined diet and physical activity interventions with a home (e.g. involving parents) or community component prevent obesity or overweight. This conclusion was based on four randomised controlled trials and four non-randomised controlled trials. Evidence was moderate that school-based interventions alone contribute to obesity prevention while the evidence for non-school interventions was insufficient or scarce.[82] There is a lack of high-quality studies that test environment- or policy-based interventions, such as regulations on food retailing and distribution.[83]

There is evidence of the cost-effectiveness of selected interventions,[72] and a number of studies have projected the potential savings that might be achieved by implementing prevention programmes. For example, Ma and Frick (2011) modelled the costs and possible savings resulting from child obesity interventions.[68] They projected that, in the USA, interventions that result in a 1 percentage point reduction in the prevalence of obesity among children and adolescents aged under 18 could lead to healthcare cost savings of between US$1.4 billion and $1.7 billion. The GBP equivalent in 2012 would be £865 million–1.05 billion. They also studied interventions specifically targeted at obese children, finding that those would likely yield higher cost savings than population-based interventions for young children aged 0–6, while population-based interventions would result in higher cost savings for adolescents aged 13–18. This is because obesity in adolescence is more strongly associated than obesity in young children with adult obesity and its lifetime costs.

Also using the US population, Wang et al. estimated that a 1% reduction in overweight and obese adolescents aged 16–17 could reduce the future number of obese adults by more than 50,000.[84] They further estimated that this reduction could be associated with a decrease in the lifetime medical costs after 40 years of about US$580 million, although the magnitude of savings would vary depending on the assumptions of progression of obesity-related adverse health outcomes. The GBP equivalent in 2012 would be £323 million. While these estimates provide useful pointers for the possible savings that may be accrued from population-based child obesity interventions, studies assume an effectiveness of existing interventions that has yet to be demonstrated. There is a need for strengthened study and evaluation designs, and for better reporting to capture process and implementation factors, longer-term outcomes and potential harms, alongside better understanding and assessment of direct and indirect costs to inform intervention design and implementation.[72,79]

Mental health: emotional, conduct and hyperkinetic disorders

The final area of child health addressed in this study is mental health. The World Health Organization (WHO) defines mental health as 'a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community'.[85] Mental health in childhood and adolescence is the foundation of healthy development, and mental health problems at this life stage can have adverse and long-lasting effects.

The most recent evidence on the prevalence of mental disorders among young people in England is from the 2004

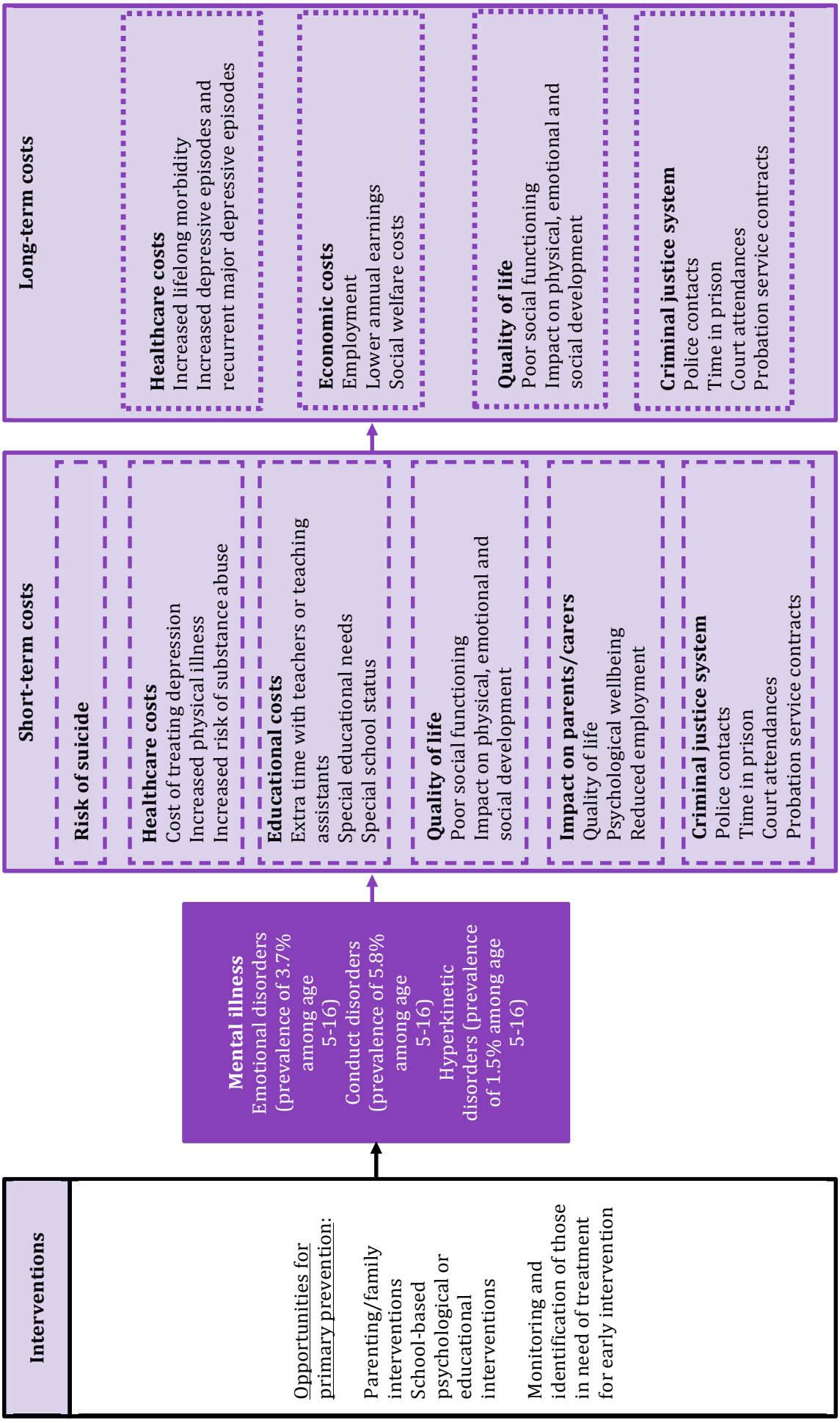


Figure 3.4 Adolescent mental health: a framework for costs and preventiion

ONS survey of the mental health of children and young people living in private households in Great Britain.[86] This survey reported that in 2004 9.6% of all children aged 5–16 in Great Britain experienced a mental disorder. The report set out the three most common kinds of mental disorders found in children and adolescents aged 5–16: emotional disorders (3.7% of all children in this age group), conduct disorders (5.8%) and hyperkinetic disorders (1.5%). Other less common disorders include autistic spectrum disorders, tic disorders, eating disorders and mutism.[86]

We focus primarily on the three most common types of mental disorders among young people: emotional disorders (e.g. anxiety), conduct disorders and hyperkinetic disorders (e.g. attention deficit hyperactivity disorder). Onset of mental health disorders frequently occurs during childhood and adolescence.[87] In the Dunedin Multidisciplinary Health and Development Study cohort, half of the adults with psychiatric disorder at age 26 had a psychiatric disorder before age 15, and three-quarters by age 18.[88]

Short-term costs

Our short-term cost estimates are based on estimates derived by Snell et al.[89] This study presents data on health, education and social care service utilisation of children aged 5–15 with psychiatric disorders over three years, and estimated mean annual costs per child. Costs for a comparator group not experiencing mental disorders are not provided. We have modelled based on 2012 population estimates[90] and prevalence data from the 2004 ONS survey.[86]

Mean annual healthcare cost per child is estimated to be £141, which includes primary care costs, paediatric and child health service costs, and mental health service costs. The largest healthcare costs in terms of mean cost per user, according to Snell et al.,[89] are those incurred by speech therapy, psychiatric inpatient services and child psychiatric services. Healthcare costs vary by type of disorder, with hyperkinetic disorders the most costly at £291, followed by conduct disorders at £138 and emotional disorders at £96. Total annual healthcare costs for mental disorder across the England population currently aged 5–16 are calculated at £118 million.

Mean annual education cost per child is £1,733, which includes costs of front-line education and special education. Education costs were largest for children with hyperkinetic disorders, at £2,946, followed by conduct disorders at £1,764 and emotional disorders at £1,133. Total annual education costs for mental disorder across the population of England currently aged 5–16 are calculated at £1,390 million.

Mean annual social care cost per child is £75, but with wide variation between different types of disorder: hyperkinetic disorders £123, conduct disorders £104 and emotional disorders £31. Total annual social care costs for mental disorder across the population in England currently aged 5–16 are calculated at £67 million.

Across the health, education and social care sectors, the total additional short-term cost is £1.58 billion.

Other short-term costs of mental disorder will include costs of the police and youth justice services. However, there is limited cost information available for these.

Long-term healthcare costs

The Maudsley long-term follow-up of child and adolescent depression estimates the long-term effects of adolescent depression in adulthood, both in terms of healthcare and wider costs.[91] The mean annual costs of health and social care services (in 1996/97 prices), based on service use between the age of 17 and time of interview (average age 35), were £801 per individual (including primary, secondary, mental health care, social workers and day care). This is translated into an annual cost per child of £1,100. If we assume that this cost is the same across all emotional disorders, the total annual cost will be £301 million for the population with emotional disorders who are currently aged 5–16.

Studies suggest that those with a conduct disorder as children are likely to suffer further mental disorders as adults. Colman et al. found that children with severe externalising behaviour (behaviours such as non-compliance, aggression and antisocial behaviour) in adolescence (aged 13–15) have higher odds of depression/anxiety and self-reported history of 'nervous trouble'.[92] Scott et al. applied costs to data which followed 142 children from age 10 to age 28.[93] Data were compared between three groups: children with a conduct disorder, with conduct problems but no disorder, and with no problems at age 10. Total cost of health services per individual with a conduct disorder from age 10 to age 28 (in 1998 prices) was £2,178, compared with £247 among those with no conduct problems. This equates to an annual cost of £145 per individual, or £62 million for the population with conduct disorders who are currently aged 5–16.

