PRIFYSGOL BANGOR UNIVERSITY

Transforming Young Lives across Wales:

The Economic Argument for Investing in Early Years

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Canolfan Economeg Iechyd a Gwerthuso Meddyginiaethau
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We would like to thank the children and staff from our local day-care and child research centre, Tir na n-Og, for providing us with some fantastic drawings and taking part in our hand print project. Tir na n-Og is for children from birth to age 4 and provides an environment for children to be free to explore, learn and play. We have displayed a number of the paintings and drawings throughout our report.

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Foreword

by Professor John R Ashton C.B.E.

This report from the Centre for Health Economics and Medicines Evaluation at Bangor University is a major contribution to our understanding of how best to protect and improve the health of our children in the twenty first century. It is relevant not only to the next generation coming through , but also to those of us who are entering the second half of the second half of our journey if we are to have a quality of life in our final years. It is also of international relevance beyond the developed world.

In Wales over the next 20 years, the population aged over 65 will increase by 50%, whilst the population of children entering the workforce will continue to decline. Not only will an ageing population produce ever more challenge to health and social care, but a reducing working age population will make it much more difficult to square the circle of caring, not least in an era of reductions in public sector finance. As Mao Tse Tung is reputed to have said ‘if the practice doesn’t work, the theory is wrong’, so we need a new approach.

This careful, thorough and evidence based review from one of the UK’s strongest Health Economics centres provides us with such an approach. It is refreshing, comprehensive and creative. It takes us from a tired, if valuable, form of health service economics to a new and emerging discipline of Public Health Economics.

Investment in the early years is not a luxury but an economic necessity and that a whole systems approach rather than a narrow, downstream medical approach is vital. An Asset Based Approach to Public health and economic and social development is the logical conclusion with a focus on the life course and a recognition of the intergenerational benefits. The foundations of a new approach can be seen here. I am confident that they will be influential.

Professor Rhiannon Edwards and her colleagues at Bangor are to be commended for offering us this nourishment and guidance.

Professor John R Ashton C.B.E.
Former President of the Faculty of Public Health of the Royal Colleges of Physicians of London, Edinburgh and Glasgow.

Preface

Our report builds on the recognition by the Welsh Government of the intergenerational relationship between poverty, health and lifetime opportunities in the Well-being of Future Generations (Wales) Act (Welsh Government, 2015a). Wales will benefit in terms of the economy, improved social cohesion and, most importantly, babies born today having a greater opportunity to thrive than at present.

In this report we explore the economic case for allocating scarce public resources within the Early Years (up to age 7), with a particular focus on the first 1000 days from conception through pregnancy to a child's second birthday, with a view to children being school ready by the age of 5. There is growing recognition of the need for an intergenerational approach to public health. Such aspirations must be balanced against the realities of economic recession, single government term political horizons and acute pressures on strained health and social care budgets. This report concludes that positive preventive actions during child development, from before birth to in nurseries and schools, are the most important ways to intervene and yield the greatest return on investment (ROI) [see glossary] to society; whether compared to investment across the life course or as a comparator, investment in financial markets.

Through the process of writing this report, what has become apparent is that there is an argument for viewing investment in Early Years as part of wider economic development investment. International evidence points towards the greatest return on investment coming from investment in the first three years of life. Welsh higher education institutions have made a significant contribution to the international evidence on the effectiveness and cost-effectiveness of programmes and practice relating to Early Years. Adopting an integrated systems based model of programmes and practice and recognising local community based assets has the potential to deliver returns on investment on Early Years in Wales.

Highlighting Early Years research conducted in Wales

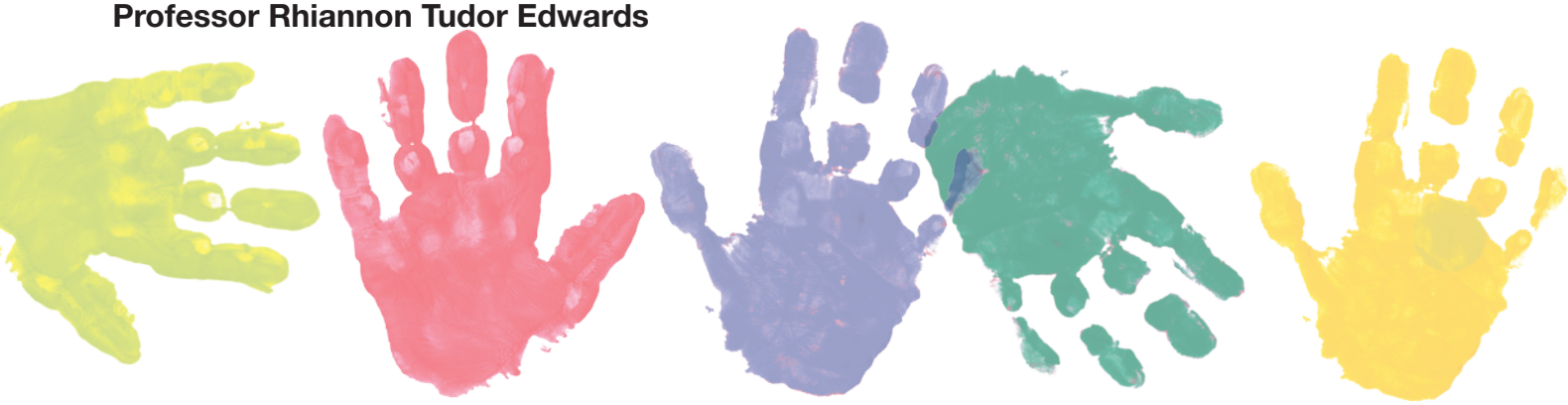
Welsh higher education institutes have been at the forefront of high quality Early Years research. Though we have looked at International evidence we wanted to highlight research undertaken in Wales as being particularly relevant to a Welsh context. In this report we have marked examples of such Welsh led Early Years research of international standing with the following logo.

I am acutely aware, as a health economist, that traditionally we have worked in the realms of measuring the cost-effectiveness of medical interventions. Health economists interested in public health have now been asked, in addition to talking about cost-effectiveness, to adopt a language of ROI more widely accessible to central and local government beyond the NHS, on the basis that many agencies have the potential to have

an impact on population health [see glossary] public health and preventing future disease and disability. There has been a pressure for public health initiatives to be proven to be cost saving in the long run. We note here that health economists are never asked to present evidence on the ROI of providing extremely expensive drugs or treating very elderly patients whilst debate over investment in Early Years requires such justification.

Ultimately, we are talking about choices and trade-offs in the use of public sector resources, trade-offs between different groups in society and trade-offs between different stages in the life course.

Professor Rhiannon Tudor Edwards



Terms of reference

The Public Health Wales Executive Board, via the Public Health Wales academic research division, led by Professor Mark Bellis during the period of this report, commissioned the Centre for Health Economics and Medicines Evaluation (CHEME, Bangor University www.cheme.bangor.ac.uk) to co-produce a report exploring the economic case for investment in Early Years across Wales. In Wales, Early Years is defined as conception to age 7, though we do refer to effects on older children and impact later in life. Wales already has a significant policy direction and investment in programmes and practice relating to Early Years. This report is intended to provide an evidence base for decisions about investment in Early Years and for investing in babies born today and future generations in Wales. An objective of this report is to help decision makers in Wales view investment in Early Years as part of wider economic development investment, providing robust evidence rather than prescriptive policy recommendations.

Approach

The role of the health economist is to evaluate evidence relating to how best to use scarce public resources to achieve societal objectives. This report brings together robust international and UK evidence on the relative return on investment of devoting public sector resources to programmes and practices supporting babies, young children and their families, and translates the findings to Wales where possible. Within the timescale for the preparation of this report, the topic was too broad to adhere to systematic reviewing methodology. We therefore adopted a pragmatic search strategy across diffuse subject areas relevant to early years (Papaioannou et al., 2010). We contacted experts and centres of excellence in the US and in the UK to bring evidence together that is relevant to Wales.

Audience

Our intended audience includes Public Health Wales, our Public Health counterparts in England, Scotland and Northern Ireland; colleagues working in the seven Health Boards across Wales; colleagues from Welsh local government and those working in the third sector who potentially have an impact on families and young children living across Wales.

About the authors

Professor Rhiannon Tudor Edwards

Rhiannon is Professor of Health Economics and Co-Director of CHEME. She is a graduate of the University of Wales, Aberystwyth, University of Calgary, Canada, and The University of York. Rhiannon was a Commonwealth Fund Harkness Fellow in Health Policy, visiting the United States 2004-05. She is a Health and Care Research Wales Senior Investigator, Fellow of the Learned Society of Wales and Honorary Member of the Faculty of Public Health. Rhiannon is Director of the Welsh Health Economics Support Service (WHESS), integral to health and social care research in Wales. She has a particular interest in the methodology of economic evaluation alongside trials of public health and psychosocial interventions.

Lucy Bryning

Lucy is a Research Officer in Health Economics at CHEME. She has a 1st Class BSc (Hons) and a Masters by Research both in Psychology. Alongside her work Lucy is undertaking a PhD in Health Economics exploring the economics of Mindfulness Based Interventions. Her research interests include the evaluation of antenatal and postnatal maternal health programmes and the appropriate methodology for assessing the cost-effectiveness of complex public health programmes and psychosocial interventions.

Huw Lloyd-Williams

Huw joined CHEME in 2012 as a Research Officer. Since then Huw has worked on a number of grant applications including the cognitive rehabilitation for Parkinson's disease project and a project on digital dictation for BCUHB. Huw's background is in applied economics, having received a Masters in Applied Economics and Data Analysis from the University of Essex in 2003 after obtaining a first class degree in Economics from Bangor University. Huw has worked as a Research Officer at Swansea University and Bangor University's Business School and Law School before joining CHEME. Huw is currently undertaking a PhD exploring the economics of tackling Adverse Childhood Experiences (ACEs).

Centre for Health Economics and Medicines Evaluation (CHEME), Bangor University

Founded in 2001, CHEME are now one of the leading health economics centres in the UK. CHEME contributed to Bangor University's highest ranked unit of assessment in the 2014 Research Excellence Framework, with 95% of outputs being world leading and internationally excellent. Research outputs were rated 3rd out of 94 institutions across the UK. At CHEME, we aim to promote and sustain high-quality research, maximise opportunities for research grant capture and publications in high impact journals.

The Centre is active across a range of health economic and medicines evaluation research activities. These are broadly categorised into the following research themes:

- Public health economics and the health economics of psychosocial interventions and other non-pharmacological health technologies, led by Professor Rhiannon Tudor Edwards
- Pharmacoeconomics, pharmaceutical policy and medicines use, led by Professor Dyfrig Hughes

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Executive Summary

Background

Intervention in children's earliest years can address or eliminate the damaging social problems later in life, which have substantial costs associated with them. Investments in the Early Years **[see glossary]** are by their nature long-term commitments, with outcomes realised over time. Early healthy brain development is crucial for ensuring that children acquire the social and emotional foundations necessary across the life course. There is a critical window of opportunity for intervention during the first 1000 days, through pregnancy to age 2.

Investment in Early Years can be justified on economic efficiency grounds and on equity, or reducing inequalities in health grounds. Investment in Early Years should be considered in the same way as European or National investment in wider economic development. Thus, investment in Early Years can contribute to the building of social capital and promote economic growth.

Welsh Government has already made a substantial investment in Early Years. This report fills a gap bringing together through a review of international evidence, available evidence relevant to Wales on the likely Return on Investment (ROI) **[see glossary]** and cost-effectiveness of programmes and practice to support the Early Years. The scope and scale of this report is limited by time, strictly we have not adhered to systematic reviewing methodology but rather begun with evidence from international centres of excellence in the US and in the UK to bring evidence together that is relevant to Wales.

NICE supports the use of cost-benefit and ROI methods to capture benefits across society from investing in public health **[see glossary]** prevention initiatives. ROI tells us what benefits we get back in pounds for every £1 we invest now. Capturing the full range of costs and benefits in Early Years is a challenging but critical factor for the efficient development of public services. The public sector is an important part of the Welsh economy but the sustainability of public services requires a stronger focus on the benefit of prevention rather than just reactions to health and social care crises.

One in three children are living in child poverty **[see glossary]** in Wales. At birth there is an 18.9 - year difference in healthy life expectancy between the least and most deprived area of Wales. There is an intergenerational impact of poverty where the adverse health impacts on one generation are inherited by the next. Further, over the next 20 years the proportion of people living in Wales over 65 will increase by nearly 50% while the proportion of children will decrease by 1%. The population of children in more affluent areas is expected to decline. While, in areas of high and medium poverty in Wales the population of children is expected to remain relatively stable over the next 20 years. Consequently, another economic argument for investing in babies born today is that they will be physically and economically able to support the aging population of Wales.

Our response requires an appropriate mix of universal programmes **[see glossary]** for all babies, children and families in Wales and targeted programmes **[see glossary]** for families most at risk. Part of this response requires a recognition and utilisation of the other collective assets individuals and communities have at their disposal. With support these assets can protect against negative health outcomes and promote health status.

Appropriately designed, Wales could receive comparable returns through investment in Early Years to those from the best UK transport schemes regarded as providing higher returns on investment.

Key Findings

Pregnancy

- Universal provision of vitamin supplements is a cost-effective way of promoting good maternal health, healthy pregnancies and child outcomes (NICE, 2015; Filby et al., 2015).
- The UK has one of the highest rate of teenage pregnancy in Western Europe (Office for National Statistics, 2016; Whitaker et al., 2016). Planned pregnancy significantly affects the life course with a higher likelihood of positive outcomes for parent and child (Lyons & Ashton, 2004).
- It is estimated that every £1 invested in contraceptive services in Wales would return between £11 and £14 in savings to the NHS in Wales (Lyons & Ashton, 2004; McGuire & Hughes 1995; North Wales local public health team, 2015).

Low birth weight

- We estimate that the annual additional cost to the Welsh NHS of caring for low birth weight babies was over £4.5million in 2014 (Godfrey et al., 2010).
- The additional cost to Welsh NHS maternity services of delivering low birth weight babies attributed to smoking and other modifiable risk factors is estimated to be £2.15 million annually (Johnson, Jones & Paranjothy, 2016).

Breastfeeding

- Low breastfeeding rates result in higher incidence of illness, which subsequently places a significant cost on the National Health Service (Ball & Wright, 1999).
- We estimate that increasing rates of exclusive breastfeeding at 4 months (currently at 9% in Wales) to the rates observed at birth (currently 57% in Wales) would lead to cost savings of £1.51 million per annum in reduced spending on various childhood conditions in Wales (Renfrew et al., 2012).
- A 1% decrease in the number of infants who were never breastfed could equate to approximately £13.9 million in gains in economic productivity, as a result of increasing IQ levels in Wales (Renfrew et al., 2012).
- Children who are not breastfed are significantly less likely to breastfeed their own babies in later life (Renfrew et al., 2012). Changing social norms in Wales supported by evidence based interventions that increase rates of breastfeeding may help break this intergenerational cycle.

Vaccinations

- Vaccinations for children reduce disease, death, disability and inequity worldwide (Andre et al., 2008).
- In Wales, less than 90% of children are up to date with all routine immunisations by the time they start school (Public Health Wales, 2016). Compared with other common public health interventions **[see glossary]**, vaccinations are considered to be a good investment and generally highly cost-effective (Chabot et al., 2004)

- Annually, vaccinations provide an internal rate of return **[see glossary]** of between 12% and 18% (Bloom et al., 2005).
- Evidence from US showed that for every $1 invested in the MMR vaccine there are $26 in benefits to society (Zhou et al., 2004). The childhood flu vaccine is highly cost-effective with a cost per Quality Adjusted Life Year (QALY) **[see glossary]** gained of £251 dramatically below the NICE threshold of £20,000 used for decisions about new medicines and services (Pitman et al., 2013).

Looked after children

- In Wales rates of looked after children are highest in the most deprived areas and have been increasing (Giant, 2014).
- Looked after children are more likely to experience health problems and have poorer educational outcomes compared to the general population (StatsWales, 2015b).
- If more children could remain safely with their families after leaving care the cost savings would offset the cost of providing the support services (All Wales Heads of Children's Services, 2013).

Parenting

- Parenting programmes when delivered well can be effective and cost-effective in preventing and reducing conduct disorder in children, with potential savings across multiple sectors (Edwards et al., 2007; Edwards et al., 2016; Hutchings et al., 2007; Knapp et al., 2011).
- Public sector costs for children with conduct disorders are ten times more than for children with no conduct disorders (Knapp et al., 2011).
- It is estimated that preventing conduct disorder in the most serious of cases could provide lifetime savings of around £150,000 per case (Friedli & Parsonage, 2007).
- The cost of crime attributable to those that had conduct disorders as children is in the region of £60 billion a year in England and Wales (Sainsbury Centre for Mental Health, 2009).

Troubled families

- Troubled families cause problems to the community around them, putting high costs on the public sector (Department for Communities and Local Government 2015). In some areas of the UK troubled families cost 10 times more to local councils than other families.
- Dealing with troubled families requires joined up services that consider the whole family unit.

Adverse Childhood Experiences (ACEs)

- Adverse Childhood Experiences (ACEs) **[see glossary]** can have a significant impact on life course health. These are stressful events in childhood including: Living in a household with someone who is depressed, mentally ill, a substance abuser or someone who has been incarcerated; exposure to child maltreatment or domestic violence, and losing a parent through divorce, separation or death (Felitti et al., 1998).
- ACEs are clustered around but not exclusive to families from a lower socio-economic background (Björkenstam et al., 2013).

- Exposure to ACEs is known to cause immediate biological and psychological damage as well as affecting later life (Bellis et al., 2014).
- The impact of ACEs represent a great cost to society including public sector services (Bellis et al., 2015). In Wales we estimate that the costs of outcomes associated with ACEs may range from £2.59m per year for cannabis use (Bryan et al., 2013), to £6.2bn per year for violent crime (Institute for Economics and Peace, 2013).

Youth crime

- There are links between aggression, hyperactivity, concentration problems, impulsivity in early childhood and later risk taking and subsequent violent behaviour in adolescence (Hawkins et al., 1998).
- Family characteristics such as poor parenting skills, family size, home discord, child maltreatment, and antisocial parents are risk factors linked to youth offending (Wasserman & Seracini, 2001).
- We estimate a high cost of over £600 million to the Welsh economy of not intervening to prevent youth crime in Wales (Knapp et al., 2014; Ministry of Justice, 2010 & 2014).

Pre-school

- A good pre-school experience can lead to better job prospects and higher income levels in later life (Barros & Mendonca, 1999; Goodman & Sianesi, 2005). Children from low socio-economic backgrounds are more likely to succeed if they receive high quality pre-school education (Melhuish, 2003; Sylva et al., 2004).
- Follow up studies from US suggest that targeted investment in pre-school programmes produces a ROI later in life for adults aged 40 of up to $16 for every $1 invested in pre-school (Schweinhart et al., 2005).
- In 2015, only 7% of local authorities in Wales said they have adequate nursery provision for children with disabilities compared with 21% in England (Rutter, 2015).