Wider long-term costs

Colman et al. showed that adolescents with severe externalising behaviour were more likely than other adolescents to leave school with no qualifications.[92] In Scott et al.'s analysis, the total costs of education services per individual from age 10 to age 28 (in 1998 prices) were: conduct disorders £12,478, conduct problems £7,524, and no problems £1,508,[93] giving an increased annual cost of £609 per individual with a conduct disorder compared with those with no problems. In 2012 prices, this equates to an annual cost of £820 per individual, or £351 million for the population with conduct disorders who are currently aged 5–16.

In terms of employment, average total social security costs per individual from age 10 to age 28 (in 1998 prices) were £2,832 in those with conduct disorders compared with £1,710 in those with no conduct problems, giving an increased annual cost of £62 per individual with a conduct disorder compared with those with no problems.[93] In 2012 prices, this equates to an annual cost of £84 per individual,

or £36 million for the population with conduct disorders who are currently aged 5–16.

Knapp et al. used British Cohort Study data to look at the relationship between a range of mental health problems at age 10 and outcomes at age 30.[94] Attention deficit problems at age 10 were associated with lower employment rates, worse jobs, lower earnings if employed, and lower expected earnings overall, for both males and females. The differences between the 25th and 90th percentiles in average expected earnings per year were £1,878 for males and £3,183 for females (in 2000 prices).[94] In 2012 prices, if we assume that these costings are applicable across all children with hyperkinetic disorders, this equates to an annual cost of £2,460 for males and £4,170 for females, per individual, or £302 million for the population with hyperkinetic disorders who are currently aged 5–16.

Those who had experienced anxiety problems at age 10 had lower expected earnings than those with no problems. The differences between the 25th and 90th percentiles in average expected earnings per year were £1,304 for males and £1,513 for females (in 2000 prices).[94] If we assume that costs are similar for all emotional disorders, this equates to an annual cost of £1,710 for males and £1,980 for females, per individual, or £508 million for the population with emotional disorders who are currently aged 5–16.

For men who had exhibited antisocial conduct at age 10 there was an unexpected finding. While males with antisocial conduct at age 10 showed a higher probability of being unemployed at age 30, those who were employed at age 30 had higher earnings than those without such behaviour (again after adjusting for other factors).[97,†] When probability of employment and predicted earnings are combined, the annual expected earnings of males at the 95th percentile for the antisocial conduct measure are £1,618 higher (in 2000 prices) than those at the 25th percentile.[94] For females there was no significant difference in annual expected earnings. In 2012 prices, this equates to an annual monetary benefit of £2,120 per individual, or £602 million for the population with conduct disorders who are currently aged 5–16. By contrast, a smaller UK longitudinal study[95] modelled the adult labour market implications of different antisocial developmental pathways. The study followed 411 boys living in South London to age 32. They found that boys (girls were not included in the study) with antisocial behaviour at age 8–10 and who were convicted between age 10 and 16 were less likely to be in employment, and had lower average earnings than boys who were not identified as troublesome at age 8–10 and were without convictions between age 10 and 16. Colman et al. also found that unemployment was higher among those who had had a conduct disorder than others, but not significantly.[92] This study did not include a costing element.

Scott et al. found that average crime costs (criminal justice system costs only) per individual from age 10 to age 28 (in 1998 prices) were £44,821 for those who suffered from a conduct disorder as a child compared with £2,541 for those with no conduct problems.[93] In 2012 prices, this equates to an annual cost of £3,160 per individual, or £1,360 million for the population with conduct disorders who are currently aged 5–16. McCrone et al. found that costs among those with major depression as adolescents, followed up for an average of 20 years,[91] included a mean annual criminal justice cost of £89 (1996/97 prices), including police contacts, time in prison, court attendances and probation service contracts. In 2012 prices, if we assume that the costs for depression are applicable across all emotional disorders, this is equivalent to £33 million for the population with conduct disorders who are currently aged 5–16.

The total long-term costs across all disorders and conditions studied were £2.3 billion.

Preventing childhood mental health problems

We consider two interventions that have been shown to be effective in addressing common types of mental disorders among young people.

Parenting programmes to prevent conduct disorders

NICE guidance recommends the use of evidence-based parenting programmes as a secondary prevention measure for parents of children who have been identified as at high risk of developing oppositional defiant disorder or conduct disorders, or who already have these disorders.[96]

Costs of group parenting programme delivery have been estimated to range between £670 and £4,100.[97,98] Bonin et al. modelled the likely long-term savings to society of implementing an evidence-based parenting programme for the prevention of persistent conduct disorders, estimating that this could result in savings of about £17,500 per family (2012 prices) over 25 years (compared with a cost of £1,016–£2,218).[99]

Psychological or educational programmes to prevent child and adolescent depression

A recent Cochrane systematic review of psychological or educational prevention programmes for young people aged 5–19 found some evidence of effectiveness of interventions in reducing the risk of having a depressive disorder.[100] The evidence of sustained effect beyond 12 months was weak, and the quality of studies considered in the review varied greatly. The review did not examine the cost of the intervention. On this basis it is difficult to quantify the likely long-term savings that may accrue from implementing universal depression prevention programmes. However, on the basis of the effect at month 12 post-intervention, such programmes for those aged 5–16 with depressive disorders might result in an annual saving of £5 million in short-term health, education and social care costs (multiplying the

† The authors of this study acknowledge that this finding is unexpected and has not been previously reported. However, they report that this finding was robust to a range of exploratory analyses. One suggestion given by the authors is that some characteristics of antisocial individuals may lend themselves to occupations that are well remunerated in early adulthood, for example jobs that involve physical activity, risk taking, or where more aggressive behaviour is rewarded.

reduction in risk by our calculations of the annual short-term cost of depression).

Discussion

Identifying the costs associated with these major health problems is challenging. The nature of the evidence means that our estimates are indicative. Differences in definitions, limited data on costs, variety in the ages for which there is evidence and the challenges in generalising from one context to another with different health and wider social welfare systems are among the most significant hurdles. Pinpointing the savings from particular interventions is even harder as the data uncertainties are multiplied.

However, this analysis does show the very high costs associated with major childhood health problems, some of which are preventable.

Our estimates were conservative.The analyses are limited by the age groups considered, and the limitations of these typically will underestimate costs. For example, the estimated costs of mental illness include costs only for children up to age 15, long-term costs for preterm birth are only calculated to age 18 and mental health costs to fairly early adulthood. Moreover, we only included the limited number of costs where there have been previous studies.

As each of the four frameworks shows, these are health problems in which many of the causes are in the environment, where the immediate costs lie with the health service but where the long-term costs are picked up right across society. Of course, the biggest cost is for individuals themselves but if we need further evidence to invest in prevention, the economics of these preventable childhood health problems should provoke action.

Conclusion

England is in an era of change in the way we think about and deliver public services. Since the inception of the Welfare State there has been recognition that we should be achieving better outcomes. However, the response of policy makers has often been to identify holes in provision and fill them. In the current financial climate this is rarely an option. For example, Birmingham City Council is budgeting to cut expenditure by £615 million by 2017.[121]

Whether as a society we can find significant extra resources for children, recognising this as an investment in society's health and wealth over the long term, is a political question.

But how we respond to the current resource challenge is a question for all policy makers and practitioners from the national to the local level, councillors, commissioners and service providers. We have evidence of policies and interventions that make a difference, yet they are not routinely implemented. Many effective interventions are already recommended in NICE guidance and quality standards, both clinical and public health, and proper implementation at scale could have a dramatic positive impact. The 'what works' centres such as NICE and the Early Intervention Foundation should increase accessibility to the evidence base and help with the translation of that evidence into everyday practice.

Despite the groundswell of voices calling for a greater focus on prevention and early action, including the many reports highlighted earlier in this chapter, a systemic response is not inevitable. It remains easier to slice budgets ever more thinly, tightening thresholds for access, and cutting those services and interventions that some may not notice are missing immediately, but whose absence will create problems further down the line.

The Local Government Association has put forward the following statement in relation to safeguarding children; it also succinctly summarises the broader challenge:

> *'The argument that resources should be re-focused on early intervention and prevention, to improve outcomes and reduce demand on safeguarding services in the longer term commands widespread support. However, there is a real challenge to make this a reality against a backdrop of increasing demand on statutory services; less money and reduced local discretion over it; political and budgetary cycles that are shorter than the period in which the benefits of early intervention are realised; costs and benefits falling to different agencies; and incomplete evidence to inform decisions.'*[102]

Rethinking approaches, while meeting acute need at a time of fiscal constraint, is much harder. It requires leadership to have foresight, place trust in the scientific evidence and be brave enough to follow through on delivering different approaches. It requires individuals thinking across professional boundaries at a time when people naturally feel defensive, protecting their corner. How can the system support the leadership and collaboration required to shift the balance more towards prevention?