Primary school

- There have been some attempts to measure economic returns from programmes delivered within primary schools. Estimates range from returns of £1.96 for every £1 invested for group Multimodal Therapy for children with ADHD (Social Research Unit, 2013d) to £26.90 in returns for the ‘Good Behaviour Game’, an intervention aimed at reducing aggressive behaviour (Social Research Unit, 2013b).
- There are nearly 70 thousand children receiving free-school meals across Wales. Establishing healthy eating practices early in life, such as a healthy breakfast, can yield educational attainment benefits (Littlecott et al., 2015).
- The resources that a family has, including access to effective primary school education and the opportunities that then follow, have a significant impact over children’s life trajectories (Alexander et al., 2014).
- Bilingualism has beneficial cognitive effects for young children (Marian & Shook, 2012; Pearl & Lambert, 1962; Kovács & Mehler, 2009).

Housing

- Poor housing conditions increase the likelihood of disability and ill health by up to 25% during childhood and early adulthood (Shelter, 2006).
- We estimate that the NHS in Wales could save £120 million a year in treatment costs for children and adults were we to improve all remaining homes up to current building regulation standards (Nicol et al., 2015). The North Wales CHARISMA study demonstrated that heating and ventilation modifications led to a marginal 14% shift of children from severe to moderate asthma for a total programme cost of £151,152 to Wrexham Borough Council (Edwards et al., 2011; Woodfine et al., 2011).
- Poor housing is also estimated to cost a further £100 million a year through poorer educational attainment and life chances (Davidson et al., 2011).
- Children who live in more cohesive neighbourhoods, have stronger families, and attend better schools tend to maintain a higher economic status later in life (Alexander et al., 2014).

Accidents

- Accidental injuries are a feature of inequalities, with children from poorer backgrounds being three times more likely to be admitted to hospital and five times more likely to die as a result of an accident than children from better off families (ROSPA, n.d.; White et al., 2000).
- Lifetime NHS costs for treating scalds are estimated to be as high as £250 thousand per person (Phillips et al., 2011b). Every £1 spent on thermostatic mixers would save £1.41 in public sector spending from prevented childhood scalds in Wales (Phillips et al., 2011b).
- With respect to road traffic accidents, we estimate that in Wales, the cost to society of road accidents among children is £39.4 million per year (Child Accident Prevention Trust, 2012).

Playgrounds and public spaces

- Physical inactivity in adults and children has poor health consequences (Han et al., 2010) and we estimate that this currently costs the Welsh NHS over £786million per year (Welsh Assembly Government, 2009).
- Rates of obesity are high in children in Wales (National Assembly for Wales, 2013) and obesity is set to overtake smoking as the main cause of premature death in the UK (Hennekens & Andriotti, 2013).
- A complex range of individual, family, social and environmental factors influence participation in physical activity by children and young people (Hill-Tout et al., 1991).
- A recent study on playgrounds in England found that they provided an ROI of £1.32 in social benefit for every £1 spent (Matrix, 2010).
- Playgrounds and public spaces should be appropriately valued as health and well-being creating assets and a means of tackling social exclusion.

Community Health Assets

- Health assets are resources that individuals in a community have that can protect against poor health.
- There are some examples of social return on investment (SROI) **[see glossary]** calculated on a whole community level; however, there is little evidence about what works specifically for children, especially in terms of their SROI.

Potential economic benefits from investment in Early Years

- The total spend on children's services under the age of eleven across Welsh Government, UK Government, Local Authorities and the NHS was estimated to be £3.65 billion in 2014/15.
- Wales could receive comparable returns through investment in Early Years to those predicted by Greater Manchester's New Delivery Model and the best UK transport schemes.

Key summary messages

There are efficiency and equity economic arguments for investing in early years, both for this generation and for future generations (Suhrcke & Kenkel, 2015).

This report has demonstrated the potential cost savings to the Welsh NHS and economy with a focus on evidence based interventions and approaches to improving health and wellbeing in the early years. Investment in Early Years in Wales can contribute to the building of social capital and promote economic growth and should be considered in the same way as European or National investment in wider economic development.

There is a need to understand which potential areas for investment in Early Years might generate value for money and a substantial body of evidence developed over the last 25 years can help, guide a case for early childhood interventions as being a medium for social change (Suhrcke & Kenkel, 2015). There is a need for joined up services that view the whole family not just the individual. Public sector agencies including Local Councils, wanting to invest in Early Years would benefit from a true valuations of the financial, economic, environmental and social value of community assets which already exist in Wales, such as playgrounds and public spaces.

Based on international evidence, investment that focuses on the critical window of the first few years of life is likely to provide the most efficient use of public resources, yielding returns over and above other forms of financial investment and investment at other points of the life course.

Wales has a political framework that already values early years as a critical period for setting health across the life course. There is a need for public services that adopt a long term focus with a shift from treatment to prevention

There is a need to make best use of technology, by sharing data, addressing problems to be more efficient and save money. Welsh higher education institutions continue to make a significant contribution to the international evidence on the effectiveness and cost-effectiveness of programmes and practice relating to Early Years. These two national assets should create an environment conducive to implementing world leading work on investing in the health and productivity of future generations.

1. Introduction

1.1 The case for investment in Early Years

The case for investing in children and particularly Early Years **[see glossary]**, which we define as 0-7 years of age, has been well documented in various high profile reports including those by the World Health Organisation's Commission on Social Determinants of Health (Irwin et al., 2007), the Marmot review (2010), Frank Field (2010) and Graham Allen (2011 a & b).

As all aspects of child development are influenced by a child's environment and experience there is a lifelong effect (Phillips & Shonkoff, 2000). Understanding what supports healthy child development is crucial for protecting not just early childhood health and wellbeing but for increasing life chances and improving lifetime outcomes. A child's development and subsequent life chances are influenced by many factors before birth and throughout childhood (Walker et al., 2011). Children go through significant development during the first few years of life and changes during these years can set the course for future developments. Investments in the Early Years are by their nature long-term commitments, with outcomes realised over time.

Field (2010) brought together compelling evidence to show that the first five years of life are most important for determining life chances. His report argues that the Government needs to move funding into Early Years, specifically targeted toward the most deprived children. His report puts forward key factors that affect life chances, such as a healthy pregnancy, effective parenting and access to high quality childcare (Field, 2010).

The Allen reports (2011 a & b) outline how intervention in children's earliest years can address or eliminate the damaging social problems later in life, which have a substantial cost associated with them. Although both reports focus on 0-5 years they acknowledge that Early Years programmes will not be effective in the long-term unless they are followed up with high quality evidence based programmes for older children and families who need them.

This report, specifically for Wales, at a time of financial recession explores the potential Return on Investment (ROI) **[see glossary]** of investing in Early Years and some evidence of the cost-effectiveness of evidence based programmes. Specifically, this report puts forward the idea that investment in Early Years should be viewed as part of wider economic investment policy.

Key messages:

Intervention in children's earliest years can address or eliminate damaging social problems later in life, which have a substantial cost associated with them.

Investments in the early years are by their nature long-term commitments, with outcomes realised over time.

1.2 Why focus on Early Years? The 1000 days window

In the first few months following birth, adequate nutrition is vital to a child's physical and intellectual development. International efforts to reduce malnutrition in developing countries, through the first 1000 days campaign, have begun to concentrate resources on women during pregnancy and for babies up to the age of 2. It is estimated that every $1 spent on improving nutrition can have as much as a $138 return on investment (1,000 days partnership, 2013, p.3).

In Wales, our focus may not primarily be on nutrition, as it is in aid programmes to developing countries, but rather on establishing healthy lifestyle choices and reducing the impact of poverty and inequality across Wales. At the extreme, children facing Adverse Childhood Experiences (ACEs) **[see glossary]** face a lifetime trajectory of poverty, ill-health and intergenerational consequences (Bellis et al., 2014).

Through a systems approach supporting families and babies born today in Wales, this cycle can be broken and yield social and economic returns from the right investment in evidence based programmes for children and families across Wales.

The first 1000 days of life – from birth to age 2:

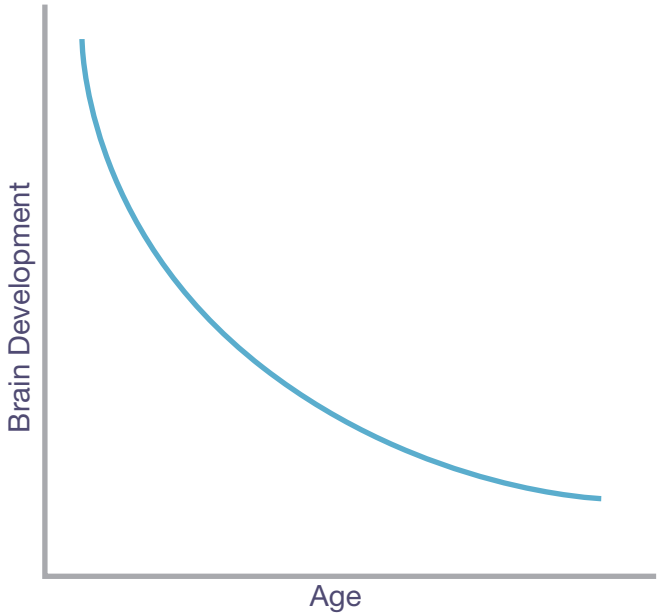
Key messages:

There is a critical window of opportunity for intervention during the first 1000 days, through pregnancy to age 2.

Healthy brain development is crucial for ensuring that children acquire the social and emotional foundations necessary across the life course.

There is overwhelming evidence from neuroscience research of the impact of the Early Years environment and experience on a child's brain development (e.g. Perry, 2002). Healthy brain development is crucial for ensuring that children acquire the social and emotional foundations necessary for learning in school, developing healthy relationships with family and friends and being ready for the workplace. There is an inverse relationship between rate of brain development and age (Figure 1) although it may also be said that there is accumulating evidence for further substantial changes between puberty and age 23 (Heckman, 2008; National Institute of Mental Health 2011).

Figure 1: Brain development with age



Source: Heckman (2008)

An introduction to public health economics

Economics is the study of how society uses scarce resources to meet our wants and needs. Health economists apply the principles of economics to the study of how society can meet our wants and needs for medical care and other interventions that promote and protect health and prevent ill health and disability. Public health economics is about how society uses scarce resources to prevent ill health, reduce inequalities in health, and more widely promote human thriving through the life course.

When we are ill we want and demand health care. The fact that many of the most common causes of chronic disease are down to socio-economic factors and life style decisions, and are to some extent preventable through government or our own individual action, raises a problem for economists. Markets for health care to some extent fail in that most developed countries have decided to provide health care on the basis of need rather than ability to pay, through public health care systems such as the NHS, or through social insurance schemes. Where the market really fails is in the case of prevention goods and services. If we are not ill, we do not demand prevention goods and services even though they might improve our length or quality of life in the future. This is also the case for when we know we are endangering our health through risky lifestyle decisions. Prevention goods and services can have some utility or improve our wellbeing in the short run i.e. knowing we are improving our future health by going to the gym, and even enjoying the time at the gym, but in general we value consumption today more than consumption in the future.

If the market is not going to solve the problem of getting to the right level of investment in prevention, some questions can be asked and answered by government, as the social planner on behalf of society,

1. What prevention goods and services to provide and at what scale? i.e. what proportion of spending on health and other sectors should be on prevention rather than cure?
2. How should these prevention goods and services be produced and delivered? i.e. a more joined up systems approach.
3. On what basis should these prevention goods and services be distributed between individuals in society? i.e. universal vs targeted interventions, and for whom?

Questions about societal goals are what economists call matters of allocative efficiency **[see glossary]**: what are our prevention goals for Wales? What proportion of health and other public spending will we choose to devote to public health initiatives, in order to achieve these societal goals? The public health interventions we choose to invest in involve questions of technical efficiency **[see glossary]** – Which smoking cessation programme yields the most quitters per £ spent? Or which location would encourage the most use, where should a local authority decide to build a new playground?

1.3 Exploring the economic case for investment in Early Years

Investing in Early Years offers many potential benefits to society and a country's economy. The Organisation for Economic Co-operation and Development (OECD) argue that investing in Early Years can provide significant short, medium and long-term economic returns. This investment supports employment opportunities for women and helps to educate children, which in turn may interrupt the intergenerational poverty cycle (OECD, 2011; Price Waterhouse Coopers, 2016).

From an economist's perspective there is an efficiency argument for public policy on Early Years to redress existing market failures. Societal welfare is lower where there is market failure, i.e. resources are not used in their most valued use. Parents, who make decisions on behalf of young children, may not have adequate information on which to base decisions about e.g. the benefits of early preschool child care (Suhrcke & Kenkel, 2015).

There is also an equity based justification for government investing in Early Years to allow children the same start in life regardless of family circumstances. Investing in Early Years may be a way of reducing disparities in a wide range of socioeconomic indicators in later life across the social gradient - going some way to redress inequities over the life course (Suhrcke & Kenkel, 2015).

Importantly, investment in Early Years can be considered in the same way as European or National investment in wider economic development, as the internal rates of return **[see glossary]**, are comparable or greater than many investments made in the name of economic development (Rolnick & Grunewald, 2003).

In developed economies, skills such as problem solving, communication and collaboration skills are valued in a workforce. Investment in Early Years which aids the development of the foundations for these skills can lead to better educational attainment and a more skilled future workforce. This investment can contribute to the building of social capital and economic growth (Karoly et al., 2005). This argument is relevant to Wales, as is a similar argument that Wales needs a skilled workforce for expansion of tourism – the single largest industry in Wales. Wales needs the right kind of jobs that are sustainable and relevant to strengthening the most disadvantaged areas of Wales.

There is a need to understand which potential areas for investment in Early Years might generate value for money and a substantial body of evidence developed over the last 25 years can help, guide a case for early childhood interventions as being a medium for social change (Suhrcke & Kenkel, 2015).

Key messages:

Investment in early years can be justified on economic efficiency grounds and on equity, or reducing inequalities in health grounds.

Investment in early years should be considered in the same way as European or National investment in wider economic development.

Investment in early years can contribute to the building of social capital and promote economic growth.

1.4 What methodology is appropriate for economic evaluation in public health?

Economic evaluations of public health interventions **[see glossary]** need to take account of a full range of costs and outcomes that span a range of public and private sectors (Weatherly et al., 2009).

Assessment of cost-effectiveness is one of the most important roles of the National Institute for Health and Care Excellence (NICE), in the UK and its guidance is relevant to England and Wales (Edwards et al., 2014). In comparison to many high cost drugs approved by NICE, many public health prevention initiatives for children and adults are either cost saving, or have a cost per Quality Adjusted Life Year (QALY) **[see glossary]** way below the threshold of £20,000-30,000 used by NICE (Owen et al., 2011). The problem is that the methodology used by NICE to weigh up the relative value for money to the NHS of new drugs, e.g. in cancer care, is not very transferable to weighing up the value for money of different public health prevention initiatives. The cost per QALY does not capture the wide range of potential savings right across society, across health, social care, schools, local government and the judicial system. Health economists are increasingly going beyond measuring QALYs, into exploring social benefit in terms of net social benefits and costs, in practice often operationalised through ROI analysis.

While NICE promotes the use of cost-benefit analysis in the evaluation of public health interventions (NICE, 2012), there is growing interest in financial returns on investment in public health and prevention (Buck & Gregory, 2013). Just as health economists are conscious that cost per quality adjusted life year (QALY) league tables, defined as giving the relative costs of producing an extra healthy year of life to society, involve a range of research methods (Drummond et al., 2015), internationally, ROI methods differ and for this reason make comparison across programs difficult (National Institute for Health and Care Excellence: NICE, 2011). This is no different from the use of ROI in other areas of the economy and may provide Welsh Government, local authorities and Public Health Wales amongst other stakeholders with ball park estimates of returns on investment (Phillips & Phillips, 2004).

Key messages:

NICE supports the use of cost-benefit and return on investment methods to capture benefits across society from investing in public health prevention initiatives.

ROI tells us what we get back in pounds for every £1 we invest now. Some caution is needed in the comparison of ROI rates across studies.

Capturing the full range of costs and benefits in early years is challenging.

What can Return on Investment (ROI) tell us?

With roots in cost-benefit analysis, Return on Investment (ROI) and Social Return on Investment (SROI) **[see glossary]** are a pragmatic way of comparing benefits and costs (Cabinet Office, 2013). Just as cost per QALY league tables come with a caveat warning about variation in the methods used, the same warning needs to apply to the interpretation of return on investment estimates due to variations in methods of calculation (Fujiwara, 2015). They can, however give us a ballpark idea of value for money.

Benefit-cost ratios (BCRs) **[see glossary]** measure the total return gained from an investment and compares this with the cost. A benefit-cost ratio of 2.8:1 means policymakers can expect £2.80 in benefits for every £1 in costs. This includes the £ invested so we are looking at total returns. Return on Investment considers net benefits. An ROI of 1.8 means that for every £1 spent a return of £1.80 would be generated. The BCR and ROI present the same information but with a slightly different perspective. Social return on investment considers the triple bottom line of economic, social and environmental benefits. It is usually shown as a ratio.

$$BCR = \frac{Total\ Benefits}{Total\ Costs}$$

$$ROI = \frac{Total\ Benefits - Total\ Costs}{Total\ Costs}$$

$$SROI = \frac{Present\ Value\ of\ Benefits}{Total\ Value\ of\ Inputs}$$

$$Net\ SROI = \frac{Net\ Present\ Value\ of\ Benefits}{Total\ Value\ of\ Inputs}$$

$$ROI = BCR - 1$$

$$NPV = -C + \frac{B}{(1 + r^t)}$$

$$IRR = r \text{ when } NPV = zero$$

The Internal Rate of Return on Investment is the rate of return that occurs when costs are equal to benefits, that is when net present value (NPV) **[see glossary]** is zero. That is, if a certain amount is invested, what is the rate of return needed for this investment to break even. If we set NPV equal to zero what would be the return (r) needed for this to be the case given the costs (C) and benefits (B).

In this report we refer to leading international examples of evidence repositories which demonstrate the returns from investment in evidence based programmes. In particular, we highlight the Washington Institute for Social Policy[1] (WSIPP) in the US and the Social Research Unit at Dartington[2] in the UK, the latter has adapted this database to a UK setting. These resources use benefit-cost ratios to show the returns.

In a UK context, there is current guidance aiming to standardise methods in ROI and social return on investment (SROI) (Cabinet Office, 2013; New Economics Foundation, 2011; Edwards et al., 2013).

[1] http://www.wsipp.wa.gov/BenefitCost

[2] http://investinginchildren.eu/search/interventions

Methodological considerations for evaluating complex early years programmes and practice

There are substantial methodological challenges facing those undertaking economic evaluations (particularly cost-benefit analysis and return on investment) of early child development programmes e.g. a long follow up period, the need to discount costs and outcomes at an appropriate discount rate **[see glossary]** and differing methods for monetizing benefits with no market price (Karoly et al., 2005).

- **Early years programmes are most commonly complex interventions**

The evaluation of some early childhood development programmes has been particularly challenging as a result of several components and goals, which we would now define as complex interventions (Medical Research Council, MRC, 2008; Karoly et al., 2005). For example, some early childhood development programmes are targeted at high risk pre-school children and have multi-disciplinary input from various sectors including education, health and social care services.

Investing in Early Years and child development can mean investing in a range of groups, e.g. babies and young children directly, women with potential to become pregnant or who are pregnant, parents and families as a whole, and their wider communities. There is a need to record spill over effects in the economic evaluation of public health interventions in the UK (Weatherly et al., 2009). Such spill over effects might be to younger siblings, parents, offspring, in an intergenerational context, and communities (Karoly et al., 2005).

Investment can be on a 'Universal' or 'Targeted' basis. Universal programmes or intervention **[see glossary]** are aimed at the whole population, while for targeted programmes **[see glossary]** the aim has been to reduce the inequalities in health by focussing on high risk disadvantaged groups within the population. There has been little evaluation of whether they are more or less cost-effective than each other.

Investment can be through a range of different one to one or group programmes, through multi-disciplinary, coordinated practice, developing communities and their assets and changing environments.

- **Evidence on the cost-effectiveness and/or the return on investment of Early Years intervention from one setting may not be applicable to another**

It is difficult to make comparisons across the findings of different evaluative studies of the effectiveness of early childhood development programmes, which can vary considerably. Results from targeted programmes cannot be assumed to be transferrable across to universal programmes. In general, there has been a view that programmes that are more resource intensive, i.e. one to one or small group, that adhere with fidelity **[see glossary]** and are delivered by appropriately trained practitioners tend to be most effective, but these are delivered at a higher cost (Karoly et al., 2005). This is where the need for evidence on the relative cost-effectiveness or value for money is especially relevant.

Problems of implementation and translation from one setting to another have been put forward as reasons for why programmes seen to be effective in one setting have not proved as effective or cost-effective in large trials in subsequent settings (Suhrcke & Kenkel, 2015).

Most of the evidence on the effectiveness and potential economic returns from investing in early child development has originated almost exclusively in the US including the evaluation of targeted programmes including Headstart (Vinovskis, 2005), Perry Preschool (Schweinhart et al., 2005) and the Nurse-Family Partnership (Olds et al., 2010). These programmes have been adopted in a number of developed countries, namely Australia, UK, Canada, and France. There is a growing literature on the effectiveness and cost-effectiveness of these programmes but it is not always conclusive (Karoly et al., 2005).

Evidence of costs and benefits of a range of Early Years programmes, which come mainly from the US or Australia, report returns of between $1 and $17 for each $ invested (Karoly et al., 2005; Aos et al., 2004; Watson & Tully, 2008). Studies that took a longer time horizon, or had a longer follow up period had a greater ROI or BCR, as they could take into account benefits that occurred later in life (Karoly et al., 2005).

It is difficult to transfer the findings of studies from the USA, and elsewhere to a UK setting, and to Wales in this case. For example, juvenile detention rates have come down significantly in recent years in Wales, through use of alternative programmes such as community service, so the rates from the USA, with associated savings are not necessarily applicable to UK and Wales (Ministry of Justice, 2015; Penn & Thomas, 2005).

1.5 The economy and how the population of Wales is changing

Wider political economic and social trends will play a significant role in influencing outcomes through family formation, employment, income and the lives of families and children (Feinstein, 2015). Investment in Early Years does not happen in isolation from these wider economic, social and policy trends.

Decisions in Westminster by the UK government have had a direct impact on the devolved government in Wales, the Welsh economy, the public sector in Wales and on the lives of people living across Wales. There has been a real reduction in capital grant and revenue settlement, this continues to have a real impact on the delivery of public sector services across Wales. Changes to the UK welfare system, such as plans for a Universal Credit system, and possible changes to reduce child benefit, changes to tax credits and the introduction of the bedroom tax have had, and will have, an impact on the poorest families and their children and young people across Wales. The devolved Welsh Government, at present, has little control over the levers that can have a real impact, i.e. taxation and benefit policy.

The economy of Wales lags behind other countries and regions of the UK, with lower employment rates, higher rates of unemployment and welfare claimants, and higher rates of economic inactivity (Welsh Government, 2016a). The barriers to people moving from welfare to work include physical and mental health difficulties, caring responsibilities, skills deficits and a lack of transport. Investing in Early Years may be a way of promoting economic activity and growth in the long term.

There is a polarisation of wealth, across the Welsh economy and population. Indeed, this is a problem for the UK generally (Wilkinson & Pickett, 2009). Looking at the UK as a whole, the most realistic comparison is between that of the economy of Wales and North East England.

The public sector dominates the Welsh economy and represents an imbalance in the economy. This has been defended historically on the basis of the relatively poorer health of the population and associated need compared with England. As an important part of the Welsh economy, there is an economic argument for changing the whole orientation of the public sector in Wales to a preventative model.

Key messages:

Investing in early years may be a way of promoting economic activity and growth in the long term.

Over the next 20 years the proportion of people living in Wales over 65 will increase by nearly 50 per cent while the proportion of children will decrease by 1 per cent.

It is important to invest in babies born today so that they are physically and economically able to support the aging population of Wales.

Public sector is an important part of the Welsh economy and services could in future be designed to focus on prevention rather than reacting to health and social care crises.

Future Demographics

Wales has a population of approximately 3.1 million (StatsWales, 2016). This is projected to rise to nearly 3.2 million by 2022 (StatsWales, 2015a).

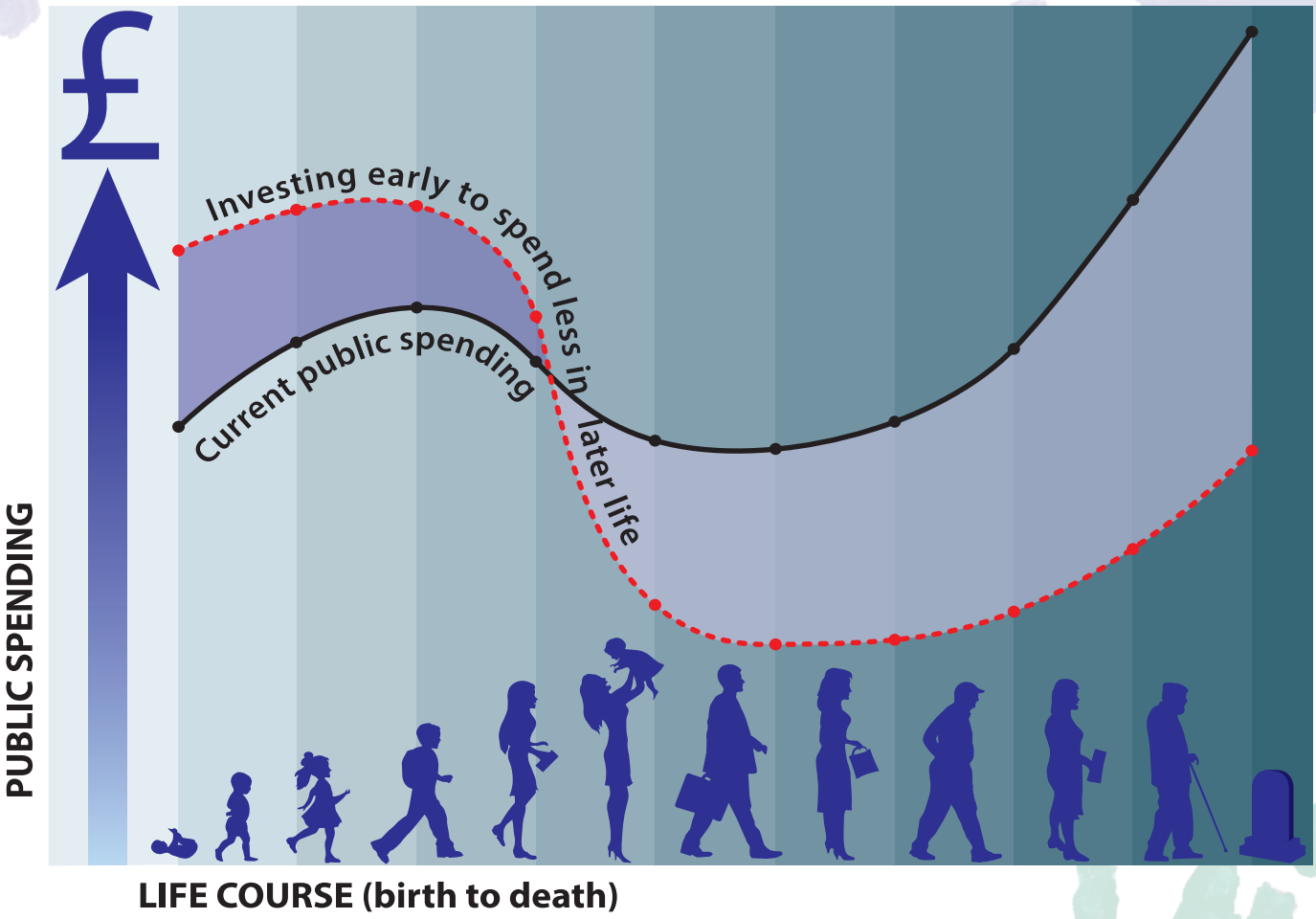
Over the next 20 years the proportion of people aged over 65 living in Wales will increase by nearly 50% while the proportion of children will decrease by 1% (Figure 2). Wales is facing a real problem – 20 years from now there will be more older people who will require an increased amount of resources to look after their health. While the number of children born is predicted to stay roughly the same over the next 20 years, future generation must be more productive if, as adults, they are to generate enough tax returns to fund the care of the elderly. From a UK and Wales perspective there is an economic argument for investing in this next generation so that they are physically and economically able as adults to support an aging population and themselves life a longer proportion of their lives in good health, ultimately requiring less care as they got older.

Figure 2: Projected population change for children aged 15 and under and those over 65

Source: StatsWales (2015)a

It is not often that policy makers visualise the use of resources across the life course when making public spending decisions. There is an economic argument for shifting the spending curve towards prevention through investment in Early Years, which in turn will reduce the costs in later life associated with preventable ill health and disability. Figure 3 is illustrative of this concept with the current pattern of public spending across the life course informed by the Office for Budget Responsibility (2015).

Figure 3: Shifting the curve towards prevention and Early Years investment



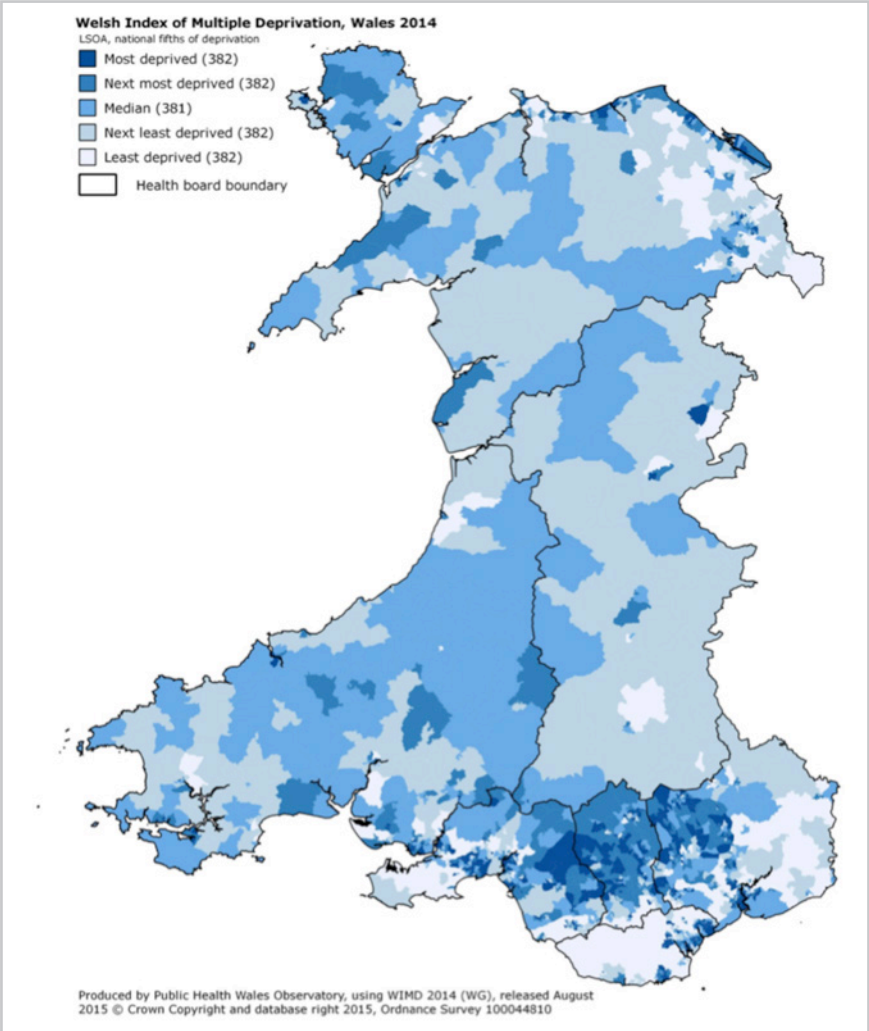
Source: Current spending based on figures by the Office for Budget Responsibility (2015)

1.6 Addressing inequalities in life chances for children living in Wales

Deprivation in Wales is commonly measured by the Welsh Index of Multiple Deprivation (2014). The most deprived areas of Wales are in the South East and in parts along the North Wales coast (Figure 4).

There is a strong relationship between deprivation and issues of public health concern such as childhood obesity (Public Health Wales, 2015a), accidents involving young children (Making the Link, 2013) and teenage pregnancy (Whitaker et al., 2016).

Figure 4: Welsh Index of Multiple Deprivation, Wales 2014



Source: Public Health Wales Observatory (2015)

Across Wales "the more rural areas tend to be less deprived. However, in rural areas, deprived people tend to be more geographically dispersed than in urban areas." (Statistics for Wales, 2015c, p.1)

The more urban the area the more deprived they are, as depicted on the overall index. This means that the design and delivery of programmes and practice, need to consider the context (urban or rural) in order to reach the families who need services most.

Key messages:

Life-expectancy and healthy life expectancy depends not so much on income but rather where people live

At birth there is an 18.9-year difference in healthy life expectancy between the least and most deprived area of Wales

One in three children are living in poverty in Wales

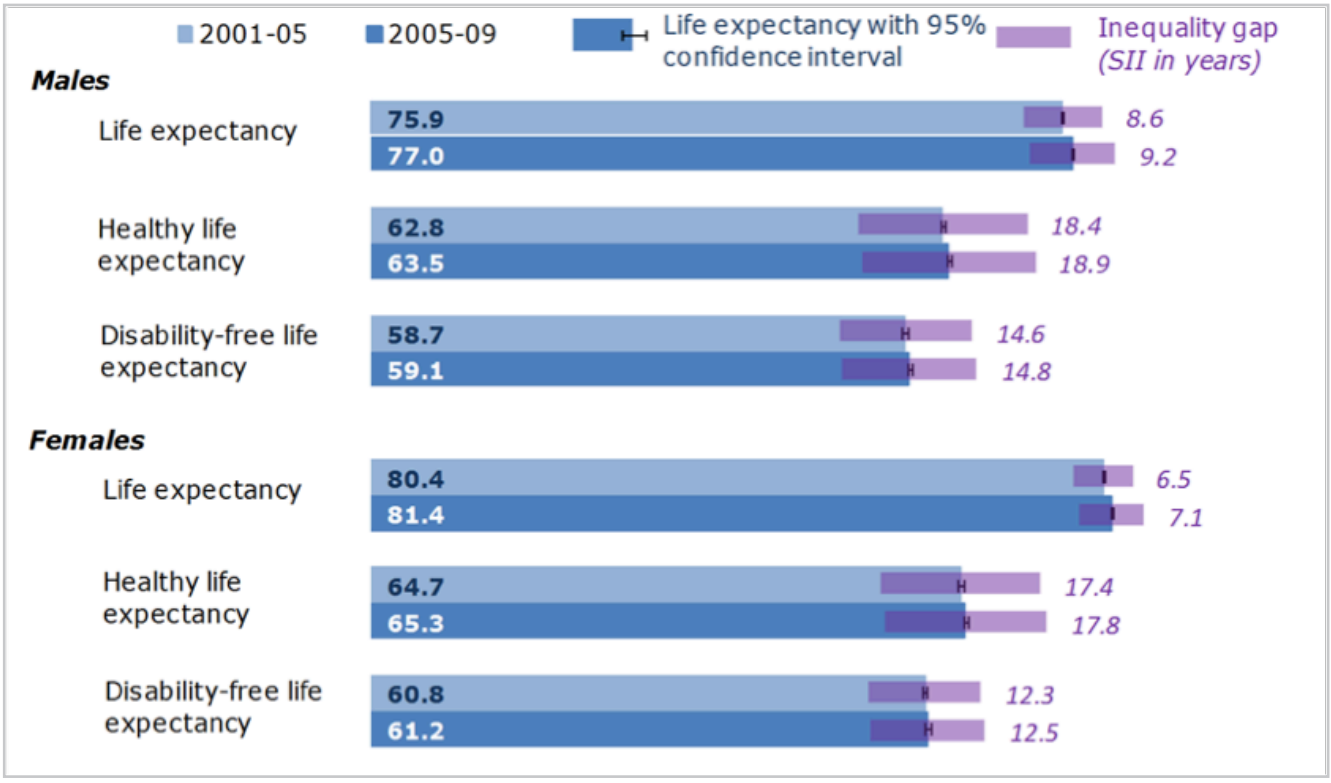
There is an intergenerational impact of poverty.

Proportionate universalism requires an appropriate mix of universal programmes for all babies, children and families in Wales and targeted programmes for families most at risk.

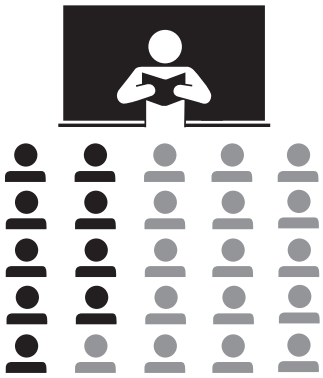
The impact of deprivation on health and life-expectancy for children and families living in Wales

Life-expectancy and healthy life expectancy depends not so much on income but rather on where people live (Buck & Maguire, 2015). Inequalities are increasing with an 18.9-year difference in healthy life expectancy at birth between the least and most deprived.

Figure 5: Life expectancy in Wales 2001-05 and 2005-09 with inequality gap.



Source: Public Health Wales Observatory (2011)



Around 9 children in every classroom are living in poverty in Wales

Child poverty **[see glossary]** in Wales is high with 31%[3] of children in Wales living in households in relative income poverty (Welsh Government, 2015b). This means there are 200,000 children and young people living in poverty. Almost half of the children living in low income households are from lone parent families.