As the National Audit Office's landscape review on early action stated, short termism is a major barrier to prevention initiatives which take time to take root and for the benefits to be realised. A narrow perspective on financial value is one part of this. As the NAO asserted:

> *'there is some evidence that departments have identified some early action investment as areas that could be reduced because of their flexibility compared to acute service spending. While this may be sensible in some cases in current fiscal circumstances, it may also reflect the finding that departments and the Treasury lacked good information to properly compare the value from different resource allocation options and inform spending prioritisation when budget-setting.'*[103]

The Big Lottery Fund's 'Fulfilling Lives: A Better Start' programme investing £165 million over 8–10 years in a small number of areas is an important example of a longer-term

investment. The same funding approach could be hugely valuable, for example, in relation to child and adolescent mental health. The Early Action Taskforce called for 10-year funding commitments and the LGA is calling for fixed-term funding agreements for the life of a Parliament. That such propositions seem radical only demonstrates that we do not currently see spending on children as an investment. Government regularly invests in long-term projects, from the £9 billion on the London 2012 Olympic and Paralympic Games to more than £40 billion for the North–South High Speed Rail project. Another approach is what Little and Sodha refer to as '1 per cent for prevention'.[104] They recommend that local authorities making substantial cuts add an extra 1% to their cuts programme but reinvest this amount in prevention activities.

As David Robinson has identified, the world of pooled budgets has existed at the margins of best practice for several years now and its move to the mainstream is overdue.[105,106] What are the levers we could use to make this change happen, to ensure that those allocating public funds move this agenda forward, ensuring that budgets are pooled, objectives aligned and data shared? What contractual mechanisms are available that would allow partners to share the benefits of effective collaboration on prevention? One such mechanism may be for a local area to set major goals that can galvanise actors across multiple sectors. For example, a goal to reduce the number of children referred with safeguarding concerns, young adults in the prison system or children requiring significant psychiatric support would require collective action from health, education, children's services and criminal justice, and each sector would benefit. Such meaningful shared goals should capture the imagination of local politicians and could also inspire local people. Local areas could ensure collective action by setting these kinds of major long-term goals through health and wellbeing boards; indeed, unless health and wellbeing boards take on these kinds of challenges they are unlikely to gain the kind of buy-in that represents real collaboration.

The quality of data routinely available on children's health and wellbeing is poor, as the Kennedy Report highlighted.[107] At a local level there is often insufficient system-wide understanding of the health challenges children face. There is rarely sufficient insight into what is spent on preventable health challenges, and therefore uncertainty remains as to the true costs of inaction and the respective level of spending on prevention activities which could inform strategic approaches. Addressing this gap could transform the conversation between health and children's services leaders, and political decision makers.[108]

For many the concept of evidence-based practice remains relatively new. The translation of evidence into practice requires commitment to a trained, stable workforce able to deliver and committed to doing so.[109] Moving to a system based on evidence-based practice requires cultural change across the spectrum, from political leaders through to those working at the front line; flexibility among those managing finances; and support for ambitious change. New tools, such as the Dartington Social Research Unit's Investing in Children project, may transform access to the quality of information required; however, it will require long-term cultural transformation and skills to implement effectively at scale.

The vast majority of public sector service spending is on the acute services end and will remain there. The pipe from which acute need flows cannot simply be turned off, allowing the world to be reconfigured to a place of early intervention with all its benefits. How can prevention approaches inform how acute services are delivered? Could prevention become part of all appropriate pathways, and providers expected to consider what they could contribute? For example, could 'Think Family' principles be more widely embedded in children's and adult services?[110] Could health and social care providers be more attuned to mental health problems, housing and finance difficulties, and drug and alcohol misuse, referring people where appropriate? Can pre-conception health be taken seriously so the health of young men and women before they become parents is on the agenda? Commissioners could use incentives to ensure that evidence-based prevention options are maximised. It is worth considering whether inspectorates could judge services based on answers to the following questions: 'What steps have you taken to shift towards prevention and how can you evidence it?', and 'How have you collaborated with major partners [i.e. children's services and health] to meet shared goals?'

Reflecting on the findings of the analysis in this chapter and the wider discussion on making steps forward around prevention, early action and early intervention, we set out our conclusions for policy and practice below.

Key messages for policy

- There should be a strong commitment to implementing NICE guidance in the following areas:
  - Support for breastfeeding (PH11 *Maternal and child nutrition*).
  - Promoting smoking cessation for pregnant women and preconception (PH26 *Quitting smoking in pregnancy and following childbirth*).
  - Developing and implementing accident prevention strategies targeting home safety and road traffic injuries (PH29, 30, 31 on prevention of unintentional injuries in under-15s).
  - Taking steps to tackle the obesogenic environments faced by many children and young people, and in particular using schools as a central place to promote healthy living (e.g. PH8 *Physical activity and the environment*).
  - Providing proportionate universal parenting support that ensures adequate evidence-based provision which does not stigmatise, and school-based approaches to wellbeing (e.g. CG158 *Antisocial behaviour and conduct disorders in children and young people* and NICE briefing on social and emotional wellbeing).
- There is a need for longer-term funding commitments and support for service transformation. Those handing funds down from HM Treasury to local authorities, clinical commissioning groups or third sector organisations should make longer-term commitments to their recipients, enabling them to invest to save.
- The setting of major long-term transformative goals at a local level could drive effective collaboration, realised through pooled or aligned budgets; shared incentives; and public engagement which both involves and enthuses local people and holds public bodies to account.
- Investing in data in a way that gives a comprehensive understanding of local need, a realistic assessment of the costs of ongoing intervention and the potential benefits of preventive action could transform the strategic capability of places.
- A commitment to implementing evidence-based practice would ensure that precious resources are invested in the most effective ways. This requires a nurturing of the conditions on which evidence-based practice thrives: a settled, committed workforce and the creation of learning organisations.
- While the overwhelming allocation of public resources remains in acute spending, prevention needs to be a greater part of most service commissioners' and providers' remit.

Supporting information 3.1 Table of cost derivations – preterm birth (page 1 of 2)

Cost	Value updated to 2012 prices	Base value/s	Incidence/ prevalence population base	Unit	Source
Societal costs	£2.4 billion	£2.18 billion	7.6% preterm 94.5% survival rate 668,195 live births Cost £51,656 per child	Incremental societal costs for all preterms (<37 weeks) from delivery to age 18	Petrou and Khan (2012)[19]
Short-term costs	£1.22 billion	£1.07 billion	7.6% preterm 94.5% survival rate 668,195 live births Cost £25,372 per child	Incremental short-term cost of care for all preterms, inclusive of delivery, neonatal and discharge to age 2	Mangham et al. (2009)[17] NHS Maternity Statistics (2011).[15] Assumes survival rate at age 18 is approximately the same as at age 2 (may be underestimate)
Long-term costs (up to age 18)	£1.24 billion	£1.09 billion	7.6% preterm 94.5% survival rate 668,195 live births Cost £25,920 per child	Incremental long-term cost of care for all preterms (<37 weeks) through childhood to age 18	Mangham et al. (2009)[17] NHS Maternity Statistics (2011).[15]
Cost of disability	£10,314	£9,058	N/A	Sum of mean costs of mild disability per preterm (<37 weeks) survivor across childhood (costs at 2–4, 5–10 and 11–18 years)	Mangham et al. (2009)[17]
Health and social care costs – preterm child	£70,916	£62,279	N/A	Mean health and social care costs per surviving preterm child (cost varies by gestational age ≤27, 28–31, 32–36 weeks) compared with child carried to term (≥37 weeks), up to age 18	Petrou and Khan (2012)[19]
Health and social care costs – term child	£8,833	£7,757	N/A		
Societal costs – extremely preterm child	£172,156	£151,189	N/A	Mean societal costs of care over childhood for surviving preterm children (<28 weeks)	Petrou and Khan (2012)[19]
Societal costs – term child	£58,521	£51,394	N/A	Mean societal costs of care over childhood for surviving term (≥37 weeks) children	Petrou and Khan (2012)[19]

Supporting information 3.1 Table of cost derivations – preterm birth (page 2 of 2)

Cost	Value updated to 2012 prices	Base value/s	Incidence/ prevalence population base	Unit	Source
Cost of neonatal period	£23,987	£21,066	N/A	Incremental cost per preterm (<37 weeks) survivor in neonatal period	Mangham et al. (2009)[17]
Public sector cost per preterm child	£26,059	£22,885	N/A	Incremental public sector cost per preterm (<37 weeks) survivor up to 18 years	Mangham et al. (2009)[17]
Cost of severe disability – preterm children*	£61 million	£53 million	4.2% incidence of disability among preterm survivors at age 2 48,035 preterm survivors Cost of severe disability £30,000	Sum of the mean standard costs of long-term severe disability (£30,001 from age 2–18) preterm (<37 weeks) infant across childhood	Mangham et al. (2009)[17] NHS Maternity Statistics (2011)[15]
Cost of severe disability – term children*	£685 million	£60 million	3.7% incidence of disability among term survivors at age 2 616,811 term survivors	Sum of the mean standard costs of long-term severe disability (£30,001 from age 2–18) for term (≥37 weeks) infant across childhood	Mangham et al. (2009)[17] NHS Maternity Statistics (2011)[18]

* Assumes those with severe disability remain severely disabled (might be overestimation of costs).

Supporting information 3.2 Table of cost derivations – unintentional injury (page 1 of 2)

Cost	Value updated to 2012 prices	Base values	Incidence (if applicable)	Population base	Unit	Sources
Average cost for A&E treatments leading to admissions	£146 per patient	£146 per patient	N/A	Number of cases: 135,131 (HES 2012)	Average cost for the UK (all types, all ages)	Curtis (2012)[5]
Average cost for minor injury services leading to admissions	£66 per patient	£66 per patient	N/A	Number of cases: 135,131 (HES 2012[30])	Average cost for the UK (all types, all ages)	Curtis (2012)[5]
Short-term costs, healthcare, RTI	£14,000	£13,500	0–4 year old: 82.5/100,000 (HES 2011[31]) 5–14 year old: 55.75/100,000 (HES 2011[31])	Population estimates: 0–4 year olds: 3,393,400 (ONS 2012[90]) 5–14 year olds: 6,091,500 (ONS 2012[90]) Total seriously injured (at least three-day hospital stay): 6,196	Average cost of a serious RTI (all ages)	Department for Transport (2011)[42]
Short-term costs, healthcare, RTI	£14,000	£13,500	N/A	2,272 seriously injured or killed on the road (Department for Transport (2013). Reported Road Casualties in Great Britain: Main results 2012, London) minus about 40 killed (HES 2010) = 2,232	Average cost of a serious RTI (all ages)	Department for Transport (2011)[42]
Short-term costs, healthcare	£2,494	€2,769	0–4 year old: 82.5/100,000 (HES 2011[31]) 5–14 year old: 55.75/100,000 (HES 2011[31])	Population estimates: 0–4 year olds: 3,393,400 (ONS 2012[90]) 5–14 year olds: 6,091,500 (ONS 2012[90]) Total seriously injured (at least three-day hospital stay): 6,196	Average cost of an injury (all types, all ages)	Polinder et al. (2008)[41]
Cost of a serious burn, short-term, healthcare	£65,788	£63,157	N/A	N/A	Average cost of inpatient treatment for a major burn, including high dependency unit care	Pellatt et al. (2010)[43]

Supporting information 3.2 Table of cost derivations – unintentional injury (page 2 of 2)

Cost	Value updated to 2012 prices	Base values	Incidence (if applicable)	Population base	Unit	Sources
Lifetime cost of a paediatric TBI (medical costs)	£271,805	£268,000	5.6 (Source: Parslow et al. 2005[46])	448 (2003; Source: Parslow et al. 2005[46])	**Indication of** the lifelong medical cost for a child who suffers a severe TBI at age 3	Adapted from Wright (2011) by the Child Accident Prevention Trust[45]
Lifetime cost of a paediatric TBI (all costs)	£4.95 million	£4.89 million	5.6 (Source: Parslow et al. 2005[46])	448 (2003; Source: Parslow et al. 2005[46])	**Indication of** the lifelong medical cost, educational cost, productivity loss, benefits and tax loss for a child who suffers a severe TBI at age 3	Adapted from Wright (2011) by the Child Accident Prevention Trust[45]
Short and long-term costs of TBI healthcare and non-healthcare	£1.43 million	$AUS 2.1 million	5.6 (Source: Parslow et al. 2005[46])	448 (n=47 for cyclists) (2003; Source: Parslow et al. 2005[46])	Lifetime average cost of TBI (all ages), including all healthcare costs, plus social care costs, productivity loss, carer costs, etc.	Access Economics Pty Limited (2009)[39]

A&E Accident & Emergency
HES Hospital Episode Statistics
ONS Office for National Statistics
RTI Road traffic accident
TBI Traumatic brain injury

Supporting information 3.3 Table of cost derivations – childhood obesity (page 1 of 2)

Cost	Value updated to 2012 prices*	Base value/s	Incidence/ prevalence	Population base	Unit	Source
Short-term healthcare costs						
Short-term healthcare cost per obese child	£34.50	£31.00 per obese child in London, 2007	London: boys 21%, girls: 16% (England: boys 17%, girls 17%) ages 2–15, 2007	London: 1,236,800 (England: 8,427,900), 2007 ⇨ London: 229,383 obese children (England: 1,391,618)	Current cost of publicly funded treatment of childhood obesity and its associated consequences	Cost: GLA (2011)[74]
Total short-term healthcare cost	£50,979,270		Boys: 16.6%, girls: 15.9%, ages 2–15, 2011	9,234,000 (2–15 years, 2012) ⇨ 1,477,660 obese children (boys: 761,047; girls: 716,613)	Current cost of publicly funded treatment of childhood obesity and its associated consequences	Prevalence: Mandalia (2012)[58] Population: ONS**
Long-term healthcare costs						
Long-term healthcare costs (1)	£171,822,305	£135 per obese adult in England, 2002 (£171 per adult in 2012 prices)	Adult obesity: 20% (based on report 'Tackling Obesity in England', NAO 2001)	Total 2002 adult population (age 16+): 39,810,900 ⇨ 7,962,180 obese adults 9,234,000 (ages 2–15, 2012) ⇨ 1,477,660 obese children (boys: 761,047; girls: 716,613)	Cost of treating the consequences of obesity per obese adult (total cost 2002: £1,075 million ⇨ £135 per obese adult)	Prevalence and cost: House of Commons (2004)[75] (using 2001 NAO report prevalence data) Population: ONS (2002)*** *Note:* Assumption: 68% of current obese child population aged 2–15 grow into obese adults (1,004,809 obese children in 2012) (Department of Health 2008;[76] Ma and Frick 2011[68])†
Long-term healthcare costs (2)	£205,985,804	£184 per obese adult in London, 2007 (£205 in 2012 prices)	Boys 16.6%, girls 15.9%, ages 2–15, 2011	9,234,000 (ages 2–15, 2012) ⇨ 1,477,660 obese children (boys: 761,047; girls: 716,613)	Average medical treatment cost of one obese adult in London	Cost: GLA (2011) [74] Prevalence: Mandalia (2012)[58] Population: ONS** *Note:* Assumption: 68% of current obese child population aged 2–15 grow into obese adults (1,004,809 obese children in 2012) (Department of Health 2008;[76] Ma and Frick 2011[68])†

Supporting information 3.3 Table of cost derivations – childhood obesity (page 2 of 2)

Cost	Value updated to 2012 prices*	Base value/s	Incidence/ prevalence	Population base	Unit	Source
Long-term non-healthcare costs						
Long-term non-healthcare costs (1)	£415,990,926	£327 per obese adult in England in 2002 (£414 in 2012 prices)	Boys 16.6%, girls 15.9%, ages 2–15, 2011	9,234,000 (ages 2–15, 2012) ⇨ 1,477,660 obese children (boys: 761,047; girls: 716,613)	Costs incurred from loss of earnings because of incapacity, sickness and premature mortality as a consequence of obesity	Cost: House of Commons (2004)[75] Prevalence: Mandalia (2012)[61] Population: ONS** *Note:* Assumption: 68% of current obese child population aged 2–15 years grow into obese adults (1,004,809 obese children in 2012) (Department of Health 2008[76]; Ma and Frick 2011[68])†
Long-term non-healthcare costs (2)	£480,298,702	£429 per obese adult in London (£478 in 2012 prices)	Boys 16.6%, girls 15.9%, ages 2–15, 2011	9,234,000 (ages 2–15, 2012) ⇨ 1,477,660 obese children (boys: 761,047; girls: 716,613)	Costs incurred from loss of earnings because of incapacity, sickness and premature mortality as a consequence of obesity	Cost: House of Commons (2004)[75] Prevalence: Mandalia (2012) Population: ONS** *Note:* Assumption: 68% of current obese child population aged 2–15 years grow into obese adults (1,004,809 obese children in 2012) (Department of Health 2008;[76] Ma and Frick 2011[68])†

GLA Greater London Authority
NAO National Audit Office
ONS Office for National Statistics

* Conversion US$ into £ derived from HM Revenue & Customs. Foreign exchange rates: USA. Unit of currency: US Dollar. www.hmrc.gov.uk/exrate/usa.htm (accessed August 2013).

** Office for National Statistics. Population Estimates for England and Wales, Mid-2012. www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-310118 (accessed August 2013).

*** Office for National Statistics. Population Estimates for England and Wales, Mid-2002. www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2002-to-mid-2010-revised--subnational-/rft---mid-1971-to-current-year-timeseries-tables-including-revisions.zip (accessed August 2013).

† Estimates for the persistence of obesity from childhood into adulthood vary by age with the likelihood of an obese child growing into an obese adult increasing as the baseline age rises (Ma and Frick 2011[68]). The Department of Health, in its 2008 report *Healthy Weight, Healthy Lives*,[76] assumes persistence at 55% for 6–9 year olds and 79% for 10–14 year olds. The GLA (2011)[74] used 79% as the upper level in all its calculations but this does not take account of lower persistence levels at younger ages. We weighted the child obesity figures according to the proportion of 6–9 year olds and 10–14 year olds using the 2012 child population in England, so arriving at an average persistence of 68% for the obese child population aged 2–15.

Supporting information 3.4 Table of cost derivations – child mental health (page 1 of 4)

Mental health condition	Population cost updated to 2012 prices (£ millions)	Annual cost in 2012 prices, per child or adolescent/£ (Note 1)	Prevalence age 5–16 (2012) (Note 2)	Population base, age 5–16, males and females unless otherwise indicated (2012)	Unit	Cost source
Total short-term costs	£1,580	£2,220	0.096	7,383,200	The cost per child was derived by dividing total population cost by number of children with any mental disorder (prevalence multiplied by population base)	N/A
Hyperkinetic healthcare cost	£32.2	£291 (from £269 in 2008 prices)	0.015	7,383,200	Healthcare costs, including primary care, paediatric and child health services, mental health services	Snell et al. (2013)[89]
Conduct disorder healthcare cost	£59.3	£139 (from £128 in 2008 prices)	0.058	7,383,200		
Emotional disorder healthcare cost	£6.39	£96 (from £89 in 2008 prices)	0.037	7,383,200		
Hyperkinetic disorder education cost	£326	£2,950 (from £2,730 in 2008 prices)	0.015	7,383,200	Education costs, including front-line education additional resource costs and special education resource costs	Snell et al. (2013)[89]
Conduct disorder education cost	£756	£1,760 (from £1,630 in 2008 prices)	0.058	7,383,200		
Emotional disorder education cost	£75.3	£1,130 (from £1,050 in 2008 prices)	0.037	7,383,200		
Hyperkinetic disorder social care cost	£13.7	£123 (from £114 in 2008 prices)	0.015	7,383,200	Social care service costs	Snell et al. (2013)[89]
Conduct disorder social care cost	£44.6	£104 (from £96 in 2008 prices)	0.058	7,383,200		
Emotional disorder social care cost	£2.03	£31 (from £28 in 2008 prices)	0.037	7,383,200		
Total long-term costs	£2,346	£3,310	0.096	7,383,200	The cost per child was derived by dividing total population cost by number of children with any mental disorder (prevalence multiplied by population base)	N/A