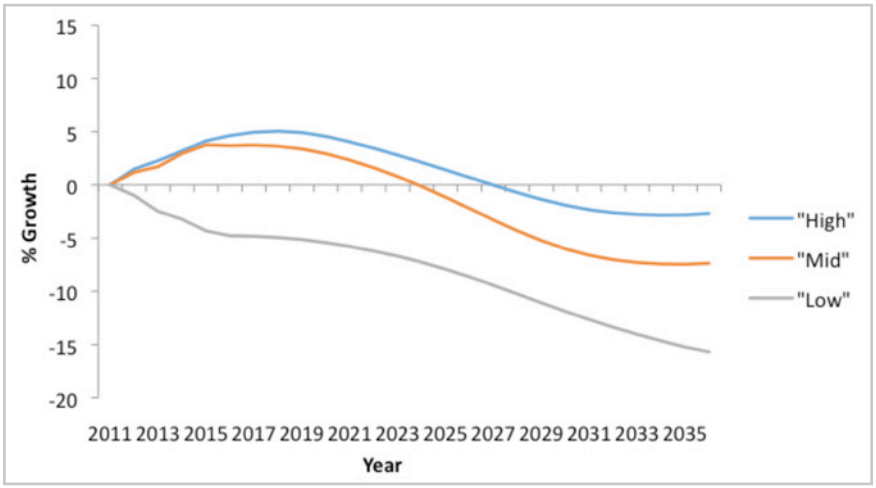
[3]After housing costs

Children growing up in poorer families are more likely to have poorer physical and mental health outcomes, be less likely to reach development and skills milestones in Early Years, have lower educational attainment and eventually be more likely to be not in education, employment or training (NEET) between ages 16 and 24. Intergenerationally, as an adult they are more likely to be living in poverty or unemployed and have children who will also be living in poverty (Welsh Government, 2015b). Work is recognised as one of the main routes out of poverty. There is an economic argument for a continued commitment to economic regeneration of employment opportunities for the poorest communities across Wales, with a reduction of the number of economically inactive families, some of whom claim long-term sickness benefits.

A child is said to be living in poverty if the family's income is below 60% of the UK median household income. The highest child poverty rate is in Blaenau Gwent with 30% of children living in poverty and the lowest rate, at 18% is in Monmouthshire. To enable the comparison of children living in areas of varying poverty we have banded the Local Authorities into three categories – low (18%-23%), mid (24%-27%) and high (28%-30%) poverty (see Table 1). This categorisation will be used in Figure 6 below.

The population of children in more affluent areas is expected to decline. While, in areas of high and medium poverty in Wales the number of children is expected to remain relatively stable over the next 20 years (see figure 6). Given plans to increase workforce participation by both men and women, there is an economic argument for planning ahead for the provision of high quality pre-school places in the areas that are going to have the most babies.

Figure 6: Percentage growth of population that are children (4 Years or less) for areas with high, mid and low child poverty rates.



Source: StatsWales (2015a)

Table 1: Percentage of children living in poverty in the 22 Local Authorities in Wales in 2013 (After Housing Costs)

Local Authority	% in Child Poverty
Blaenau Gwent	30
Cardiff	30
Merthyr Tydfil	29
Newport	29
Neath Port Talbot	28
Rhondda, Cynon, Taf	28
Caerphilly	28
Torfaen	28
Bridgend	27
Carmarthenshire	27
Ceredigion	27
Isle of Anglesey	26
Pembrokeshire	26
Swansea	26
Denbighshire	25
Conwy	25
Wrexham	24
Gwynedd	23
Flintshire	22
The Vale of Glamorgan	22
Powys	20
Monmouthshire	18

High
Medium
Low

Source:
End Child Poverty (2014)

There is an intergenerational impact of poverty. Increasing income does not necessarily protect children from low income families against the high risk that they will end up in poverty themselves (Field, 2010). The Marmot review (2010) argued that policy and practice should work towards investing in children with a view to reducing social inequalities for future generations. Marmot advocates the concept of 'proportionate universalism' whereby actions are universal but with a scale and intensity that reflects and is proportionate to the level of disadvantage. It can be said that the Flying Start programme in Wales has taken this approach.

Focus on investment in Early Years needs to consider the impact of deprivation and how investment can play a role in addressing inequalities in life chances for children born and living in Wales.

Economic returns to investment are likely to be much larger from targeted programmes, aimed at the most disadvantaged children and families who are high risk (Suhrcke & Kenkel, 2015; Heckman, 2012; Hutchings et al 2013).

Understanding the risk factors, the protective factors and the factors that promote thriving through life can help determine an appropriate mix of universal programmes for all babies, children and families born in Wales and targeted programmes for families most at risk.

"The highest rate of return in early childhood development comes from investing as early as possible, from birth through age five, in disadvantaged families. Starting at age three or four is too little too late, as it fails to recognize that skills beget skills in a complementary and dynamic way. Efforts should focus on the first years for the greatest efficiency and effectiveness. The best investment is in quality early childhood development from birth to five for disadvantaged children and their families."

(Heckman, 2012, p.1)

1.7 What about an asset based approach to public health?

There have been five waves of Public Health approaches (Hanlon et al., 2011), the most recent of which promotes the idea of 'assets based public health', allowing communities to decide and generate and action interventions that will improve social cohesiveness, promote social capital and improve health as well as other relevant outcomes. The asset based approach recognises that individuals and communities possess 'assets' which they can deploy in order to deal with adverse health conditions.

Assets are the collective resources which individuals and communities have at their disposal. These assets can promote health and protect against negative health outcomes and (Glasgow Centre for Population Health, 2011).

The asset based approach is about the building of opportunities for good health in a community rather than the treatment of ill health and disease (Morgan, 2007). An asset based approach should not replace the need for addressing investment in service improvement or the structural causes of health inequalities (Glasgow Centre for Population Health, 2011). The assets based approach has been the premise of the Healthy Cities Movement internationally. In Wales, Swansea is part of this healthy cities movement (Taylor, 2010). The asset based approach challenges a more traditional 'medical model', of public health, of interventions within hospitals, schools and workplaces, that aim to change individual health harming behaviours and promote behaviours that can protect our health. Internationally, there is little published cost-effectiveness evidence available on assets approaches to building social capital, including the place of children in this framework (McIntosh, 2014).

Key messages:

Assets are the collective resources which individuals and communities have at their disposal. These assets can protect against negative health outcomes and promote health status.

The asset based approach challenges a more traditional 'medical model' of public health.

In both of these models, in a tax based public health care system such as in Wales, there is a need for evidence on effectiveness, cost-effectiveness, and now return on investment (ROI) of using scarce public funds, whether to support communities to build health assets, or to provide more traditional universal or targeted public health services. This report makes the case to shift resources from spending on ill health today, to spending on preventing ill health and premature death, and addressing the inequalities in these, that we know exist across the social gradient.

In the language of Public Health, there is a distinction between upstream and downstream interventions. Downstream interventions focus on changing adverse health behaviours while upstream interventions aim to change the circumstances that cause these adverse health behaviours (Kelly et al., 2005). Changing the environment in which children can thrive, by removing a barrier to thriving, is akin to an upstream intervention.

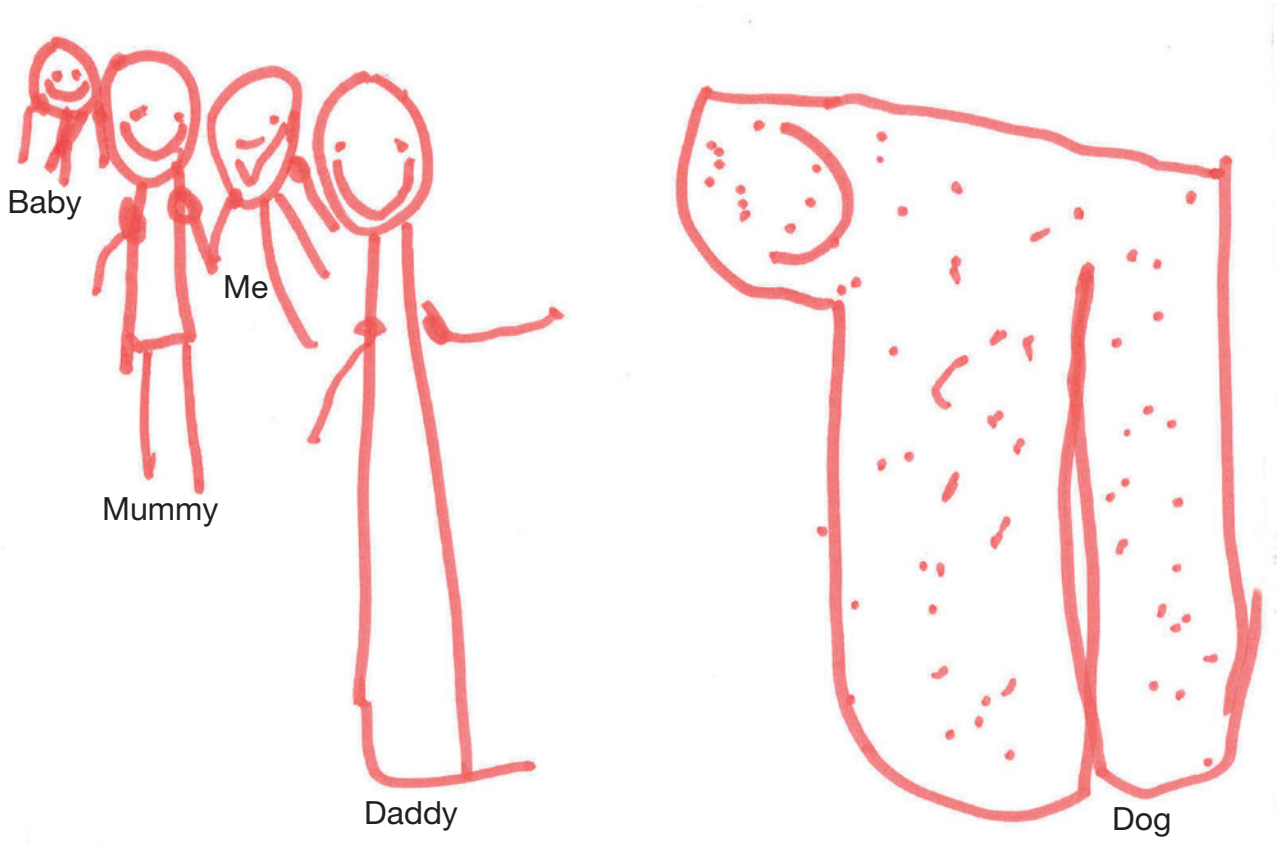
Assessing the return on investments in early years

In the next sections, we explore the evidence on the possible return on investment of a range of public health interventions relevant to the assets of babies born in Wales. We are not being prescriptive here – rather we are saying what the economic benefits are of investing in this kind of intervention.

Early years intervention can be seen from two distinct but related viewpoints. Universal provision and policy level interventions can be used to create environments that are healthy and conducive to child development and promote thriving at a population level. The other complementary approach is that of purposely designed, licensed or manualised interventions during key stages in the early years that are targeted at families, children and sub groups that could most benefit from intervention. These are specific interventions designed to improve or promote health outcomes of children.

The next sections are organised as follows: Section 2 deals with investment in babies and children by looking at some of the life course stages in the early years for potential investment. Through adopting a life course model to investment we consider when the critical time points are for investment and where the greatest returns are. We review the economic evidence considering areas of opportunity such as pre-conception, pregnancy, birth, and the first year of life. Section 3 looks at investment in the family taking into consideration such elements as improving positive parenting, joined up services for families, the costs of Adverse Childhood Experiences (ACEs) and preventing youth offending. Section 4 encompasses education and skills, from pre-school through to primary school while section 5 concludes with a discussion on the environments and communities that allow children to thrive.

Picture by JJ age 4 years and 3 months



2. Investing in babies and children living in Wales

2.1 Preconception, pregnancy and first year of life

The foundations for thriving are laid down long before birth, with a critical time for investment occurring pre-conception and in early pregnancy. The physical, mental and emotional health of women while pregnant and in an infant's Early Years will have a lifelong effect on a child's life-chances (Marmot et al., 2010).

Promoting good maternal health is crucial in order to provide babies with the best start in life. For example, during pregnancy, factors such as maternal smoking, stress, diet and alcohol or drug misuse can have a significant impact on the child's development (Newman, 2002). Vitamin supplements appear to be a cost-effective way of promoting good maternal health and healthy pregnancies (NICE, 2015; Filby et al., 2015).

Getting a healthy start in life: nutrition and a healthy diet

In the UK, eligible pregnant women, women with a baby under 1 years old and children from 6 months to 4 years old receive Healthy Start vitamin coupons. Healthy Start vitamins contain the appropriate amount of recommended vitamins A, C and D for children aged from six months to four years, and folic acid and vitamins C and D for pregnant and breastfeeding women. Babies under 6 months old who are exclusively breastfed or who are having less than 500ml (one pint) of infant formula a day might benefit from them earlier.

The National Institute for Health and Care Excellence (NICE) modelled two investment scenarios, and found that it is cost-effective to offer supplementation universally to all women planning a pregnancy and before 10 weeks pregnant, infants aged 0-6 months and children aged from 4 to 5 years old (NICE, 2015; Filby et al., 2015). The cost per QALY gained was estimated to be £6528 which is below the limit set by NICE to determine if an intervention is cost effective at a threshold of £20-£30,000 per QALY (NICE, 2013a). Targeted provision was not cost-effective with a cost per QALY gained of £620,898. One of the key drivers of cost-effectiveness appears to be the inclusion of women in the pre-conception and early pregnancy stages, with effects dominated by the impact of folic acid consumption on the prevention of neural tube defects.

Key messages:

The foundations for thriving are laid down long before birth, with a critical time for investment occurring pre-conception and in early pregnancy.

Universal provision of vitamin supplements is a cost-effective way of promoting good maternal health, healthy pregnancies and child outcomes.

2.2 Planned pregnancy

Planned parenthood can significantly affect the individual and community. Waiting for a time where one is economically and emotionally ready to have children benefits the child and parents alike.

"Children are an asset both to their parents and the community, and those born as the result of a planned pregnancy are more likely to experience favourable conditions for growth and development that will enable them to achieve their potential" (Lyons & Ashton, 2004, p. 636).

The group most at risk of unintended pregnancy are young women from deprived backgrounds. Pregnancy during teenage years increases the risk of poorer health outcomes for both the mother and the baby (Paranjothy et al., 2009).

The UK has one of the highest rate of teenage pregnancy in Western Europe (Office for National Statistics, 2016; Whitaker et al., 2016) and of particular concern are the high levels of repeat unintended teenage pregnancies in Wales (Whitaker et al., 2014).

Teenagers who have a baby are at a greater risk of social exclusion and poverty because they are less likely to have a good education and hence well paid, employment (Lyons & Ashton, 2004). They are therefore more likely to suffer poverty and ill-health throughout their lives.

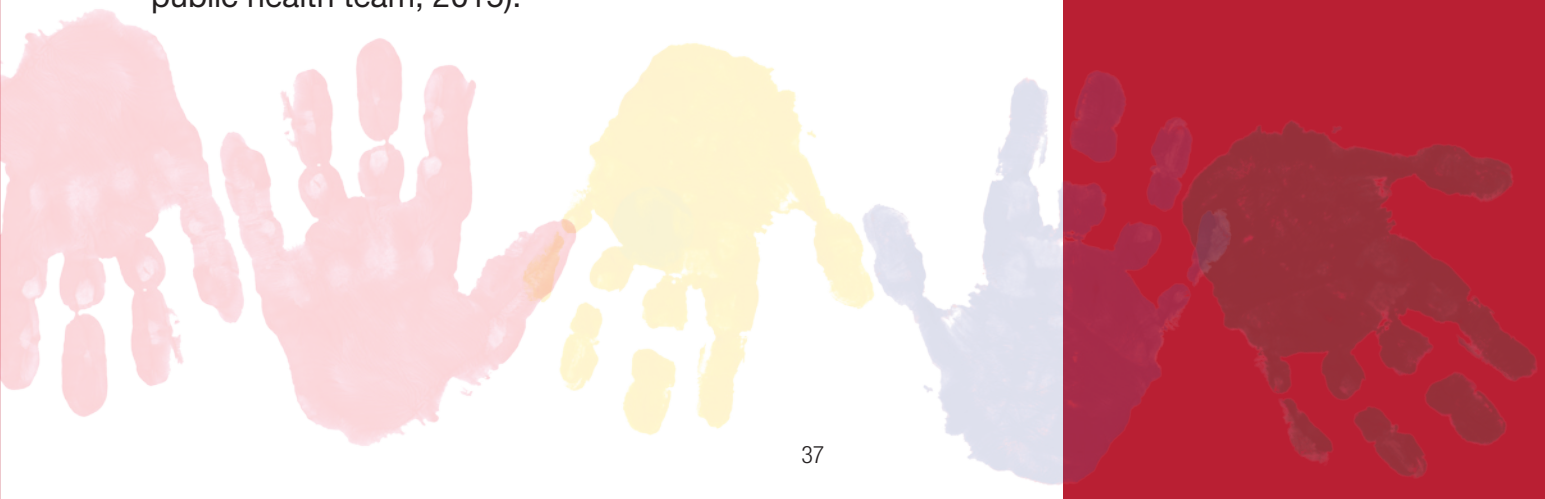
Interventions aimed at promoting planned pregnancy or reducing unwanted teenage pregnancy have a positive return on investment. The return on investment of the publicly funded family planning program in the US is $7.09 for every dollar spent (Frost et al., 2014). These family planning programs, as well as reducing unintended pregnancy, also helped avoid cervical cancer, HIV and other sexually transmitted diseases. In 2010 these government programs are estimated to have had the effect of avoiding 2.2 million unplanned pregnancies. It is estimated that every £1 invested in contraceptive services in Wales would return between £11 and £14 in savings to the NHS in Wales (Lyons & Ashton, 2004; McGuire & Hughes 1995; North Wales local public health team, 2015).

Key messages:

Planned pregnancy significantly affects the life course with a higher likelihood of positive outcomes for parent and child.

The UK has one of the highest rate of teenage pregnancy in Western Europe.

It is estimated that every £1 invested in contraceptive services in the UK would return between £11 and £14 in savings to the NHS in Wales.



2.3 Low birth weight

Low birth weight (LBW) babies (those born weighing less than 2500g) have poorer short and long-term outcomes (Jefferis et al., 2002; Currie, 2009). They are at higher risk of infant death (McCormick, 1985) and there is evidence of negative health consequences, lower educational attainment and lower lifetime earning outcomes (Currie & Moretti, 2007). Delivery of LBW babies entails high direct neonatal treatment costs (Godfrey et al., 2010).

The determinants of low birth weight have been extensively researched (Kramer, 1987; Mumbare et al., 2012; Ohlsson & Shah, 2008). Socio-economic status, which is linked to health status, has been reported to be a key risk factor, with disadvantaged mothers more likely to have low birth weight babies (Jefferis et al., 2002). Consequently, low birth weight is considered to be a key indicator of child poverty and health inequalities.

Smoking during pregnancy

- Smoking in pregnancy and exposure to tobacco smoke is considered to be the largest modifiable risk factor for low birth weight in Wales (Johnson et al., 2014; 2016).
- Stopping smoking is an effective strategy for the prevention of low birth weight and neonatal mortality (Public Health England, 2015).
- Teenage mothers are more likely to smoke during pregnancy than other age groups (Chen et al., 2007).

Rates of low birth weight in Wales

In Wales in 2014 over 2200 low birth weight live births were recorded, 7.1% of all live births. The proportion varied across Wales from 5.9% in Abertawe Bro Morgannwg University Local Health Board (LHB) to 8.1% in Cwm Taf LHB area (Statistics for Wales, 2015a).

The cost of low birth weight

Low birth weight babies are costly to the NHS during the first year of life (direct hospital costs alone are estimated to be of over £4.5 million in Wales[4]) and can go on to have lifetime complications requiring further NHS care (Godfrey et al., 2010).