Supporting information 3.4 Table of cost derivations – child mental health (page 2 of 4)

Mental health condition	Population cost updated to 2012 prices (£ millions)	Annual cost in 2012 prices, per child or adolescent/£ (Note 1)	Prevalence age 5–16 (2012) (Note 2)	Population base, age 5–16, males and females unless otherwise indicated (2012)	Unit	Cost source
Hyperkinetic disorder long-term costs	Unable to identify robust estimates				Crime and Healthcare	
	£242	£2,460 lower annual expected earnings at age 30 (from £1,880 in 2000 prices)	Prevalence among boys 0.026	3,782,000 (males only)	Expected earnings (men)	Knapp et al. (2011)[94] The study compares those at the 95th percentile and the 25th percentile as scored for severity of attention deficit
	£60.1	£4,170 lower annual expected earnings at age 30 (from £3,180 in 2000 prices)	Prevalence among girls 0.004	3,601,100 (females only)	Expected earnings (women)	
Conduct disorder long-term costs	£61.9	£145 per individual with conduct disorder as a child (from £107 in 1998 prices)	Prevalence among boys and girls 0.058	7,383,200	Healthcare costs, including hospital inpatient, psychiatric and abortion/miscarriage costs	Scott et al. (2001)[93] Compares cost incurred by those diagnosed with conduct disorder vs. those without
	—£602	£2,120 higher annual expected earnings at age 30 for those scored at the 95th percentile compared with the 25th percentile for antisocial conduct at age 10 (from £1,620 in 2000 prices)	Prevalence among boys 0.075	3,782,000 (males only)	Expected earnings (men)	Knapp et al. (2011)[94] The study compares those at the 95th percentile and the 25th percentile as scored for severity of antisocial conduct
	0	£0 difference in higher annual expected earnings at age 30 for those scored at the 95th percentile compared with the 25th percentile for antisocial conduct at age 10	Prevalence among girls 0.039	3,601,100 (females only)	Expected earnings (women)	

Supporting information 3.4 Table of cost derivations – child mental health (page 3 of 4)

Mental health condition	Population cost updated to 2012 prices (£ millions)	Annual cost in 2012 prices, per child or adolescent/£ (Note 1)	Prevalence age 5–16 (2012) (Note 2)	Population base, age 5–16, males and females unless otherwise indicated (2012)	Unit	Cost source
Conduct disorder long-term costs (continued)	£351	£820 per individual with conduct disorder as a child vs. no conduct disorder (from £609 in 1998 prices)	Prevalence among boys and girls 0.058	7,383,200	Education costs, including remedial health at school, exclusion, social worker costs and adult literacy classes	Scott et al. (2001)[93] Compares cost incurred by those diagnosed with conduct disorder vs. those without Scott et al. (2001)[93]
	£35.8	£84 per individual with conduct disorder as a child vs. no conduct disorder (from £62 in 1998 prices)	Prevalence among boys and girls 0.058	7,383,200	Benefit costs, including unemployment and single parent benefits	
	£1,360	£3,160 per individual with conduct disorder as a child vs. no conduct disorder (from £2,349 in 1998 prices)	Prevalence among boys and girls 0.058	7,383,200	Crime costs, including conviction and prison costs	
Emotional disorder long-term costs	£301	£1,100 per individual suffering from depression as a child (from £801 in 1997 prices)	Prevalence among boys and girls 0.037	7,383,200	Healthcare costs, including primary, secondary and social care	McCrone et al. (2005)[91] Assumes long-term costs for other emotional disorders are similar to those for depression
	£200	£1,710 per individual suffering from anxiety as a child (from £1,300 in 2000 prices)	Prevalence among boys 0.031	3,782,000 (males only)	Expected earnings (men)	Knapp et al. (2011)[94] The study compares those at the 95th percentile and the 25th percentile as scored for anxiety problems Calculations assume that costs are similar for all emotional disorders Knapp et al. (2011)[94]
	£307	£1,980 per individual suffering from anxiety as a child (from £1,510 in 2000 prices)	Prevalence among girls 0.043	3,601,100 (females only)	Expected earnings (women)	

Supporting information 3.4 Table of cost derivations – child mental health (page 4 of 4)

Mental health condition	Population cost updated to 2012 prices (£ millions)	Annual cost in 2012 prices, per child or adolescent/£ (Note 1)	Prevalence age 5–16 (2012) (Note 2)	Population base, age 5–16, males and females unless otherwise indicated (2012)	Unit	Cost source
Emotional disorder long-term costs (continued)	£33.4	£122 per individual diagnosed with major depression as a child (from £89 in 1997 prices)	Prevalence among boys and girls 0.037	7,383,200	Criminal justice costs	McCrone et al. (2005)[91] Calculations assume that costs are similar for all emotional disorders

Notes:

(1) Costs are rounded to the nearest £ and to 3 significant figures for larger values.

(2) 2012 population estimates and prevalence data from the 2004 ONS survey.[86]

Supporting information 3.5 Table of costing studies – preterm birth

Study	Type of study	Country, year	Data	Costs considered	Summary of cost estimates
Petrou and Khan (2012)[19]	Modelling	UK	Studies derived from literature search covering Jan 1980–Sept 2011	■ Costs of initial hospitalisation ■ Costs following initial discharge ■ Societal costs of care over childhood, including health and social care, education, parental expenses, lost productivity	Mean societal costs per survivor (2006 prices): =<27 weeks £151,189 28–31 weeks £113,160 32–36 weeks, £66,291, =>37 weeks £51,394
Mangham et al. (2009)[17]	Modelling	UK	EPICure study; Department of Health; Schroeder EA, Petrou S, et al. The economic costs of Group B Streptococcus (GBS) disease: prospective cohort study of infants with GBS disease in England. *Eur J Health Econ.* 2009;10(3):275-85	■ Childhood costs ■ Costs to the public sector ■ Hospital, community health and social care, education costs ■ Cost of disability states ranging from no disability to severe disability ■ Costs per period of life, type of expenditure, gestational age, level of disability	Incremental cost per preterm survivor over childhood £22,764 (2006 value) to public sector is £22,855 (2006 value), and over neonatal period is £21,066 (2006 value)
Renfrew et al. (2009)[23]	Health Technology Assessment/ cost-effectiveness modelling	UK	NHS Reference Costs; other sources derived from literature	■ Cost of breastfeeding intervention ■ Cost of necrotising enterocolitis treatment ■ Cost of long-term disability ■ Cost of formula and donor supplements	Incremental costs ranging from £–328 to £586 for those without intervention depending on birth weight group and formula versus donor supplements
Chang et al. (2013)[20]		Countries with very high human development index	Global Alliance to Prevent Prematurity and Stillbirth Review Group; Institute of Medicine (US) Committee on Understanding Premature Birth and Assuring Healthy Outcomes	■ Cost savings if five high-coverage interventions fully implemented: smoking cessation, reducing multiple embryo transfers during assisted reproductive technologies, cervical cerclage, progesterone supplementation, and reduction of non-medically indicated labour induction or caesarean delivery	Approximately 58,000 preterm births averted and total annual economic cost savings of about US$3 billion (based on 2005 US data)

Supporting information 3.6 Table of costing studies – unintentional injury

Study	Type of study	Country, year	Data	Costs considered	Summary of cost estimates
Curtis (2012)[5]	Cost unit review	UK	NHS trusts and primary care trusts combined	■ Average cost for A&E treatments leading to admissions ■ Average cost for minor injury services leading to admissions	£146 and £66 per patient respectively
Polinder et al. (2008)[41]	Modelling	Europe (incl. UK)	Emergency department data systems and hospital discharge register systems	Hospital costs for injury patients (A&E visits, inpatient days in hospital and readmissions)	Average short-term healthcare cost per patient in the UK: €2,769
Department for Transport (2011)[42]	Modelling	UK (Great Britain)	2011 prices and values of prevention for accidents and casualties, including the National Transport Survey	■ Ambulance cost ■ Short-term healthcare cost	Average short-term healthcare cost of a serious road traffic injury (all ages): £13,500
Access Economics Pty Limited (2009)[39]	Modelling (incidence-based costing approach)	Australia	Data from compensation claim (Victoria State) and governmental sources	■ Healthcare ■ Social care ■ Productivity (carer) ■ Taxation, revenue forgone and welfare transfers	Average lifelong cost of severe traumatic brain injury: $AUS 2.1 million per case
Pellatt et al. (2010)[43]	Case study	UK (Bristol)	Analysis of the cost for three cases	Three major paediatric burns of 30–40% total body surface area admitted to Burns Service in Bristol; the acute costs per patient from the initial inpatient stay, from admission to the burns service, to first discharge	Mean cost per patient of £63,157.22 (range £55,354.79–£74,494.24)
Adapted from Wright et al. (2011) by the Child Accident Prevention Trust[45]	Scenario development from combination of different cases	UK	Adaptation of cost calculated by Wright et al. (2011),[45] based on cost of different healthcare services provided by the NHS Reference Costs 2008–09 (NHS trusts and primary care trusts combined) and other governmental sources for various costs	■ Medical costs ■ Education ■ Direct social care costs ■ Missed employment (carer) ■ Cost to government in lost tax revenue for mother and child ■ Cost to government in benefits (transfer payments including Disability Living Allowance, Carer's Allowance and Child Tax Credit)	Approximate total lifelong costs: £4.89 million Approximate total lifelong healthcare costs: £268,000

Supporting information 3.7 Table of costing studies – childhood obesity (table adapted from John et al.[111]) (page 1 of 2)

Author/s	Country	Time frame	Population	Data sources	Definition of overweight/obesity	Cost considered	Main findings
Breitfelder et al. (2011)[112]	Germany	2007	3,647 9–<12 years	Birth cohorts of healthy full-term neonates born between 1995 and 1999 in four cities in Germany (German Infant Nutritional Intervention study; Influence of lifestyle factors on the development of the immune system and allergies in East and West Germany)	BMI (measured)	Direct medical costs: physician visits, (physical) therapies, hospitalisation, inpatient rehabilitation Indirect costs: parental work absence *(cost estimated from parental-reported utilisation data)*	■ Mean annual direct and indirect costs higher for obese children compared with normal-weight children in all cost categories ■ Total direct medical costs for obese children €680 (443,975) vs. normal-weight children €402 (328,646) ■ Indirect costs for obese children 118 (59,187) vs. normal-weight children 100 (90,110)
Hampl et al. (2007)[113]	USA Midwest	2002/03	8,404 5–18 years	Claims data of children presenting at a paediatric integrated delivery system	BMI: measured in clinic 21.9% obese (42.9% had clinical diagnosis of obesity)	Number of visits to primary care, emergency room, inpatient, outpatient primary care, same-day surgery, lab use, observation unit stays	Mean healthcare charges for those with diagnosed obesity US$172 higher than those with normal weight ($617 (SD 533) vs. $445 (SD 450)); undiagnosed obesity: $481 (SD 439; mean difference to normal weight: 39) (2003 prices)
Hering et al. 2009[114]	Israel	2003/04	363 obese children matched with 382 control children 4–18 years	Clalit Health Care database	BMI: measured in child care centre	Cost: medication Utilisation: paediatrician primary care, emergency department, medication	Spend on medication over two years significantly higher among obese children (US$115,760 vs. $60,269); utilisation (clinic visits, number and length of hospitalisation) also significantly higher among obese children; e.g. no. of admissions: 67 vs. 34; no. of hospital days: 207 vs. 79
Janssen et al. (2009)[115]	Canada Ontario	2002/03	2,440 12–17 years	2000/01 Canadian Community Health Survey Cost: Ontario Health Insurance Plan 2002/03	BMI (based on self-reported height and weight)	Physician costs	Adjusted overall mean physician costs in normal-weight adolescents (US$233 per year; 95% CI: 194, 264) not different from those for overweight/ obese adolescents ($233 per year; 95% CI 196, 274)

Supporting information 3.7 Table of costing studies – childhood obesity (table adapted from John et al.[111]) (page 2 of 2)

Author/s	Country	Time frame	Population	Data sources	Definition of overweight/obesity	Cost considered	Main findings
Janicke et al. (2010)[116]	USA Florida	2007	200 7–15 years (recruited from paediatric primary care clinics)	Florida Medicaid claims database	BMI (measured)	Outpatient and medical/physician use, pharmacy, acute care	Adjusted mean annual expenditure higher among obese children at US$3,042 compared with $2,578 among normal-weight children although not uniformly across cost components (outpatient: $1,813 vs. $1,176; acute care: $212 vs. $132; pharmacy: $1,017 vs. $1,270) (Total cost overweight children: $2,907)
Ma and Frick (2011)[68]	USA	2006	4,148 6–17 years	National Health and Nutrition Examination Survey Cost: Medical Expenditure Panel Survey	Not stated	Annual medical expenditure including insurance and out-of-pocket payments	Obese children spent US$264 per capita more than normal-weight children (2006)
Trasande & Chatterjee (2009)[117]	USA	2002–05	19,613 6–19 years	Medical Expenditure Panel Survey	BMI (based on parental or self-reported height and weight)	Emergency room, outpatient attendance, prescription drugs	Obese children US$194 higher outpatient visit expenditures, $114 higher prescription drug expenditures and $12 higher emergency room expenditures compared with normal/ underweight
Wenig et al. (2011)[118]	Germany	2006	14,836 3–17	German Interview and Examination Survey for Children and Adolescents (KiGGS) 2003–06	BMI (measured)	Prescription drugs Physician (GP and specialists outside hospital), allied health services, hospital *(cost estimated from parental-reported utilisation data in KiGGS)*	Mean pharmaceutical costs per year in obese children were 24% higher compared with normal-weight children €211 vs. €170
Wenig (2012)[119]	Germany	2006	14,836 3-17	German Interview and Examination Survey for Children and Adolescents (KiGGS) 2003–06	BMI (measured)		Total healthcare cost per child per year did not differ: normal weight €438 (392,492), obese €443 (417,688) (NB overweight but not obese: €540 (417,688)). Cost of physician visits significantly higher for obese children €136 (123,150) compared with normal weight €111 (109,114)

CI Confidence interval
SD Standard deviation

Supporting information 3.8 Table of costing studies – mental health (page 1 of 2)

Study	Country, time frame	Data and sample	Age definition	Costs considered	Cost estimate
Snell et al. (2013)[89]	UK, 1999–2002	Nationally representative sample of 5–15 year olds in Britain, 2,461 children	5–15 Assessment of psychiatric disorder using the Development and Well-being Assessment	■ Primary care ■ Paediatric/children's health services ■ Mental health services ■ Front-line education (extra resources required) ■ Special education ■ Social care	Mean annual cost of disorder per child: ■ Hyperkinetic disorders £3,108.03 ■ Conduct disorders £1,856.44 ■ Emotional disorders £1,165.23 Cost for each disorder subdivided further based on service type
McCrone et al. (2005)[91]	UK, 1970–1998	Adults who had as children attended the Maudsley Hospital in South London, 149 subjects	Any children attending the Child and Adolescent Psychiatric Department for depression between 1970 and 1983	■ General hospital ■ Psychiatric hospital ■ Criminal justice ■ Primary healthcare ■ Psychiatrist ■ Social worker ■ Community mental health nurse ■ Counsellor ■ Day care	Mean annual cost per user: ■ General hospital £248 ■ Psychiatric hospital £343 ■ Criminal justice £89 ■ Primary healthcare £56 ■ Psychiatrist £14 ■ Social worker £67 ■ Community mental health nurse £7 ■ Counsellor £17 ■ Day care £51
Colman et al. (2009)[92]	UK, 1946–1999	Cohort (3,652 subjects) whose behaviour was assessed at ages 13 and 15, (2,297 followed up at age 53)	Teacher rating questionnaire at ages 13 and 15 Survey data at ages 36, 43 and 53	No costing. Data on the following outcomes: ■ Mental health in adulthood ■ Family life in adulthood ■ Employment and educational outcomes in adulthood ■ Global life adversity	N/A

Supporting information 3.8 Table of costing studies – mental health (page 2 of 2)

Study	Country, time frame	Data and sample	Age definition	Costs considered	Cost estimate
Scott et al. (2001)[93]	UK, 1970–1988	Children age 10 from a disadvantaged London borough (inner London longitudinal survey) followed up at age 28, 142 subjects	Children screened at age 10 using the Rutter Children Behaviour Questionnaire for teachers	■ Foster and residential care in childhood ■ Special educational provision ■ State benefits received in adulthood ■ Breakdown of a relationship ■ Health ■ Crime	Cost of services per individual from age 10 to age 28 (in 1998 prices): ■ Health services cost: Conduct disorder £2,178, No problems £247 ■ Education cost: Conduct disorder £12,478, No problems £1,508 ■ Foster and residential care: Conduct disorder £7,647, No problems £1,320 ■ Relationships: Conduct disorder £63, No problems £97 ■ Benefits: Conduct disorder £2,832, No problems £1,710 ■ Crime: Conduct disorder £44,821, No problems £2,541 Total cost, including healthcare: Conduct disorder £70,019, No problems £7,423
Knapp et al. (2011)[94]	UK, 1970–2000	Children from the British Cohort study, 11,261 subjects	Children were retrospectively assessed at age 10 for antisocial conduct, attention deficit problems, anxiety Interviews of cohort members at age 30 obtained occupational and earnings data	Unemployment and earnings at age 30	Conduct disorder: Annual expected earnings of males at the 95th percentile for the antisocial conduct measure are £1,617.50 higher (in 2000 prices) than those at the 25th percentile. For females there was no significant difference in annual expected earnings. Attention deficit: The differences between the 25th and 90th percentiles in average expected earnings per year were —£1,878 for males and —£3,183 for females (in 2000 prices) Anxiety: The differences between the 25th and 90th percentiles in average expected earnings per year were —£1,304 for males and —£1,513 for females (in 2000 prices).
Healey et al. (2004)[95]	UK, 1961–86	UK Cambridge Study in Delinquent Development) of 411 boys living in South London		No costing. Data on: ■ Extended unemployment ■ Employment in manual/unskilled jobs ■ Earnings at age 32	N/A