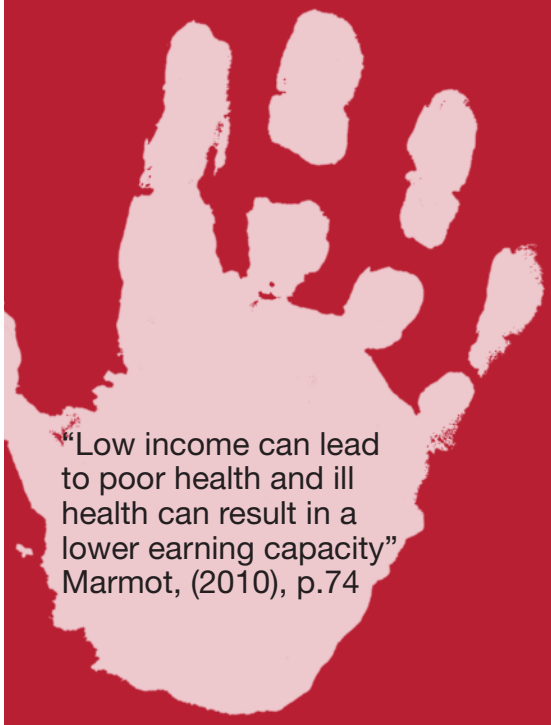
Birth weight has a significant impact on an individual's future earnings and outcomes of subsequent generations (Currie & Moretti, 2007; Marmot, 2010).

[4]Cost estimates were derived from Godfrey et al (2010) 2006/07 rates, and are inflated to 2014/15 rates using the Bank of England Calculator. The incremental cost of initial hospitalisation for low birth weight neonates in Wales was £4,584,014, based on an average unit cost per low birth weight baby of £3120, minus the average unit cost per non-low birth weight baby of £2040, multiplied by the rates of low birth weight babies born in Wales in 2014 (N=2247).

Key messages:

The annual additional cost of caring for low birth weight babies in hospital was estimated as over £4.5 million in Wales in 2014.

The additional cost to Welsh NHS maternity services of delivering low birth weight babies attributed to smoking and other modifiable risk factors is estimated to be £2.15 million annually.



"Low income can lead to poor health and ill health can result in a lower earning capacity" Marmot, (2010), p.74

The additional cost to Welsh NHS maternity services of delivering low birth weight babies attributed to smoking and other modifiable risk factors is estimated to be £2.15 million annually (Johnson, Jones & Paranjothy, 2016).

2.4 Breastfeeding

Rates of breastfeeding across Wales

The World Health Organisation recommends that infants are exclusively breastfed for the first 6 months of life and that breastfeeding is continued as part of a healthy diet up to age two and beyond (WHO, 2011).

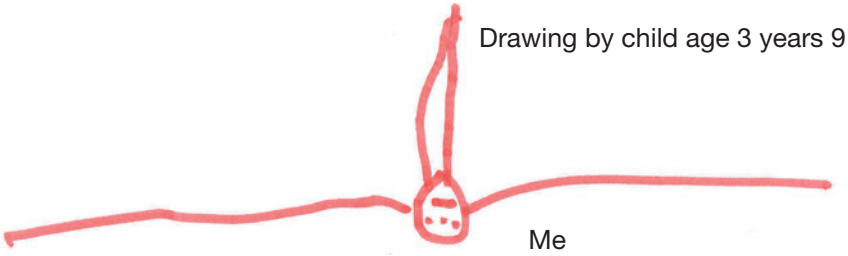
In the UK the National Institute for Health and Care Excellence (NICE) guidance advocates encouraging breastfeeding and the need for breastfeeding support, especially in areas of low income and disadvantaged groups (NICE, 2008, updated 2014).

The percentage of women who initially begin breastfeeding in the UK is amongst the lowest in Europe (Huus et al., 2008). Only 1% of mothers are meeting the WHO recommendations of exclusive breastfeeding until six months (McAndrew et al., 2012).

Rates of exclusive breastfeeding in Wales reduce over time from 57% at birth to only 9% by four months of age. Rates of partial breastfeeding where mothers give their baby other milk (e.g. infant formula) or solid foods in conjunction with some continued breastfeeding are higher than those for exclusive breastfeeding (71% at birth in Wales) but still decline sharply over time. Rates are lower in Wales than England (83%) or Scotland (74%).

Factors that influence the intention, initiation and duration of breastfeeding are complex, and include socio-demographic factors (e.g. maternal age, ethnicity and education). Only half of teenage mothers in Wales are likely to initiate breastfeeding when compared with older mothers (McAndrew et al., 2012).

Measures of poverty and deprivation can predict the rates of initiation and duration of breastfeeding (Brown et al., 2010) with inequalities in the rates of breastfeeding at all ages. Initiation is 25% lower in the most deprived areas of Wales compared with the least deprived areas (McAndrew et al., 2012) and those in more deprived areas are less likely to continue breastfeeding by six months.



Drawing by child age 3 years 9 months

Key messages:

Low breastfeeding rates result in high incidence of illness, which places a significant cost on the National Health Service.

Increasing rates of exclusive breastfeeding at 4 months (currently at 9% in Wales) to the rates observed at birth (currently 57% in Wales) would lead to cost savings of £1.51 million per annum in reduced spending on various childhood conditions in Wales.

A 1% decrease in the number of infants who were never breastfed could equate to approximately £13.9 million gains in economic productivity in Wales.

Children who are not breastfed are significantly less likely to breastfeed their own babies in later life. Evidence based interventions that increase rates of breastfeeding may help break this intergenerational cycle.

The impact of Breastfeeding on healthcare systems

Current breastfeeding rates in Wales result in significant excess health care costs and preventable infant deaths.

Economic predictions in the US[1] suggest that raising breastfeeding rates could save as much as $13 billion per year and prevent 911 infant deaths (Bartick & Reinhold, 2010). In addition to costs associated with illness and loss of life, further evidence suggests that not breastfeeding results in significantly higher rates of health care service use, primarily through GP visits and hospital admissions. Together with the increase in prescriptions it can be estimated to cost up to $475 more per infant when compared with a breastfed infant (Ball & Wright, 1999).

Australian evidence indicates that a 20% increase in breastfeeding rates to 80% would translate into over $35 million savings from preventing a range of illnesses, including eczema and insulin dependent diabetes (Drane, 1997).

A recent UNICEF UK report (Renfrew et al., 2012) proposes that a mid-level policy scenario to increase exclusive breastfeeding rates from 7% to 45% at four months could result in £3.63 million in savings every year due to the reduced prevalence of gastro-intestinal infections in breastfed babies. These savings rise to £17.18 million when considering the savings from avoiding costs of treatment from a further three acute diseases in infants (specifically respiratory tract infection, acute otitis media, AOM, and necrotizing enterocolitis, NEC). In Wales, baseline breastfeeding rates are lower than those elsewhere in the UK. Only 9% of babies in Wales are exclusively breastfed at 4 months (McAndrew et al., 2012). If breastfeeding rates were increased at 4 months to the rate at 6 weeks, 1 week or at birth, this would save the NHS in Wales between £200,000 and £1.5 million per year through reduced treatment costs for the above four acute infant diseases (Table 3).

[5]Although US breastfeeding rates are similar to rates in the UK, healthcare costs are likely to vary considerably.

Table 3: Estimated annual savings from avoiding costs of four acute infant diseases

	Least Optimistic Scenario (Breast-feeding rates increased at 4 months to current rate observed at 6 weeks)	Mid-level scenario (Breastfeeding rates increased at 4 months to current rate observed at 1 week)	Most optimistic scenario (Breastfeeding rates increased at 4 months to current rate observed at birth)
Gastrointestinal infection in infants	£43,722	£149,056	£310,880
Respiratory tract infection in infants	£79,940	£271,826	£569,573
AOM in infants	£9,103	£30,712	£65,094
NEC, infants in neonatal units	£75,045	£248,294	£561,155
Total annual savings from acute disease in infants	£207,810	£699,888	£1.51 million

Source: Estimates based on UK Unicef report, pro-rated [see glossary] to represent Welsh population as 5% of UK population and adjusted to reflect rates of breastfeeding in Wales scenarios.

Increases in breastfeeding rates could result in an additional reduction of annual health care expenditure as a result of reducing the prevalence of childhood obesity and maternal breast cancer (Renfrew et al., 2012).

Wider economic benefits of breastfeeding

Breastfeeding may be associated with improved cognitive outcomes in infants and may influence IQ levels, educational attainment and lifetime earnings. It is estimated that a 1% decrease in the number of infants who were never breastfed would equate to an increase of between £17,000 and £72,000 in individual lifetime earnings (Renfrew et al., 2012), which could equate to approximately £13.9 million gains in economic productivity in Wales.

There may be a greater prevalence of later behavioural problems, and negative consequences for family relationships and social functioning/development. These challenges are likely to place an additional burden on schooling as children require more resource intensive teaching and their behaviour may lead to exclusion from activities (Renfrew et al., 2012).

It has been argued that not breastfeeding is both a cause and effect of social inequalities, with those who were not breastfed being the least likely to breastfeed their own babies in later life (Renfrew et al., 2012). Increasing rates of breastfeeding can help stop this intergenerational cycle of social deprivation.

Furthermore, not breastfeeding can lead to a higher demand for milk substitute formula with its associated costs in

terms of resource use and environmental damage from the production and consumption of milk formula (Rollins et al., 2016). Particularly relevant for low income families is the direct cost of purchasing milk formula.

Examples of evidence of programmes and practice

There are a number of interventions that aim to increase breastfeeding initiation rates and extend the duration of feeding. These include:

- Paid and voluntary peer supporters
- Breastfeeding support centres
- Antenatal education workshops
- Healthcare assistants
- Qualified breastfeeding counsellors/supporters
- Education/training for healthcare professionals
- School education

The cost of schemes needs to be considered on two levels. Firstly, whether there are cost savings due to avoiding downstream treatment costs and secondly, what the expenditure per QALY gained is.

In Wales the 'Breastfeeding Peer Support Programme' (which has an annual cost of £31,000) and the 'Breast Feeding Welcome Scheme' (which has an annual cost of £11,000) were reviewed as part of a national Programme Budget and Marginal Analysis (PBMA) **[see glossary]** exercise in Wales. Based on the available evidence and professional opinions both were placed in the red category of interventions deemed 'unlikely to bring a population health benefit' (Edwards et al., 2014). One other investment, the 'Baby Friendly Initiative' which costs £110,000 annually was reported to be a 'sound programme with a reasonable evidence base' however its cost-effectiveness was yet to be assessed (Edwards et al., 2014).

NICE public health guidance on maternal and child nutrition note that:

"Schemes to promote breastfeeding vary in their effectiveness and occasionally, where they have little effect, may not be good value for money. However, most established peer and professional educational breastfeeding interventions were estimated to be cost effective, even when the resulting health benefits were conservatively estimated. Indeed, if it is accepted that demonstrable health benefits in later life (for example, reduced risk of cardiovascular disease) are causally associated with breastfeeding, then virtually all breastfeeding schemes would be cost effective, and often extremely so."

(NICE 2008, updated 2014

point 3.18, p. 21)

2.5 Early Years immunisation in Wales

Vaccinations in the Early Years greatly reduce disease, disability, death and inequity worldwide (Andre et al., 2008). Compared with other common public health interventions, they are considered to be a good investment and generally highly cost-effective (Chabot et al., 2004). The annual internal rate of return on investment in vaccinations has been estimated to be between 12% and 18%, although the economic benefits of improving health are greatly underestimated (Bloom et al., 2005). Evidence from US showed that for every $1 invested in the measles, mumps and rubella (German measles), MMR vaccine there are $26 in benefits to society (Zhou et al., 2004).

The Childhood Influenza Vaccination Programme in Wales will see the introduction of universal provision of the flu vaccine for all children aged 2 – 16 years (Public Health Wales, 2015b). The influenza vaccine for all pre-school children is considered to be highly cost effective with a cost per QALY gained of £251 (Pitman et al., 2013).

The World Health Organisation (1998) recommends a national minimum target of 95% of children being immunised against diseases preventable by immunisation.

In Wales, the most recent figures reported by Public Health Wales (2016) show that by age four 87% of children are up to date with all routine immunisations. The proportion of children up to date by age five was higher at 89%. Uptake of the Rotavirus primary vaccine by age one, MMR second dose by age five and the '4 in 1' pre-school booster in five year olds were all reported to be below 95%. While data trends indicate that overall rates of uptake have been rising, the current rates are still below the target rates recommended by WHO.

Key messages:

Vaccinations for children reduce disease, death, disability and inequity worldwide.

In Wales, less than 90% of children are up to date with all routine immunisations by the time they start school.

Annually, vaccinations provide an internal rate of return of between 12% and 18%.

Evidence from US showed that for every $1 invested in the MMR vaccine there are $26 in benefits to society.

The childhood flu vaccine is highly cost-effective with a cost per QALY gained of £251.

2.6 A spotlight on looked after children

Looked after children are babies and young people (aged 0-18 years) who are cared for by the Local Authority, as they cannot remain safely at home with their families.

In March 2015 there were 5,615 looked after children in Wales (StatsWales, 2015b). Over the last decade, the number of looked after children has increased considerably (Giant, 2014). Local Authority areas with the highest rates of deprivation have higher rates of looked after children. Population size, deprivation, and lone parent households explains some but not all of variation between Local Authorities (All Wales Heads of Children's Services, 2013).

Looked after children are likely to have poor health and quality of life outcomes compared with the general population. Between 45 and 72% of looked after children have a mental health problem that requires a health professional, compared to 10% of children in the general population (Meltzer et al., 2004 a & b; Sempik et al., 2008).

Looked after children have poorer education attainment with 40% fewer gaining 5 GCSEs at grade A*-C compared with children in the general population. Children in the general population are twice as likely to go to University as care leavers (Department for Education, 2014).

In England, the total estimated cost for all failed reunifications (which result in children re-entering care) is £300 million a year. If an additional 300 children a year, over a 3-year budget cycle, could remain safely with their families after leaving care, the cost savings would offset the cost of providing appropriate support and services to all families (Holmes, 2014).

In Wales, group parenting programmes have been used to support foster family resilience and looked after children (Bywater et al., 2011a; O'Neill et al., 2011).

Later in life leaving care and transition to adulthood support services can be cost-effective particularly if they focus on enhancing skills to find employment (NICE, 2010).

Key messages:

Over the last decade the number of looked after children has increased considerably.

Areas with high deprivation have the highest number of looked after children.

Looked after children are more likely to experience health problems and have poorer educational outcomes compared to the general population.

If more children could remain safely with their families after leaving care the cost savings would offset the cost of providing the support services.

3. Investing in the whole family

3.1 Parenting

There is a "need to appreciate that children's behaviour is influenced by their parents, which is in turn influenced by their families and the communities in which they reside" (Rutter, 2006, p. 139). Furthermore, there is strong evidence that the impact of poverty is mediated through its impact on parenting (Patterson & Forgatch, 1995).

Investing in parenting may occur through a variety of support and training programmes including:

- Antenatal programmes that aim to support childbirth and the transition to parenthood;
- Attachment focused interventions that highlight the importance of early skin to skin contact;
- Group based parenting programmes to improve emotional and behavioural outcomes of children and families (Public Health England, 2015).

Conduct disorder and antisocial behaviour in adolescence and subsequent life-long problems, including violence, criminality, substance misuse and enduring mental health problems, have their origins in early childhood (Hutchings & Gardner, 2012).

Conduct disorder is the most prevalent of mental health conditions in children and affects approximately 5% of children (aged 5-16 years) in the UK (Green et al., 2005).

Parenting programmes that reduce child behavioural problems, supporting parents to effectively respond to difficult behaviour and strengthen family relationships have a strong evidence base and have been promoted by NICE and in recent reviews in England (NICE 2013c; Allen, 2011a).

The cost of conduct disorder

Costs to the health sector represent only a small percentage of the overall costs of conduct disorder to society and the economy as a whole (Scott et al., 2001; NICE, 2013 b & c; Muntz et al., 2004). Children and adolescents with conduct disorder are more likely to participate in health harming behaviours such as smoking, drinking and drug use (Green et al., 2005). These children and young people are more likely to have tried to hurt, harm or kill themselves (Bella et al., 2010; Scivoletto et al., 2010).

The direct costs to the NHS associated with childhood conduct disorder has been estimated to be an additional £4140 per child per year[6] (Knapp et al., 1999). The health care costs attributed to conduct disorder may be under reported as not all children present to mental health services (Scott et al., 2001).

Key messages:

Parenting programmes when delivered well can be effective and cost-effective in reducing conduct disorder in children, with potential savings across multiple sectors.

Public sector costs for children with conduct disorders are ten times more than for children with no conduct disorders.

It is estimated that preventing conduct disorder in the most serious of cases could provide lifetime savings of around £150,000 per case.

The cost of crime attributable to those that had conduct disorders as children was in the region of £60 billion a year in England and Wales.

NICE estimates lifetime savings from effectively treating childhood conduct disorder to the NHS and social services per person to range between £4700 and £24,800 (NICE, 2013c). According to the NICE (2013b) guidelines on antisocial behaviour and conduct disorders in children and young people and the accompanying costing report (NICE, 2013c) effective intervention to decrease rates of childhood conduct disorder will result in "lifetime savings [that] are anticipated to be considerably higher than the cost of intervention" (NICE, 2013c, p.6). The report emphasises that "savings will arise across public sectors including the NHS, social services, education and the criminal justice system, as well as private costs such as insurance and replacing stolen property" (NICE, 2013c, p.6).

At a society level it has been identified in the Sainsbury Centre for Mental Health (2009) briefing that the cost of crime attributable to those that had conduct disorders as children was in the region of £60 billion a year in England and Wales.

Estimated individual lifetime savings range from between £23,800 and £104,900 when considering a full range of public sectors including the education and the criminal justice system (NICE, 2013c). Preventing conduct disorder in the most serious of cases could provide lifetime savings of around £150,000 per case (Friedli & Parsonage, 2007).

Parenting programmes when delivered well can be effective and cost-effective in preventing and reducing conduct disorder in children, with potential savings across multiple sectors (Edwards et al., 2007; Edwards et al., 2016; Hutchings et al., 2007; Knapp et al., 2011).

Examples of evidence of programmes and practice supporting parenting skills

The demand for publicly funded early intervention services to deliver effective evidence-based programmes is growing (Hutchings & Gardner, 2012). There is good evidence that targeted interventions for parents of younger at-risk children are effective in reducing the risk of early childhood emotional and behavioural problems (Furlong et al., 2013; PHE, 2015).

Research trials of some parenting interventions with parents of children who are starting primary school have demonstrated repeated effectiveness and cost-effectiveness (Hutchings et al., 2007; Edwards et al., 2007; Edwards et al., 2016). Over the long term parenting programmes for parents of children with conduct disorder are cost saving to both the public sector, and to the NHS alone (Knapp et al., 2011; Bywater et al., 2009).

[6]Mean costs reported in Knapp et al (1999) of £2469 annual direct costs to the NHS have been inflated to 2014 using the Bank of England inflation calculator.

One example of a parenting programme that has been successfully implemented within Wales is the Incredible Years Parent Training (Evans et al., 2015; Jones et al., 2012). It is a group-based, skills-focused behavioural intervention for parents of children with conduct problems. It focuses on reducing and treating behavioural problems (such as aggression and conduct disorder) by strengthening parenting skills (monitoring, positive discipline, confidence) and increasing parents' involvement in children's school experiences.