References

1. Early Action Taskforce (2013). The Triple Dividend, Community Links.
2. Marmot MG, Allen J, Goldblatt P, Boyce T, McNeish D, Grady M, and Geddes I (2010). Fair society, healthy lives: Strategic review of health inequalities in England post-2010.
3. Greater Manchester Combined Authority/Association of Greater Manchester Authorities (2013) The Greater Manchester Strategy 2013–2020, Draft for consultation
4. The Cost of Exclusion: Counting the cost of youth disadvantage in the UK, The Prince's Trust, 2010.
5. Curtis L (2012) Unit Costs of Health and Social Care, PSSRU, University of Kent.
6. Leadsom A, Field F, Burstow P, Lucas C (2013) The 1001 Critical Days, APPG Conception to Age Two.
7. PricewaterhouseCoopers (2013) NHS @75 Towards a Healthy State.
8. National Audit Office (2013) Early Action Landscape Review, The Stationery Office.
9. Puffett, N (2013) Councils cut back on young people's mental health services, CYP Now, 11 March.
10. National Children's Bureau (2012) Beyond the Cuts: Children's charities adapting to austerity.
11. Prinz, Ronald J et al. Population-based prevention of child maltreatment: The US Triple P system population trial. Prevention Science (2009): 10:1–12
12. ONS (2013) Childhood, Infant and Perinatal Mortality in England and Wales, 2011 Table 7: Live births, stillbirths and linked infant deaths.
13. ONS (2013) Childhood, Infant and Perinatal Mortality in England and Wales, 2011, Table 4: Postneonatal and childhood deaths: broad underlying cause groups.
14. ONS (2013) Suicides in the United Kingdom, 2011.
15. Health and Social Care Information Centre, NHS Maternity Statistics, 2010–2011. NHS, 2011.
16. Saigal S, Doyle LW. An overview of mortality and sequelae of preterm birth from infancy to adulthood. Lancet 2008;371(9608):261–9.
17. Mangham LJ, Petrou S, Doyle LW, Draper ES, Marlow N. The Cost of Preterm Birth Throughout Childhood in England and Wales. Pediatrics 2009;123(2):e312–e27.
18. Platt MJ, Cans C, Johnson A, et al. Trends in cerebral palsy among infants of very low birthweight (<1500g) or born prematurely (<32 weeks) in 16 European centres: a database study. Lancet 2007;369(9555):43–50.
19. Petrou S, Khan K. Economic costs associated with moderate and late preterm birth: primary and secondary evidence. Seminars in Fetal & Neonatal Medicine 2012;17(3):170–8.
20. Chang HH, Larson J, Blencowe H, et al. Preventing preterm births: analysis of trends and potential reductions with interventions in 39 countries with very high human development index. Lancet 2013;381(9862):223–34.
21. Patole S (2012). Effect of necrotizing enterocolitis on growth and development in preterm neonates. Springer.
22. Statnikov Y, Santhakumaran S, Manktelow B, Modi N. Surveillance of necrotising enterocolitis in England. Neonatal Society Abstracts, 2010.
23. Renfrew MJ, Craig D, Dyson L, et al. Breastfeeding promotion for infants in neonatal units: a systematic review and economic analysis. Health Technology Assessment 2009;13(40):1–146, iii–iv.
24. Lumley J, Chamberlain C, Dowswell T, Oliver S, Oakley L, Watson L. Interventions for promoting smoking cessation during pregnancy. Cochrane Database Syst Rev 2009; (3).
25. Health and Social Care Information Centre, 2012, Infant Feeding Survey 2010: Summary, 20th November 2012 (available online from: www.hscic.gov.uk/catalogue/PUB08694/ifs-uk-2010-sum.pdf)
26. Goldenberg RL, Rouse DJ. Prevention of premature birth. New England Journal of Medicine 1998; 339 (5):313–320.
27. Tucker J, McGuire W. Epidemiology of preterm birth. BMJ 2004;329(7467):675–78.
28. Hollowell JL, Oakley L et al. The effectiveness of antenatal care programmes to reduce infant mortality and preterm birth in socially disadvantaged and vulnerable women in high-income countries: a systematic review. BMC Pregnancy and Childbirth 2011;11:13.
29. National Institute for Health and Clinical Excellence (2010). Strategies to prevent unintentional injuries among the under-15s – NICE public health guidance 29. London, National Institute for Health and Clinical Excellence.
30. Health and Social Care Information Centre (2012). Hospital Episode Statistics, Admitted Patient Care, England 2011–2012.
31. Health and Social Care Information Centre (2011). Hospital Episode Statistics, Admitted Patient Care, England 2008–2009.
32. Office for National Statistics (2013, 26 June). Annual Mid-year Population Estimates for England and Wales, 2012. Retrieved July 2013 from www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2012/mid-2012-population-estimates-for-england-and-wales.html.
33. Fauth, R and Ellis A (2010). Reducing unintentional injuries in childhood: A research review, London. National Children's Bureau.
34. Towner E et al. (2005). Injuries in children aged 0–14 years and inequalities: A report prepared for the Health Development Agency, London, Health Development Agency.

35. Martin-Herz SP, et al. Health-related quality of life in children and adolescents following traumatic injury: a review. Clin Child Fam Psychol Rev 2012;15(3): 192–214.
36. Valadka S et al. Long-term disability after trauma in children. J Pediatr Surg 2000;35(5): 684–687.
37. Anderson V, et al. (2009). Educational, vocational, psychosocial, and quality-of-life outcomes for adult survivors of childhood traumatic brain injury. J Head Trauma Rehabil 2009;24(5): 303–312.
38. Sturms LM, et al. A prospective study on paediatric traffic injuries: health-related quality of life and post-traumatic stress. Clin Rehabil 2000;19(3): 312–322.
39. Access Economics Pty, Limited (2009). The economic cost of spinal cord injury and traumatic brain injury in Australia.
40. King WJ, et al. The effectiveness of a home visit to prevent childhood injury. Pediatrics 2001;108(2): 382–388.
41. Polinder S, et al. (2008). APOLLO: The economic consequences of injury – Final report. Amsterdam, Consumer Safety Institute.
42. Department for Transport (2011). Reported Road Casualties in Great Britain: 2011 Annual Report – A valuation of road accidents and casualties in Great Britain in 2011. London, Department for Transport: 4–9.
43. Pellatt R, et al. The cost of a major paediatric burn. Burns 2010;36(8): 1208–1214.
44. Rockhill CM, et al. Healthcare costs associated with mild traumatic brain injury and psychological distress in children and adolescents. Brain Inj 2010;24(9): 1051–1060.
45. Child Accident Prevention Trust. The costs of head injuries. Retrieved July 2013, from www.makingthelink.net/costs-head-injuries.
46. Parslow RC, et al. Epidemiology of traumatic brain injury in children receiving intensive care in the UK. Archives of Disease in Childhood 2005;90(11): 1182–1187.
47. Anderson CJ. and Vogel LC. Employment outcomes of adults who sustained spinal cord injuries as children or adolescents. Arch Phys Med Rehabil 2002;83(6): 791–801.
48. National Institute for Health and Clinical Excellence (2010). Preventing unintentional injuries among the under-15s in the home. NICE public health guidance 30. London, National Institute for Health and Clinical Excellence.
49. National Institute for Health and Clinical Excellence (2010). Preventing unintentional road injuries among under -15s. NICE public health guidance 31. London, National Institute for Health and Clinical Excellence.
50. Thompson DC, et al. Helmets for preventing head and facial injuries in bicyclists. Cochrane Database of Systematic Reviews 1999;(4).
51. Sharatt C, Walter L, Anjurn O (2009). Cycle Helmet Wearing in 2008. London: Transport Research Laboratory.
52. Wilson C, et al. Speed cameras for the prevention of road traffic injuries and deaths. Cochrane Database Syst Rev 2010;11(10).
53. Kendrick D, et al. Home safety education and provision of safety equipment for injury prevention. Cochrane Database Syst Rev 2012;1(1).
54. Phillips CJ, et al. Preventing bath water scalds: a cost-effectiveness analysis of introducing bath thermostatic mixer valves in social housing. Injury Prevention 2011;17(4): 238–243.
55. World Health Organization. Obesity and overweight. Retrieved August 2013 from www.who.int/mediacentre/factsheets/fs311/en/
56. Dinsdale H, Ridler C, Ells LJ. (2011) A simple guide to classifying body mass index in children. Oxford: National Obesity Observatory.
57. Health and Social Care Information Centre (2012). National Child Measurement Programme: England, 2011/12 school year: Health and Social Care Information Centre.
58. Mandalia D. (2012) Children's BMI, overweight and obesity. Health Survey for England 2011, Health, social care and lifestyles. The Health and Social Care Information Centre.
59. Stamatakis E, Zaninotto P, Falaschetti E, Mindell J, Head J. Time trends in childhood and adolescent obesity in England from 1995 to 2007 and projections of prevalence to 2015. J Epidemiol Community Health 2010;64:167–74.
60. Reilly J, Methven E, McDowell Z, Hacking B, Alexander D, Stewart L, et al. Health consequences of obesity. Arch Dis Child 2003;88:748–52.
61. Lakshman R, Elks C, Ong K. Childhood obesity. Circulation 2012;126:1770–9.
62. Verbeeten K, Elks C, Daneman D, Ong K. Association between childhood obesity and subsequent Type 1 diabetes: a systematic review and meta-analysis. Diabet Med 2011;28:10–8.
63. Swallen K, Reither E, Haas S, Meier A. Overweight, obesity, and health-related quality of life among adolescents: the National Longitudinal Study of Adolescent Health. Pediatrics 2005;115:3407.
64. Griffiths L, Parsons T, Hill A. Self-esteem and quality of life in obese children and adolescents: a systematic review. Int J Pediatr Obes 2010;5:282–304.
65. Halfon N, Larson K, Slusser W. Associations between obesity and comorbid mental health, developmental, and physical health conditions in a nationally representative sample of US children aged 10 to 17. Academic Pediatrics 2013;13:6–13.