There is a growing evidence base for the effectiveness of Incredible Years Parenting programmes and further evidence of cost-effectiveness led by CHEME (Charles et al., 2011; 2013; Edwards et al., 2007; Muntz et al., 2004). The Social Research Unit at Dartington reports Incredible Years programmes to have a benefit-cost ratio of 1.37:1, an internal rate of return on investment of 6% and a risk of loss of 33% (Social Research Unit, 2013e).

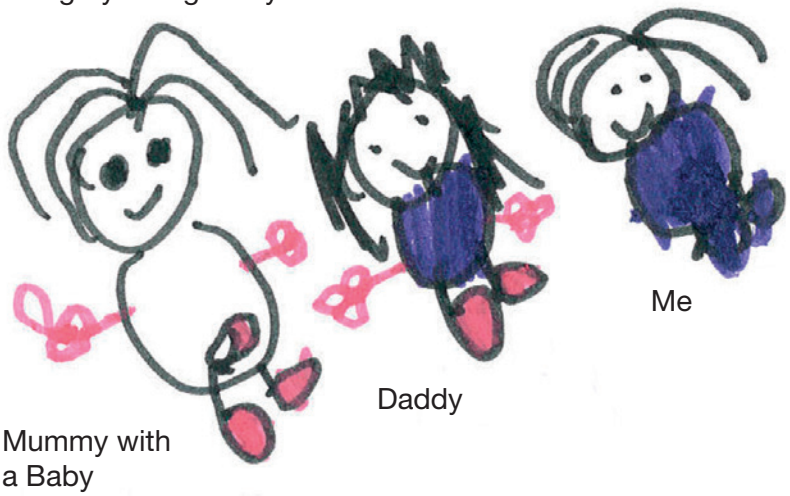
Another example of a parenting programme is the Triple P Positive Parenting Programme which is currently delivered in 25 countries including the UK. The Triple P positive parenting programme is a multi-level approach that aims to prevent severe behavioural and emotional problems in young children by offering parents simple and effective parenting strategies (Sanders, 2002). It originated in Australia where there is evidence that it was a highly cost effective use of resources, with cost savings of around A$6 million annually as a result of a 4% reduction in conduct disorder (Mihalopolous, 2007). While most of these benefits would occur in the health care sector some of the costs avoided would have been incurred by the criminal justice and special education systems. The Triple P Positive Parenting Programme has been reported to have a cost-benefit ratio of 5.05:1 (Public Health England, 2015). The evidence on the cost effectiveness of Triple P in the UK is mixed and without further effectiveness and cost-effectiveness evidence decision makers should not implement or invest further in the programme within the UK, outside of a research randomised control trial (RCT) **[see glossary]** environment (Marryat et al., 2013).

Implementation of Incredible Years Parenting Programmes in Wales

The Incredible Years programme has been implemented successfully in several countries and is now delivered across Wales, with over three hundred groups in 2011 (Hutchings, Williams and Morgan-Lee, 2011). In Wales we have home grown rigorous evidence of the effectiveness and cost-effectiveness of a suite of Incredible Years parenting and school based programmes taking children through from baby and toddler, pre-school to class room settings. The research trials, demonstrating that the IY programmes were effective in Wales, overcame the common criticism that programmes developed overseas are not culturally relevant.

The internationally significant research outcomes from IY evaluations meant that the lessons learned about fidelity (Hutchings, Bywater, Daley, Gardner et al., 2007) were taken on board. The focus, from the start, on getting locally available trainers, accredited by the programme developer, is essential for enabling training and supervision to be brought in-house making it accessible and economically viable. Co-ordination of training and support activity within Bangor University has meant that there is a register of trained people within Wales. This has enabled the Centre to maintain contact with them, to run annual conferences, to keep them updated on training opportunities and research findings and to undertake surveys to obtain feedback from programme deliverers about successes and challenges.

Drawing by LS age 4.5years old



3.2 Joined up services and systems for families living in Wales

Early intervention strategies targeting disadvantaged high-risk communities, such as the Sure Start and Flying Start programmes, have become part of government strategy across the UK (Rutter, 2006).

Sure Start is an initiative that aims to provide additional complementary family and child services for the most deprived communities.

"The Sure Start initiative was launched in 2001 and by 2006 £3.1 billion had been invested in it [in England] (Meadows, 2006). However, central Government had failed to specify effective interventions meaning that service providers delivered widely differing services, with some delivering evidence-based programmes and others developing their own (Belsky et al., 2006). As a result, an evaluation of the first three years of the intervention showed no benefits for the most disadvantaged families (Belsky et al., 2006; Hutchings et al., 2007)" (Hutchings & Williams, 2014, p.35). The less disadvantaged families who had "more personal, social and economic resources available to them", benefitted most, albeit only marginally (Melhuish et al., 2007). This led to changes and subsequent evaluations of Sure Start in England showed better results especially when linked to children's centres (Melhuish et al., 2010).

Flying Start aims to make a decisive difference to the lives of children in the most disadvantaged communities. It offers eligible parents free quality childcare for 2-3 year olds, parenting support, an enhanced health visitor service and help for early language development (Welsh Government, 2015c).

Families First is designed to improve outcomes for children, young people and families. It emphasises prevention and early intervention for families, particularly those living in poverty (Welsh Government, 2015d).

According to the Department for Communities and Local Government (2015) policy paper on support for families, troubled families "have problems and cause problems to the community around them, putting high costs on the public sector" (p.1).

Key messages:

Troubled families cause problems to the community around them, putting high costs on the public sector. In some area of the UK troubled families cost 10 times more to local councils than other families.

Dealing with troubled families requires joined up services that consider the whole family unit.

Troubled families are defined as those who:

- are involved in youth crime or anti-social behaviour
- have children who are regularly truanting or excluded
- have an adult on out-of-work benefits
- cost the public sector large sums in responding to their problems

It has been reported that in England they

> "spend disproportionately more on troubled families than the 'average' family. For example, in West Cheshire, the council is spending an average of £7,795 on an average family in its area, compared to £76,190 for a troubled family. In Solihull, local services spend an average of £5,217 on an average family, compared with £46,217 on a troubled family. The amount spent on a troubled family is estimated at nearly £100,000 in Barnet. This is not sustainable" (Department for Communities and Local Government, 2013, p.5).

In England a payment by result scheme provides local authorities with up to £4,000 for turning around a troubled family. This involves getting results across a whole family unit, getting children back into school, demonstrating a reduction in crime, taking steps towards employment and reducing the cost of public services (Department for Communities and Local Government, 2012).

Dealing with troubled families requires joined up services that consider the whole family approach. On the ground, there is a movement in Wales to work towards a whole families approach to dealing with troubled families in deprived communities through services such as the Integrated family support services (described in the Children and Families (Wales) Measure 2010) and interventions such as Flying Start and Families First.

Complex Early Years interventions in Wales such as Flying Start and Families First "include diverse interventions with different delivery models, dosage and intended impacts", these factors among others mean that "outcomes will vary between localities and will depend on the quality of implementation and effectiveness and continuity of the wider system of support for children and families" (Feinstein, 2015, p. 1).

Feinstein (2015) reports that in Wales,

> "the Family First model has made good progress in establishing a credible infrastructure of early intervention and prevention that could have a substantive effect on outcomes across outcome areas. However, it is still early days in establishing a baseline in terms of population

need. A programme of referral and support has been established but given the variability in the nature of this provision for different participants, it is early to evaluate the long-term impact. We have not yet been able to assess the degree to which it is aligned across health, police, local authorities and the voluntary sector" (p. 28).

Feinstein (2015) argues "(that) outcomes will vary between localities and will depend on the quality of implementation and effectiveness and continuity of the wider system of support for children and families" (p.1).

We draw on a useful example of a systems approach in action as presented by Feinstein (2015) on the impact of an Integrated Early Support Service implemented in Cheshire West and Cheshire in 2013:

> "The service brings together the work of over 20 different agencies and data systems into a single and coherent model. This includes a single 'front door' into services, a single assessment model, shared IT and co-located workers in seven multiagency locality teams. A menu of evidence based interventions is available for children and families; for more complex cases a range of different professionals act as the lead worker, developing a clear family plan that meets the needs of the particular family" (Feinstein, 2015, p. 15).

The impact of systems reforms is at a formative stage and evaluations are too short in duration and lack comparison groups (Feinstein, 2015).

A spotlight on the Family Nurse Partnership

The Family Nurse Partnership (or Nurse-Family Partnership, as it is known in the United States) is a childhood preventive programme and is argued to transform the chances of some of the most disadvantaged children and families (Department of Health, 2012). It is based on robust and scientific research about what makes a difference to the outcomes of vulnerable babies and their families. The programme has been developed from over 30 years of extensive US research, including a large scale RCT, the most rigorous research method for testing the effectiveness of a programme (Olds et al., 2010).US research has also shown significant cost savings to the public purse from the long-term benefits of Nurse Family Partnership – for example from, improved employment outcomes for mothers and reduced risk of youth offending for their babies when they grow up – as well as financial benefits for beneficiaries, their children and wider society (Olds et al., 2010; Karoly et al., 2005; Lee et al., 2015). The Family Nurse Partnership has been reviewed by the Dartington Social Research

Unit (SRU), who have calculated for England and Wales a benefit-cost ratio of 1.94:1, an internal rate of return on investment of 6%, and a risk of the intervention not succeeding of 29% (Social Research Unit, 2013a).

The programme is being rigorously evaluated in England, with early pilots that showed promising results (Barnes et al., 2008; 2009; 2011) however, a pragmatic large-scale RCT concluded that their findings did not support the continuation of the programme (Robling et al., 2016). These findings demonstrated significant additional costs but few benefits despite the targeting of the programme at first time teenage mothers (Robling et al., 2016).

This evidence shows the considerable problems with transferring programmes from one setting to another and the challenges facing researchers in capturing costs and benefits effectively. If Wales does pilot the Family Nurse Partnership then perhaps given the linked databases such as the Secure Anonymised Information Linkage databank (SAIL www.saildatabank.com) in Wales, researchers based in Wales may be in a strong position to evaluate programmes and better capture relevant costs and benefits.

An example of targeted and universal provision of support in high risk communities (Hutchings et al., 2013)

- Families in Flying Start and Sure Start areas in Wales were recruited to a randomized controlled trial of an early years parenting programme and the result of the two methods of recruitment was compared.
- Families First uses a geographical method of recruiting families from disadvantaged backgrounds and this was found to be an effective way of targeting high risk families.
- The Sure Start method, which included families that were known by health visitors to have the risk factor of challenging child behaviour also identified families with a significant amount of other risk factors. While targeting by locality alone provided a sample with fewer risk factors (Families First method).
- Simple screening for risk factors associated with deprivation, such as poverty, parental stress and delayed child development can identify families with a greater need for intervention and hence a more effective and cost effective allocation of resources.
- Joined up services and health visitors on the ground who know families improves the reach of programmes, increased the uptake by families, and produces better results.

3.3 Adverse Childhood Experiences

ACEs can have a significant impact on life course health. These are stressful events in childhood including:

- Physical abuse
- Emotional abuse
- Sexual abuse
- Physical neglect
- Emotional neglect
- Parental separation
- Incarceration
- Drug abuse
- Alcohol abuse
- Mental illness

(Felitti et al., 1998; Bellis et al., 2014)

Exposure to ACEs is known to cause immediate biological and psychological damage as well as affecting later life (Bellis et al., 2014).

ACEs tend to be clustered around but not exclusive to families from a lower socio-economic background (Björkenstam et al., 2013). Reducing the prevalence of ACEs therefore improves health and reduces health inequalities in our society.

In an England survey nearly half of all adults have experienced at least one ACE with 8% experiencing four or more ACEs (Bellis et al., 2014). It is not however known how many of these ACEs occur within the Early Years period. They also found that disease development and health harming lifestyles worsened as the number of ACEs increased. For example having four or more ACEs was associated with being three times more likely to be a smoker and eleven times more likely to have used heroin or crack or be incarcerated (Bellis et al., 2014).

The negative outcomes and associated anti-social and health harming behaviours in later life represent a great cost to society (Bellis et al., 2015). The total costs associated with ACEs to society is not known, however the costs fall to many sectors and aspects of society and have a wide range of consequences (see figure 7). The costs of some of the individual outcomes associated with ACEs, to some sectors are known, these include:

Key messages:

ACEs lead to an elevated risk of experiencing negative health outcomes in later life and represent a great cost to society.

ACEs are more clustered around but not exclusive to families from a lower socio-economic background.

Costs of outcomes associated with ACEs range from £2.59m for cannabis use to £6.2bn for violent crime.

- Early sex and teen pregnancy: The cost of teenage pregnancy in Wales is £4.5 million per year. It is estimated that child sexual abuse costs £160 million per year in Wales[8].
- Smoking: In 2013 the total economic cost of smoking to Wales was £791 million, with the cost to the NHS in Wales specifically being £437 million per year (ASH, 2013).
- Binge drinking: The cost of excessive alcohol consumption in Wales is estimated at between £69.9m and £73.3m (Phillips et al., 2011a). Inflated to today's figures this stands at £78.2m to £82m per year.
- Cannabis use: The cost of treating cannabis users in Wales is £2.59m[9] per year.
- Heroin/crack cocaine use: The total economic cost of treating Class A drug use in Wales is £253.1m[10] per year, of which 88% can be attributed to crime and policing costs (Godfrey et al., 2012).
- Violent crime: The cost of violent crime in Wales is £6.2 billion[11] per year.
- Incarceration: The cost of incarceration in Wales in 2013-14 was £113.1 million[12] per year.
- Poor diet: Poor diet related ill health costs the NHS in Wales £349 million[13] per year.

All of these consequence have an on-going impact on children in their Early Years living in affected households (Bellis et al., 2014; 2015), and ultimately what we are presenting here is the costs of not preventing ACEs, much of which is only possible through early intervention both before and within the Early Years. In Wales there are a handful of interventions which aim to help avoid the problems with ACEs by intervening early in children's lives. One such intervention is Flying Start which offers free quality, part-time childcare for two to three year olds, a health visiting service, parenting programmes and speech, language and communication support (Bellis et al., 2014) However, empirical data on the effectiveness of Flying Start in reducing the impact of ACEs is lacking.

[7]According to the Department for Education and Skills (2006) the cost of teenage pregnancy to the NHS alone is estimated to be £63m a year in England. Inflated and pro-rated to Wales this amounts to £4.5 million per year.
[8]£3.2bn in the UK in 2012 (NSPCC 2014). Inflated and pro-rated to Wales this amounts to £160 million
[9]Bryan et al., (2013) puts the cost of treating cannabis use in England and Wales at £44.7m in 2009/10. Inflating and pro rating to Wales gives a figure of £2.59m per year.
[10]Total economic costs of class A drug use in England and Wales was put at £3.5 billion in 2000 according to the Home Office (Godfrey et al., 2012). Inflated to today's figures and pro-rated this puts the figure in Wales at £253.1m per year.
[11]A study from the Institute for Economics and Peace (2013) puts the cost of violent crime in 2012 at £124bn. Inflated and pro-rated to Wales gives a figure of £6.2bn per year.
[12]The cost of incarceration in England and Wales in 2013-14 was £2.1 billion according to the Ministry of Justice (2014). Pro-rated to Wales puts the figure in Wales at £113.1 million per year.
[13]According to Scarborough et al (2011) in 2006–07, poor diet-related ill health cost the NHS in the UK £5.8 billion. This, inflated and pro-rated to Wales gives a figure of £349 million per year.

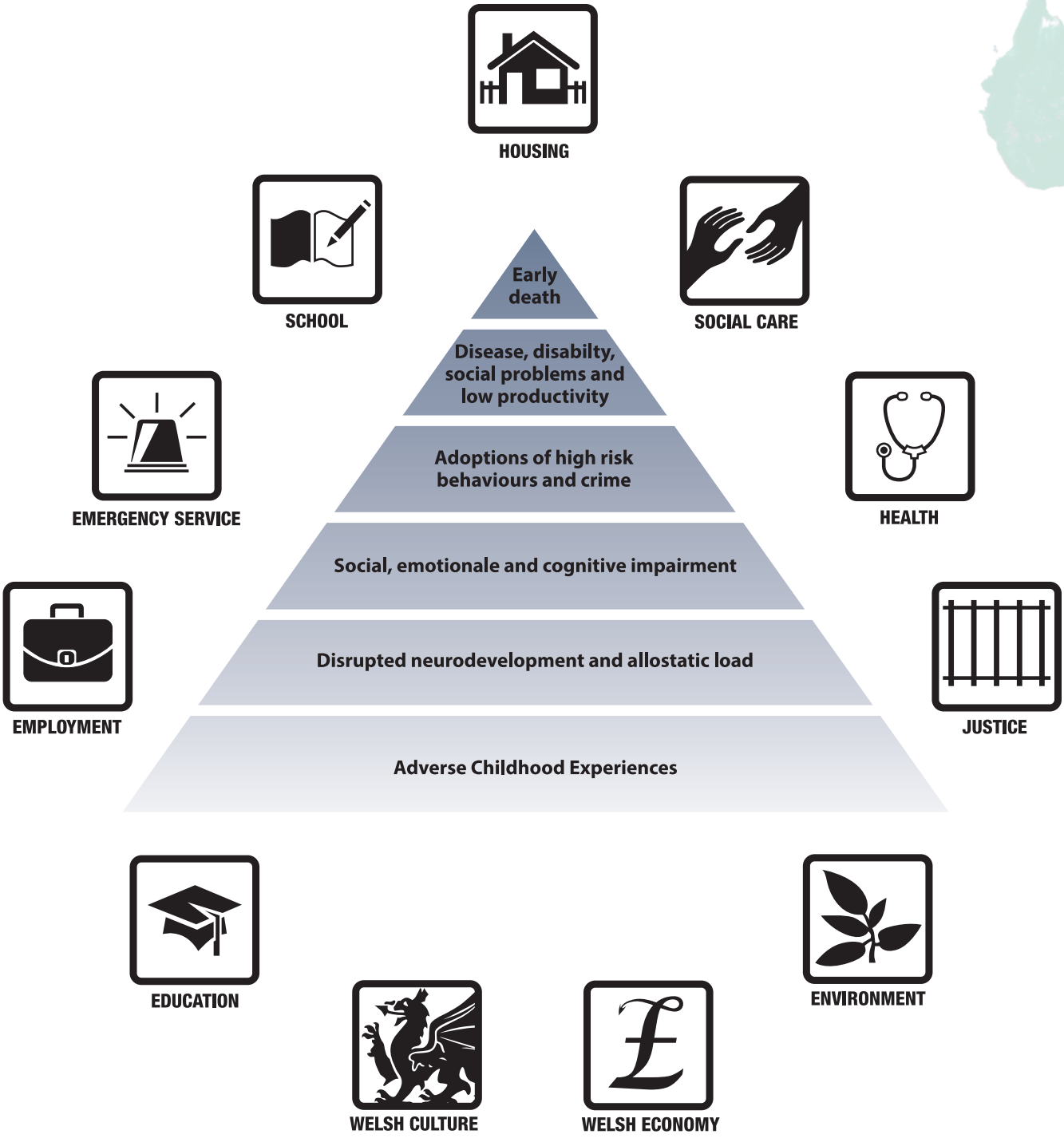


Figure 7: Model of ACE impacts across the life course by Bellis et al., (2015) with additional icons of where related costs to sectors and aspects of society fall.

3.4 Youth offending

The cost of youth crime to the Welsh economy can be estimated at around £628 million per year[14] (Ministry of Justice, 2010; 2014). The cost of incarceration is high and is estimated in Wales to be around £29.8 million per year. This is the number of children living in Wales and also held in custody in Wales (144) multiplied by the cost of a typical custodial stay (£3,983 per week) multiplied by 52.

There is a large body of evidence indicating that the main factors predicting youth offending can be found in the early years leading to criminal and other anti-social behaviour in the teenage years (Graham, 2006). There is now good evidence of risk and protective factors related to crime and also the impact of specific interventions that can be funded for the early years that will have a beneficial effect on subsequent criminal behaviour (Sherman et al., 1997, Welsh, 2003)

There is a recognition that society needs to tackle the risk factors that predispose children and adolescents to criminality. Furthermore, there seems to be some correlation between youth offending and coming from a disadvantaged and vulnerable background. A report by the Prison Reform Trust claims that in England and Wales a third of adolescent males in custody and over 60% of adolescent females come from a care background (Prison Reform Trust, 2014).

Preventing youth offending can have an effect on a young person's lifetime trajectory. They are less likely to go to prison as an adult and more likely to contribute positively to the Welsh economy. The Howard League for Penal Reform (2009) on a report about youth justice in Wales concluded that

> "when you consider the problem of youth crime, as policy makers, there are two levers that you can pull and push. One is on the social welfare side, which is the most important because, most children who commit crimes, particularly those who commit such serious crimes that they end up in custody, are very likely to be children in need. The other lever is the criminal justice system, which has a role to play in some cases but which is a blunt tool. It cannot tackle the underlying causes of crime, which develop from social problems that afflict these young people's childhoods with chaos, neglect and abuse. Despite the limited effectiveness of the criminal justice system as a lever to tackle youth crime, it seems somewhat perverse that the Assembly has access to the social welfare lever but not the criminal justice lever. If the

[14]Figures pro-rated to represent Welsh population as 5% of UK population.

Key messages:

The high cost of over £600 million to the Welsh economy of not intervening to prevent youth crime in Wales.

There are links between aggression, hyperactivity, concentration problems, impulsivity in early childhood and later risk taking and subsequent violent behaviour in adolescence.

Family characteristics such as poor parenting skills, family size, home discord, child maltreatment, and antisocial parents are risk factors linked to youth offending

Assembly had control of both levers then it would have the ability to move finances between the two accordingly. Money currently spent on ineffective prisons could be transferred to bolster prevention and social welfare strategies" (p. 17).

Tremblay and LeMarquand (2001) remarked that "the best social behavior characteristic to predict delinquent behavior before age 13 appears to be aggression" (p. 141). In addition, Hawkins and colleagues (1998) reviewed several studies and reported "a positive relationship between hyperactivity, concentration or attention problems, impulsivity and risk taking and later violent behavior" (p. 113). Low verbal IQ and delayed language development have both been linked to delinquency; these links remain after controlling for race and class (Moffitt et al., 1994; Seguin et al., 1995).

Family characteristics such as poor parenting skills, family size, home discord, child maltreatment, and antisocial parents are risk factors linked to youth offending (Wasserman & Seracini, 2001). Peer pressure, peer approval of anti-social behaviour and attachment to groups displaying anti-social behaviour are all predictors of delinquent behaviour.

Existing research points to a powerful connection between residing in an adverse environment and participating in criminal acts (McCord et al., 2001). Sociological theories of nonconformity to social rules hypothesize that "disorganized neighborhoods have weak social control networks; that weak social control, resulting from isolation among residents and high residential turnover, allows criminal activity to go unmonitored" (Herrenkohl et al., 2001, p. 221). Although researchers debate the interaction between environmental and personal factors, most agree that "living in a neighborhood where there are high levels of poverty and crime increases the risk of involvement in serious crime for all children growing up there" (McCord et al., 2001, p. 89).

The cost of youth offending

While the focus of this report is on investing in children in their Early Years, we report here the costs of not intervening and summarise some of the high costs of youth offending in Wakes.

In 2009 the total number of Welsh children held in custody was 161 (Howard league for penal reform, 2009). 144 of these children were placed in Wales, the others in England. Of the children placed in Wales, 109 were from South Wales and 35 from North Wales. This was at a cost of over £17million (2007/08). Of this total figure £2.9m was given to the Youth Justice Board, £1.6m to the police, £1.4m to the probation service, £8.9m to social services, £0.7m on

education, £0.8m on health and £1.4m on local authority (Howard league for penal reform, 2009).

One of the main problems in youth offending is substance misuse. A report by Bradly and Bolas (2013) mentions that the National Treatment Agency claims that,

> "Regular substance misuse can cause significant problems for young people. Young people can react in different ways to the effects of drug and alcohol misuse. In extreme cases, they may develop serious medical problems or emotional disorders. Their attendance at school and college may suffer, along with relationships with friends and family members" (p. 4-5).

According to the National Crime Survey around 18.9% of young adults (16-19 years old) had reported taking illicit drugs in 2012/13 (Home Office, 2014). If we assume the percentage to be similar in Wales this equates to around 28,796 young people in Wales (Welsh Government, 2015c & d). Bradly and Bolas (2013) conducted a SROI and found that the cost of substance misuse treatment in terms of the average cost of a drug treatment and testing order per person is £11,727. We see, therefore, that if we assume that 25% of young people that took drugs got treatment then this would cost approximately £85 million, some of which could be saved if there was investment in early intervention to prevent substance abuse.

Another major component of youth offending is gun and knife crime. A study by Christensen et al. (2008) made the point that, "measures designed to reduce the incidence and severity of penetrating trauma may result in significant hospital cost savings" (p. 1013-1014). They estimate that stabbing, for example, costs the NHS £7,196 per victim – while, "at an average cost of £7699 per penetrating injury from alleged assault and a total of 417 injuries per year requiring hospitalisation for at least 3 days …, the total acute care cost of this type of injury alone may exceed £3.2 million annually" (p. 2023).

Bradly and Bolas (2013) continue, in their report, to show wider economic benefits of reducing substance use among young people. Substance abuse can have a long-term effect on young people's outcomes and life chances. They estimate that the lifetime costs of young adults becoming NEET (Not in Education, Employment or Training) due to substance misuse are between £92,000 and £356,000 per person. Costs which could be averted by early intervention to educate about the negative effects of substance use.

Preventing youth offending potentially affects young people's lifetime trajectory. They are less likely to go to prison and more likely to contribute positively to the Welsh economy.

Targeted and universal interventions for the reduction of youth crime

Suspension and expulsion from school do not appear to reduce undesirable behaviour, and both are linked to increased delinquent behaviour (Shader, 2001).

Evidence from Dartington SRU (2013 b & c) points towards two interventions that aim to prevent youth crime. These are the 'Good Behaviour Game' (also discussed in the primary school section of this report), which is an universal classroom intervention aimed at children aged 6-8. It seeks to reduce aggressive behaviour in order to prevent problem behaviours in middle childhood through to early adulthood. This intervention has an expected benefit-cost ratio of 26.90:1 and also has a risk of loss of 2% - that is the risk of the intervention not being successful. This intervention is also in the process of being evaluated by the Educational Endowment Foundation (EEF) in a cluster RCT (EEF, 2014). Results from this study will be available in 2017. The other intervention is a targeted one called 'Behavioural Monitoring and Reinforcement Programme' and is aimed at children aged 12-14 years who are at high risk of school failure by means of at least two of the following criteria: low academic motivation, family problems, and frequent or serious discipline referrals. This intervention has an expected benefit-cost ratio of 1.56:1 and a risk of loss of 42%. These are considered to be blueprint approved programmes and meet a set of rigorous evaluation standards.

4. Investing in education and skills

4.1 Early years childcare and access to pre-school

High quality childcare offers families the opportunity to achieve a work and childcare balance and helps children to become school ready, gaining social skills and early literacy and numeracy skills.

> "Recent studies suggest that one critical form of education, early childhood development, or ECD, is grossly under-funded. However, if properly funded and managed, investment in ECD yields an extraordinary return, far exceeding the return on most investments, private or public…. In the future any proposed economic development list should have early childhood development at the top" (Rolnick & Grunewald, 2003, p.7)

Underpinning this potential economic return from early childhood development interventions, such as pre-school education, is the work of neuroscientists who have found that the brain develops at an astounding rate in Early Years. If synapses in the brain are not fully utilised then they are often pruned back and so brain development is not as full as it could be. It is important for a child to have adequate stimulation in order to help these synapses develop and interventions aimed at making this happen can have a very beneficial effect (Allen, 2011a).

A good pre-school experience can lead to better job prospects and higher earning potential in later life (Barros & Mendonca, 1999; Goodman & Sianesi, 2005). High quality pre-school experience can protect children from the effects of a low effective primary school i.e. a school where children make less developmental gains than predicted (Melhuish, 2003; Sylva et al., 2004).

Access to pre-school is important for educational development and overcoming adversity. Young children who come from homes where there are multiple economic and social stressors often "enter preschool with higher rates of emotional difficulties related to fear and anxiety, disruptive behaviors, impairments in executive function and self-regulation, and a range of difficulties categorized as behavior problems, learning disabilities, attention deficit hyperactivity disorder (ADHD), or mental health problems" (Shonkoff, 2011, p.982).

> "If early childhood policy and practice focused more explicit attention on buffering young children from the neurodevelopmental consequences of toxic stress, then scientists, practitioners, and policy-makers could work together to design and test creative new interventions

Key messages:

A good pre-school experience can lead to better job prospects and higher income levels in later life.

Children from low socio-economic backgrounds can succeed against the odds if they receive high quality pre-school education.

Follow up studies from US suggest that targeted investment in pre-school programmes produces a ROI later in life for adults aged 40 of up to $16 for every $1 invested in pre-school.

Almost all local authorities in Wales (93 per cent) are deemed to have inadequate nursery provision for children with disabilities.

that combine both cognitive-linguistic stimulation with protective interactions that mitigate the harmful effects of significant adversity, beginning as early as possible and continuing throughout preschool. For this two-pronged approach to succeed, new strategies will be needed to strengthen the capacities of parents and providers of early care and education (beyond the provision of additional information and supports) to help young children cope with stress (Shonkoff, 2011, p.982-983)."

There is evidence to support that good quality pre-school provision can help protect children from the effects of growing up in disadvantaged families and promote educational attainment (Sylva et al., 2004). Pre-schools or nurseries can take the form of nursery classes attached to primary schools, nurseries run as private businesses, volunteer-run playgroups and maintained nursery schools (those run by the state).

Early years education in Wales is provided part-time for those aged 3-4 in nurseries and full-time aged 4-5 in primary school reception classes. Statutory duty lies with local authorities to provide nursery education from the age of three onwards and at least 10 hours a week for 38 weeks is provided by the state. The actual number of hours varies between local authorities. The cost to local authorities in Wales is £11.32 per hour for deprived children enrolled in Flying Start Initiatives (National Assembly for Wales, 2014).

Supporting children with disabilities to access education and gain skills

- Only 7% of local authorities in Wales in 2015 say they have adequate nursery provision for children with disabilities compared with 21% in England in 2015 (Rutter, 2015).
- All eligible disabled children aged two, three and four have a right to 15 hours of free childcare a week. However 41% of parent carers said that they did not access the full 15 hours (Buckland & Glass, 2014).
- Parent carers of disabled children are reported to pay up to £20 per hour for childcare compared to the national average of £3.50 -£4.50 per hour for non-disabled children (Honstvet, 2013).
- Nurseries may have a special educational needs co-ordinator (SENCO) that help disabled children to gain skills through taking part in the activities of the nursery.

Learning through multi media

Sesame Street is a long running educational television programme for children which is shown in 150+ countries around the world. It uses 'muppets' in order to provide, in an entertaining way, literacy and numeracy for young children and prepare them to be school ready. The basic template of the US show is adapted to reflect the local culture and language of different countries. In the US the cost of producing the show is between $16-$17 million dollars for 26 episodes (Wickman, 2016). This equates at just under a million dollars a show and a cost of $5 per child (Kearney & Levine, 2015). There have been numerous academic studies looking at the effect Sesame Street has had on educational attainment, particularly literacy and numeracy and school readiness in early years (Fisch et al., 2001; Mares & Pan, 2013; Kearney & Levine, 2015), producing comparable outcomes to other effective programmes such as Head Start but delivered at a fraction of the cost (Kearney & Levine, 2015).

In Wales, S4C runs a children's entertainment 'platform' known as 'Cyw', which includes television shows, a website and an app. It is not as directly educational as Sesame Street but nonetheless it has elements that help young children become school ready e.g. basic numbers and the alphabet. There have been no attempts to measure the benefits of Cyw to young children growing up in Wales. The programme encourages learning through the medium of Welsh.

PISA scores show children in Wales aged 15 are ranked 39th out of 64 participating countries in Maths, 32nd in Literacy and 26th in Science (Welsh Government, 2013).

Across OECD countries, children who attended 1 year or more of pre-school scored 30 more PISA points than those who did not, by age 15, equating the benefits of 1 additional years schooling (OECD 2011).

Economic benefits to the healthcare sector of investing in Early Years childcare

Many health habits are formed at an early age. The Welsh Government's Healthy and Sustainable Pre School Scheme (Welsh Government, 2011) is aimed at all pre-school provision in Wales and emphasises the importance of nutrition amongst other factors that are related to childhood obesity.

Twenty-nine per cent of all reception age children living in the most deprived areas in Wales are overweight or obese compared with 21% in the more affluent areas in Wales (Public Health Wales 2015a, strategic plan,).

Evidence shows that dietary intake in childhood is a weak but clinically significant predictor of dietary intake in adulthood (Wood & Harper, 2008). Interventions aimed at getting children to eat more healthily have the possibility of altering the life course to prevent adult obesity.

An example of an internationally recognised evidence based programme is the Food Dudes programme developed by

Bangor University, to encourage children to eat more fruit and vegetables both in school and at home. In the case of pre-school there were promising results for increasing children's motivation for trying and liking new fruit and vegetables (Horne et al., 2011). High childhood BMI has been associated with increased risks of cancer and cancer mortality in adulthood (De Pergola & Silvestris, 2013), which has significant cost implications for the NHS and society.

Wider economic benefits

Heckman, a Nobel prize winning Chicago economist, provides evidence that investment in pre-school produces an ROI of between $7-$10 for every $1 invested (Heckman, 2012), through reducing the achievement gap between disadvantaged children and their more affluent peers; improving health (reducing incidence of cardiac and metabolic disease in later life with associated savings to healthcare and social care); increasing lifetime earnings by up to 25%. The above savings are achieved through better outcomes in health, education, sociability, economic productivity and reduced crime (Gertler et al., 2014).

Investment in Early Years could be viewed as wider investment in the Welsh economy leading to more jobs in the Early Years industry. The early care and education industry is important as an economic driver in Wales. According to the Children's Nurseries UK Market Report (Laing Buisson, 2014) the value of day-care nurseries in the UK was £4.9 billion in 2013/14. Pro-rating to Wales on the basis of population gives an estimate of around £280 million.

Examples of evidence of programmes and practice

Internationally, the most influential published evidence comes from the US - High/Scope Perry pre-school study and the Chicago Child Parent Center Program (CPC). The Perry school project was a US government initiative to provide high quality pre-schooling in Michigan in the 1960s. Many studies have taken place since then attempting to evaluate the programmes' effect on individuals. One such study by Schweinhart et al. (2005) followed a cohort of 123 African American children from age 3 to 40 in order to find out what effects good pre-school education would have on the later life outcomes of this cohort. They found that the economic return per child over their lifetime was $244,812 compared with an investment of $15,166 – a return on investment of $16.14 per dollar spent. From that lifetime return $195,621 went to the general public while each participant benefited by $49,190. Of the public return, 88%

came from crime savings, 4% came from education savings, 7% came from increased taxes due to higher earnings, and 1% came from welfare savings. The participants of the programme earned 14% more than their non-preschool counterparts while male participants cost 41% less in crime costs per person over their lifetimes. These findings deserve attention as they are used extensively to justify investment in Early Years in the US.

The Chicago Child-Parent Center Program (CPC) followed 100,000 children (of whom 93% were African American) over a thirty-year period. The findings were that the programme was linked to 29% higher high-school completion, 42% lower arrests for violent crime, 41% reduction in special education and a 51% reduction in child abuse and neglect. In a study Reynolds, Temple, Robertson & Mann (2002) calculated that the CPC programme cost $6,730 per child to run per 1.5 years but that it produced benefits to society of $47,759 per child in savings from subsequent reductions in costs to society for poor educational and criminal outcomes - a return on investment of $7.10 for every dollar spent.

The above example may not be generalizable across the whole of the US and caution is needed in transferring these findings to other international settings, primarily because of lower underlying crime rates than were the case in Michigan and Chicago. However, internationally, this evidence sends a strong message both of the potential returns on investment in Early Years, and on the importance of long-term cohort studies, particularly in public health and prevention. There has been only one attempt at an economic evaluation of pre-school in the UK and this was an evaluation of Early Excellence Centres (EEC) by Pascal et al. (2001). They found that the integrated childcare centres, designed to serve disadvantaged communities generated a ROI of approximately £10 for every £1 invested. These savings are based on an anecdotal approach of what the parents thought would have happened if they had not received early intervention rather than from An RCT(Pascal et al., 2001). In the UK an intervention which provides nursery staff with effective child behaviour management strategies has shown both significant improvements for child behaviour in the nursery and also the nursery staff's self-reported stress and sense of competence (Bywater et al., 2011b).

4.2 Primary school

Primary school has an important role in shaping the skills development that children go through which can have a lasting impact on later outcomes in life such as social and economic success. High quality early education has the potential to reduce the effects of socio-economic disadvantage and help children on a trajectory to achieve their full potential as an adult.

It is important that children have the emotional, social and physical maturity to integrate into school by the time they reach compulsory school age following their fifth birthday. While there is no agreed upon definition of what it means to be school ready, having a desire to learn and a basic ability to cope independently of their parents or guardians including basic life skills such as being able to go to the toilet, hold a pen and having the ability to follow simple classroom instructions are important (Ofsted, 2014).

School ready skills include:

Possessing these basic skills on entry to school may help children to engage appropriately in school and the associated developmental processes during this time. School readiness is commonly measured by test scores on entry to Year 1 in key skills areas of communication and mathematics.

The importance of play based learning in early education

Play is essential to development because it contributes to the cognitive, physical, social, and emotional well-being of children and youth. The current Welsh primary school's Foundation Phase Framework for Children's Learning for 3 to 7-year-olds in Wales fosters learning through play until the age of 7 (Welsh Government, 2015b).

Primary schools in Wales are going through comprehensive changes in the curriculum by putting into place the recommendations of Professor Graham Donaldson (2015). Rather than taking a subject based approach primary schools from 2018, will be implementing a 'theme' based approach whereby education is covered by general themes such as creative arts, science and mathematics, personal development, languages and culture.

Key messages:

There are 68,388 children receiving free-school meals in Wales.

Establishing healthy eating practices early in life, such as a healthy breakfast, can yield real educational attainment benefits.

The resources that a family has, including access to effective primary school education and the opportunities that then follow, have a significant impact over children's life trajectories.

Bilingualism has beneficial cognitive effects for young children.