66. Jones Nielsen J, Laverty A, Millett C, Mainous III A, Majeed A, Saxena S. Rising obesity-related hospital admissions among children and young people in England: national time trends study. PLoS One 2013;8:e65764.
67. Juonala M, Magnussen CG, Berenson GS, Venn A, Burns TL, Sabin MA, et al. Childhood adiposity, adult adiposity, and cardiovascular risk factors. New England Journal of Medicine 2011;365(20):1876–85.
68. Ma S, Frick K. A simulation of affordability and effectiveness of childhood obesity interventions. Academic Pediatrics 2011;11:342–50.
69. The N, Suchindran C, North K, Popkin B, Gordon-Larsen P. Association of adolescent obesity with risk of severe obesity in adulthood. JAMA 2010;304:2042–7.
70. Reilly J, Kelly J. Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review. Int J Obes 2011;35:891–8.
71. Park M, Falconer C, Viner R, Kinra S. The impact of childhood obesity on morbidity and mortality in adulthood: a systematic review. Obes Rev 2012;13:985–1000.
72. John J, Wolfenstetter S, Wenig C. An economic perspective on childhood obesity: recent findings on cost of illness and cost effectiveness of interventions. Nutrition 2012;28:829–39.
73. Pelone F, Specchia M, Veneziano M, Capizzi S, Bucci S, Mancuso A, et al. Economic impact of childhood obesity on health systems: a systematic review. Obes Rev 2012;13:431–40
74. Greater London Authority (2011). Childhood obesity in London. London: Greater London Authority Intelligence Unit.
75. House of Commons Select Committee on Health (2004). Obesity. Volume 1. London: House of Commons.
76. Department of Health (2008). Healthy weight, healthy lives: a toolkit for developing local strategies. London: Department of Health.
77. Wang Y, McPherson K, Marsh T, Gortmaker S, Brown M. Health and economic burden of the projected obesity trends in the USA and the UK. Lancet 2011;378:815–25.
78. Wang Y, Wu Y, Wilson R, Bleich S, Cheskin L, Weston C, et al (2013). Childhood obesity, prevention programs: comparative effectiveness review and meta-analysis. Rockville: MD: Agency for Healthcare Research and Quality.
79. Waters E, de Silva-Sanigorski A, Hall B, Brown T, Campbell K, Gao Y, et al. Interventions for preventing obesity in children. Cochrane Database Syst Rev 2011;12.
80. Bovbjerg M, Amador C, Uphoff A. Breastfeeding and Childhood Obesity: Where Do We Go From Here? JAMA Pediatr 2013. [Epub ahead of print].
81. Reilly J. Evidence-based obesity prevention in childhood and adolescence: critique of recent etiological studies, preventive interventions, and policies. Adv Nutr 2012;3:636S-41S.
82. Showell N, Fawole O, Segal J, Wilson R, Cheskin L, Bleich S, et al. A systematic review of home-based childhood obesity prevention studies. Pediatrics 2013;132:e193–200.
83. Ding D, Gebel K. Built environment, physical activity, and obesity: what have we learned from reviewing the literature? Health Place 2012;18:100–05.
84. Wang L, Denniston M, Lee S, Galuska D, Lowry R. Long-term health and economic impact of preventing and reducing overweight and obesity in adolescence. J Adolesc Health 2010;46:467–73.
85. International Monetary Fund. World Economic Outlook Database. Retrieved June 2013 from www.imf.org/external/pubs/ft/weo/2013/01/weodata/index.aspx
86. Green H, McGinnity Á, Meltzer H, Ford T, Goodman R (2005). Mental health of children and young people in Great Britain, 2004. Newport: Office for National Statistics.
87. Kessler RC, Amminger GP, Aguilar Gaxiola S, Alonso J, Lee S, Ustün TB. Age of onset of mental disorders: a review of recent literature. Current Opinion in Psychiatry 2007; 20(4): 359.
88. Kim-Cohen J, Caspi A, Moffitt TE, Harrington H, Milne BJ, Poulton R. Prior juvenile diagnoses in adults with mental disorder: developmental follow-back of a prospective-longitudinal cohort. Archives of General Psychiatry 2003; 60(7): 709.
89. Snell T, Knapp M, Healey A, et al. Economic impact of childhood psychiatric disorder on public sector services in Britain: estimates from national survey data. Journal of child psychology and psychiatry 2013.
90. Office for National Statistics. Annual Mid-year Population Estimates for England and Wales, 2012. Retrieved June 2013 from www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2012/mid-2012-population-estimates-for-england-and-wales.html.
91. McCrone P, Knapp M, Fombonne E. The Maudsley long-term follow-up of child and adolescent depression. Predicting costs in adulthood. Eur Child Adolesc Psychiatry 2005; 14(7): 407–13.
92. Colman I, Murray J, Abbott RA, et al. Outcomes of conduct problems in adolescence: 40 year follow-up of national cohort. BMJ 2009; 338.
93. Scott S, Knapp M, Henderson J, Maughan B. Financial cost of social exclusion: follow up study of antisocial children into adulthood. BMJ 2001; 323(7306): 191.
94. Knapp M, King D, Healey A, Thomas C. Economic outcomes in adulthood and their associations with antisocial conduct, attention deficit and anxiety problems in childhood. J Ment Health Policy Econ 2011; 14(3): 137–47.

95. Healey A, Knapp M, Farrington DP. Adult labour market implications of antisocial behaviour in childhood and adolescence: findings from a UK longitudinal study. Applied Economics 2004; 36(2): 93–105.
96. NICE (2013). Antisocial behaviour and conduct disorders in children and young people: recognition, intervention and management, National Clinical Guideline Number 158. London: National Institute for Health and Care Excellence.
97. Charles JM, Bywater T, Edwards RT. Parenting interventions: a systematic review of the economic evidence. Child Care Health Dev 2011;37(4):462–74.
98. Dretzke J, Frew E, Davenport C, et al. The effectiveness and cost-effectiveness of parent training/education programmes for the treatment of conduct disorder, including oppositional defiant disorder, in children. Health Technol Assess 2005;9(50):iii, ix-x, 1–233.
99. Bonin E-M, Stevens M, Beecham J, Byford S, Parsonage M. Costs and longer-term savings of parenting programmes for the prevention of persistent conduct disorder: a modelling study. BMC Public Health 2011;11(1):803.
100. Merry SN, Hetrick S, Cox GR, Brudevold-Iversen T, Bir JJ, McDowell H. Psychological and educational interventions for preventing depression in children and adolescents (Review). Cochrane Database Syst Rev 2011;12.
101. Stephen Hughes, Chief Executive of Birmingham City Council, Westminster Forum on Early Intervention.
102. Local Government Association (2013) Rewiring public services – children's services, pp. 5–6
103. National Audit Office (2013). Early Intervention: Landscape review. London: The Stationery Office, p. 28.
104. Little. M and Sodha, S (2012) Prevention and Early Intervention in Children's Services, NESTA.
105. 'Without stronger leadership, localism will eat itself' David Robinson, Guardian Professional, 5 January 2012.
106. Robinson D. (2013) Ten Principles for Better Government, IPPR.
107. Kennedy, I (2010) Getting it right for children and young people Overcoming cultural barriers in the NHS so as to meet their needs.
108. Little. M and Sodha, S (2012) Prevention and Early Intervention in Children's Services, NESTA.
109. See for example Strelitz J. "It sounds good but?…?": Children's Centre managers' views of evidence-based practice. Journal of Children's Services 8.1 (2013): 21–30; Aarons GA and Palinkas LA. Implementation of evidence-based practice in child welfare: Service provider perspectives. Administration and Policy in Mental Health and Mental Health Services Research 34.4 (2007): 411–419.
110. Roscoe H, Constant H and Ewart-Boyle S (2012). Think child, think parent, think family: final evaluation report, Social Care Institute for Excellence.
111. John J, Wolfenstetter S, Wenig C. An economic perspective on childhood obesity: recent findings on cost of illness and cost effectiveness of interventions. Nutrition 2012;28:829-39.
112. Breitfelder A, Wenig C, Wolfenstetter S, Rzehak P, Menn P, John J, et al. Relative weight-related costs of healthcare use by children--results from the two German birth cohorts, GINI-plus and LISA-plus. Econ Hum Biol 2011;9:302-15.
113. Hampl S, Carroll C, Simon S, Sharma V. Resource utilization and expenditures for overweight and obese children. Archives of pediatrics & adolescent medicine 2007;161:11-4.
114. Hering E, Pritsker I, Gonchar L, Pillar G. Obesity in children is associated with increased health care use. Clin Pediatr 2009;48:812-8.
115. Janssen I, Lam M, Katzmarzyk P. Influence of overweight and obesity on physician costs in adolescents and adults in Ontario, Canada. Obes Rev 2009;10:51-7.
116. Janicke D, Harman J, Jamoom E, Simon S, Zhang J, Dumont-Driscoll M. The relationship among child weight status, psychosocial functioning, and pediatric health care expenditures in a medicaid population. J Pediatr Psychol 2009;35:883-91.
117. Trasande L, Chatterjee S. The impact of obesity on health service utilization and costs in childhood. Obesity 2009;19:1749-54.
118. Wenig C, Knopf H, Menn P. Juvenile obesity and its association with utilisation and costs of pharmaceuticals--results from the KiGGS study. BMC Health Serv Res 2011;11:340.
119. Wenig CM, et al.Juvenile obesity and its association with utilisation and costs of pharmaceuticals--results from the KiGGS study. BMC Health Serv Res 2011;11(340).
120. Tulloch et al, (2008) The Costs, Outcomes and Satisfaction for Inpatient Child and Adolescent Psychiatric Services (COSI-CAPS) study, HMSO.
121. Birmingham City Council (2013) Budget Book 2013/14.
122. Heckman, James J. "Skill formation and the economics of investing in disadvantaged children." Science 312.5782 (2006): 1900-1902
123. Berridge, D, Biehal, N, Henry, L. Living in Children's residential homes. Department for Education, Research Report DFE-RR20, 2010.