The life trajectory of a child starting primary school from a disadvantaged background is very different to that of a child from a middle class environment. Sociologist Karl Alexander from the John Hopkins University studied 790 Baltimore school children for 25 years and found that the family they were born into largely determined their life trajectory. He says in his book 'The Long Shadow: Family Background, Disadvantaged Urban Youth, and the Transition to Adulthood' (Alexander et al., 2014),

> "A family's resources and the doors they open cast a long shadow over children's life trajectories" and "This view is at odds with the popular ethos that we are makers of our own fortune" (Rosen, 2014).

This study found that children who lived in more cohesive neighbourhoods, had stronger families, and attended better schools tended to maintain a higher economic status later in life. Those from disadvantaged backgrounds tended to have worse outcomes in later life.

Speech, language and bilingualism

The acquisition of speech, language and communication skills acts as a mediator for educational and behavioural outcomes and ultimately life chances (All Party Parliamentary Group on Speech and Language Difficulties, 2013). Vocabulary difficulties at age 5 are significantly associated with poor literacy, mental health and employment outcomes at age 34 (Law et al., 2000).

For children in the UK there are known areas of unmet needs in terms of parenting and speech and language therapy, for example, in Manchester 40% of children require additional support for speech and communication problems (Greater Manchester Combined Authority, 2013). Of concern is that 6% of children in the UK age 5 have speech, language and communication needs which may not be currently fully met (Law et al., 2000). This is an area for considerable return on investment with every £1 spent on enhanced speech and language therapy resulting in £6.43 in return generated through increased lifetime earnings (Strelitz et al., 2013).

Bilingualism has beneficial cognitive effects across the life course (Marian & Shook, 2012; Pearl & Lambert, 1962) with benefits beginning in early infancy, well before the onset of speech (Kovács & Mehler, 2009. The bilingual brain has more task-switching abilities and a longer attention span than the monolingual brain (Marian & Shook, 2012). This is because the bilingual brain can inhibit one language while using another. The Welsh language is one of the things that makes Wales unique from the rest of the UK and supports the development of skills for life through growing up bilingual. The number of Welsh speakers in Wales according to the 2011 census was 562,000. For babies born in Wales

today, there are potential educational and developmental benefits of continuing to promote the Welsh language.

Codi'r Tô

Codi'r Tô is a music based intervention pilot, set up in two schools in deprived areas in North Wales, namely Ysgol Glancegin, Maesgeirchen, Bangor and Ysgol Maesincla, Caernarfon. It is probably the only minority language (Welsh) focused El Sistema project in the world. El Sistema was created originally in Venezuela and focused on giving young children from disadvantaged backgrounds a better start in life through music. Its adaptation in Wales has proved to be very successful in improving educational, behavioural and social outcomes in children. Research by CHEME (Owen et al., 2015) has found the Codi'r Tô project to generate a return on investment to the societal stakeholders of £1.76 for each £1 spent on the project.

Modern Languages

Research by the team behind the popular book 'Freakonomics' (Saiz & Zoido, 2005) has established that the rate of return for investment in acquiring a modern language is around 2% of lifetime income. This means that, due to compound interest, a graduate starting at a salary of $45,000 in the US would expect to be $67,000 better off in retirement than would be the case if they hadn't learnt a new language. Wales, however, is performing poorly in teaching modern foreign languages. A new scheme 'Global Futures' is to be put into practice from September 2015 backed by £480,000 of Welsh Government funding. Its aim is to improve levels of take up and teaching of modern foreign languages in schools in Wales·

Local food for local schools across Wales

The school catering industry is worth £1.2 billion per year in the UK. Every pound spent on serving Food for Life standard school meals creates £6 worth of local economic, social and environmental benefits. By buying directly from local suppliers and planning menus well, schools can often save money on ingredients and still invest more in the local economy.

Local procurement can be part of the primary school curriculum, good food education (including cooking and growing) gives young people the skills and knowledge they need to take responsibility for their own diet and the health of their future families.

The Food for Life Partnership – with its goal that at least 50 per cent of school-meal ingredients should be locally sourced – is helping to channel more of this money into the local economy and to local food producers. Over 200,000 meals are now served daily to Food for Life Catering Mark standards. In Wales we need to view schools as productive industries, both in the short term, boosting local economies, and in the long term building social capital.

Although outside the age range of early years in Wales, a recent study by the DECIPHer team at Cardiff University found a direct link between a healthy breakfast for children aged 9-11 and higher educational outcomes. They found significant associations between all dietary behaviours and better performance in SATs. They found no evidence that improving breakfast consumption would reduce inequality in educational outcomes (Littlecott et al., 2015). Another study found that there was a need for population level interventions aimed at parents to remove the barriers to making healthy choices for their children (Khanom et al., 2015)

Examples of evidence of programmes and practice

The Good Behaviour Game is a prime example of an intervention aimed at primary school age children. The Social Research Unit (2013b) estimate a benefit-cost ratio of £26.90 for every £1 spent. The Good Behaviour Game is a universal classroom intervention for children aged 6-8 and seeks to reduce aggressive behaviour in order to prevent problem behaviours in middle childhood through early adulthood. Another such intervention is the Group Multimodal Therapy (MMT) for Children with ADHD estimated by Dartington SRU to have a benefit-cost ratio of £1.96 for every £1 spent (Social Research Unit, 2013d). This is an intervention targeting several areas including behaviour, emotion, sensation, imagery, cognition and biology. It consists of medication management and group based behavioural therapy.

As the number of evidenced based pre-school and school based programmes increases, there is an argument for building their principles into pre-school and teacher training. There is an argument for resources to be made available for pre-school and school teachers accredited with evidence based Early Years programmes, as part of their career development. Further, the Incredible Years child and teacher programmes have been taken to scale in Wales based on demonstration of effectiveness (Hutchings, 2012). The programmes are aimed at reducing challenging behaviour and promote peer relationships and school engagement.

5. Investing in a child's environment and wider community

5.1 Housing for families with young children

There exists a complex relationship between poor housing and health. Poor housing is associated with increased risk of cardiovascular disease, respiratory diseases and depression and anxiety (Parliamentary Office of Science and Technology, 2011)

Poor housing conditions increase the likelihood of disability and ill health by up to 25% during childhood and early adulthood (Shelter, 2006). There is a link between poor housing and lower educational attainment leading to a higher likelihood of unemployment and poverty in adulthood (Shelter, 2006). Children in overcrowded housing are 10 times more likely to contract meningitis leading potentially to deafness, blindness and behavioural problems (Shelter, 2006). Overcrowding can lead to respiratory problems such as coughing and asthma, which can contribute to losing sleep and missing school (Shelter, 2006). Almost half of all childhood accidents are associated with physical conditions in the home (Shelter, 2006). Children who move home and more importantly move school may experience some negative outcomes, for example, they are less likely to achieve required levels at Key stage 1 (Hutchings et al., 2013), however some other possible negative outcomes may be avoided, for example, the uptake of routine immunisations does not appear to be adversely affected as a result of frequently moving house (Hutchings et al., 2016).

The Welsh Housing Quality Standard (WHQS) has been published by the Welsh Government and its aim is to improve 72,492 homes to meet the standard by 2020 (Statistics for Wales, 2014). This means that homes owned by councils will be transferred to a registered social landlord and improvements made to these homes to ensure they are 'of good quality'

In 2004 there were 235,000 social homes in Wales with only 0.8% meeting the WHQS. This had risen to 67% by March 2014 (Statistics for Wales, 2014) signifying the substantial progress in improving the stock of social homes in Wales.

Economic benefits to the healthcare sector of investing in housing

Improving housing will save the NHS money. The NHS in Wales could make significant savings by investing in improving poor housing by alleviating excess cold, dampness, lead content, noise and electrical problems.

The NHS in Wales could save £120 million a year[15] in treatment costs were all homes improved up to current building regulation standards.

[15]The latest findings at a UK level, based on estimates by Nicol et al., (2015), pro-rated for Wales.

Key messages:

Poor housing conditions increase the likelihood of disability and ill health by up to 25% during childhood and early adulthood.

The NHS in Wales could save £120million a year in treatment costs for children and adults were we to improve all remaining homes up to current building regulation standards.

Poor housing costs an additional £100million per year through poorer educational attainment and life chances.

Children who live in more cohesive neighbourhoods, had stronger families, and attended better schools tended to maintain a higher economic status later in life.

Wider economic benefits of investing in housing

Poor quality housing can have a negative impact on educational performance, due to factors such as lack of privacy and study space. The quality of schools tends to be lower in disadvantaged areas where poor housing may be a real problem (Chartered Institute of Environmental Health, 2013). In their report 'The Cost of Poor Housing in Wales' Davidson et al. (2011) state that:

> "In addition to the direct costs to the NHS, poor housing also results in broader economic consequences for society in Wales – including poorer educational attainment and life chances – which can be estimated at a further £100m per annum" (p. 1).

Investment in poor housing could help in the longer term with wider economic benefits, in terms of improved educational outcomes leading to higher wages and standards of living, if housing were improved in disadvantaged areas. In addition, energy efficiency and retrofitting as proposed by the Institute for Welsh Affairs (IWA) could create 9000 new jobs in Wales, improve energy efficiency and improve health (IWA, 2015).

Examples of evidence of programmes and practice

Poor housing is mostly nested within wider deprivation and this makes any before and after studies difficult. The CHARISMA Study, undertaken in Wrexham, North Wales, was a pragmatic RCT (n=177) of housing modifications for families of children with moderate and severe asthma. The economic analysis conducted by CHEME reported that heating and ventilation modifications led to a marginal 14% shift of children from severe to moderate asthma for a total programme cost of £151,152 to Wrexham Borough Council (Woodfine et al., 2011; Edwards et al., 2011).

In terms of financial returns on investment, the BRE in the UK have developed a housing health cost calculator (https://www.housinghealthcosts.org/) which allows researchers to calculate the savings made from mitigating or significantly reducing hazards in homes. It uses the information available about the geographical area of interest and calculates a HHSRS score. Health cost data can then be provided for any, or all, hazards mitigated for a 12-month period. This resource is aimed at use by local authorities and many LAs have used this methodology to carry out retrospective health-cost benefit analyses of hazards mitigated by their intervention including Bristol, Liverpool, Derby and Plymouth. In Wales the LAs in Dyfed (Carmarthen, Cardigan and Pembroke LAs) have used this approach and have found a cost saving to the NHS of around £99,000 per annum to these three local authorities.

5.2 Accidents in childhood

Injury constitutes a major cause of death and disability for children in Wales. There are many types of accident that may occur such as road accidents and accidents at home or in preschool/school such as bath water scalds, hot drink scalds and burns. According to the Home and Leisure Accident Surveillance System in 2002 (the latest figures available) there were around 13,000 accidents in 0-4 year olds and a further 10,000 in 5-14 year olds in the UK.

Accidental injuries are a feature of inequalities. The incidence of bone fractures presenting at A&E were higher in children from disadvantaged backgrounds when the reason was assault. The incidence of factures in affluent areas was higher for sporting related fractures (Lyons et al, 1999). Children from poorer backgrounds are five times more likely to die as a result of an accident than children from better off families (ROSPA, No Date). Children from deprived backgrounds are three times more likely to be admitted to hospital than those from more affluent homes (White et al., 2000).

Economic benefits to the healthcare sector of investing in Early Years accident prevention

The overall cost of road accidents among children was £796 million in 2011, of which £446 million is for serious injuries Child Accident Prevention Trust (2012). This can be broken down further into £32 million for medical and ambulance costs, £53 million in lost output and £361 million in human costs. Pro-rated to Wales, the cost of road accidents among children would be £39.4 million. Human costs are based on people's 'willingness to pay' to avoid pain, suffering and grief.

The cost of treating burns and scalds varies widely depending on the severity of the injury. The average cost of treating a burn that covers less than 10% of the body is £1,850 rising to £63,157 for a major burn that covers 30-40% of the body. Based on the average cost of long-term treatment, the 400 children under 5 admitted to hospital per year with bath water scalds generated lifetime medical costs of around £6.6 million in the UK (Phillips et at., 2011b). Pro-rating to Wales yields an estimate of £317,349 per year.

Wider economic benefits

A child can have impacts from a serious injury that will last them the rest of their lives. Accidents can affect physical and cognitive abilities, as well as psychological wellbeing. Children who had sustained certain head injuries were significantly less likely to achieve a satisfactory KS1 result than children who had not been injured (Gabbe et al., 2014). Wider economic benefits of accident prevention include the

amount paid in disability welfare payments over the life of a child that has suffered disability as the result of an accident. This, coupled with loss of earnings over the child's lifetime, can prove to be a substantial cost that could be avoided through accident prevention interventions.

Examples of evidence of programmes and practice

A report by the Royal Society for the Prevention of Accidents (ROSPA), in conjunction with Public Health England estimate an ROI of £29 per £1 spent for bicycle helmet wearing in children and adults and £69 per £1 spent for use of smoke alarms (ROSPA 2011). In the UK, Phillips et al. (2011b) 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.

Much of the published ROI evidence for children is from the United States. The Centers for Disease Control and Prevention (2012) in the US conducted a study on the potential return on investment of a range of accident preventing interventions, the results of which are shown in the table below:

Table 4: Return on investment of accident preventing interventions in the US

Every dollar spent on	Saves society
Childproof cigarette lighters	$72
Child booster seats	$71
Bicycle helmets	$48
Child safety seats	$42
Smoke alarms	$17
Prevention counselling by paediatricians	$9

Source: CDCP (2012)

Children in Wales (2013) has published a report on various interventions aimed at reducing the prevalence of accidents in Wales. Interventions range from scald prevention to home safety schemes and for each intervention an upfront and ongoing cost is reported but no return on investment is available. This is because the report does not aim to measure the benefits of each intervention and so no attempts have been made to compare benefits with costs.

5.3 Community spaces, parks and playgrounds

Under the UN Convention on the Rights of the Child, children have the right to play, recreation and culture. Play is crucial for many aspects of children's development, from the acquisition of social skills, experimentation and the confrontation and resolution of emotional crises, to moral understanding, cognitive skills such as language and comprehension, and of course physical skills.

Local councils wanting to invest in Early Years would benefit from a true valuations of the financial, economic, environmental and social value of playgrounds and public places which already exist in Wales (CABE, 2009). Play is important in child development and health, and the design and building of playgrounds serves as important interventions to change the environment in which children can thrive. Playgrounds can provide a range of opportunities for child development through their ability to offer an environment that promotes play and learning through play. They provide an environment that holds a certain element of acceptable risk and in doing so promote learning. They also provide an environment where children might play that may be less risky than other places, e.g. roads.

Physical inactivity has poor health consequences (Han et al., 2010) and currently costs the Welsh NHS over £786million[16] per year (Welsh Assembly Government, 2009). In Wales, the proportion of children (under 16) that are overweight is at 35%, with 19% considered obese (National Assembly for Wales, 2013). Obesity as a risk factor will overtake smoking as the leading cause of premature death in 10-15 years if current trends persist (Hennekens & Andriotti, 2013). The link between obesity and certain types of cancer has also been assessed (Polednak, 2008). Physical inactivity in adults and children has poor health consequences (Han et al., 2010).

Economic benefits to the healthcare sector of investing in community spaces

From a health economics perspective, studies that have tried to estimate lifetime costs and benefits of increasing access to playgrounds and public spaces for children have generated modest benefits (Matrix, 2010; Telama et al., 2005). These were very expensive adventure playgrounds. Playgrounds and public spaces provide wider benefits to the value of property, and can be an important part of promoting community health assets.

Wider economic benefits

The Commission for Architecture and the Built Environment (CABE) has raised concerns that local councils value parks

[16]Figures inflated to 2014/15.

Key messages:

Physical inactivity in adults and children in Wales is estimated to cost the NHS £786 million per year.

Playgrounds and public spaces should be appropriately valued as health and well-being creating assets and a means of tackling social exclusion.

Obesity is high in children in Wales and is set to overtake smoking as the main cause of premature death in the UK.

A complex range of individual, family, social and environmental factors influence participation in physical activity by children and young people.

A recent study on playgrounds found that they provided a return on investment of £1.32 for every £1 spent.

and playgrounds at a nominal £1 for their assets listing. They argue that the true financial, economic, environmental and social value can reach millions of pounds (CABE, 2009). The protection of these public spaces in Wales, and decisions about whether to build more, needs to reflect their true value as health assets.

Access to an adventure playground increased the likelihood of attaining 5 GCSE's A*-C by 3% and an increase in adult earnings of £4,096 per child (Matrix, 2010). There is some evidence to suggest that playgrounds can reduce youth crime and especially vandalism. Significant reductions in crime and vandalism followed the installation of play facilities and a youth shelter in the Thames Valley (Hampshire and Wilkinson, 2002). No attempt was made, however, to calculate the cost savings associated with reduced crime.

Play provision provides an important context in which children can counter the effects of poverty and deprivation. Where the home environment is poor or there is a restricted range of stimuli, play services and spaces offer variety and even comfort. Good play provision offers a welcoming space where children can meet on a more equal basis. For this reason, play provision can be the starting point for tackling social exclusion, engaging with marginalized families and communities and working to build their capacity to improve their social, environmental and economic circumstances (Hill-Tout et al., 1991).

"Good play experiences also support the development of autonomous adults, with a strong sense of personal identity, who are effective in society as parents, workers, informed consumers, active citizens, and in a range of other roles" (National Playing Fields Association, 2000, p.14)

Examples of evidence of programmes and practice

A study by Matrix (2010) on a hypothetical adventure playground found that over a lifetime, a playground yielded modest QALY gains and a cost per QALY under the NICE threshold of £20,000 and a return on investment of £1.32 for every £1 spent for the health sector excluding any other health benefits.

Investing in play in times of natural disaster

In 2005, when Hurricane Katrina devastated the Gulf states in the US a community member called Ginny Reynolds had the idea of building a playground in her small home town of Bay St. Louis, Mississippi (Epakto, 2015). She started collecting funds and soon contacted a Washington based company KaBOOM that specialised in building playgrounds. At first they thought it might not be the best idea and thought the area needed more in the way of food, shelter and basic supplies. However, Reynolds persevered and was able to find 600 volunteers to build a playground in her home town. This gave a rise to Operation Playground and to date nearly 200 play spaces in 44 cities across the Gulf States have been built. The feeling of community that arose from people getting together to build something for the community is something that cannot be underestimated as is the idea that something positive can come of such adversity.

5.4 Asset based community development

There are some examples of economic evaluations of asset-based interventions on a whole community level. *Altogether Better* in England is an organisation which aims to build understanding and capacity to empower communities to take ownership of their healthcare needs and improve their health and wellbeing. It is a good example of the asset-based approach in that it funds interventions aimed at improving diet and nutrition, increase physical activity and improve mental health all through community based activities. An SROI analysis by York Health Economics Consortium (2011) evaluated 15 projects run by Altogether Better and found SROI ratios of between 0.79:1 and 112.42:1.

A study by Goodwin (2011) looked at an initiative called Healthwise, which was also funded by *Altogether Better*, and is aimed at providing training to increase people's awareness and knowledge on health issues thus acting as 'Health Champions' in their community. They calculated a SROI of £3.55 for every pound spent on the project.

In a report by the New Economics Foundation (2011) the authors conducted a SROI analysis of community development work based on a common outcomes framework. They showed that investment in community development work today can save expenditure in palliative care in the future. The saving was £2.16 for each pound invested, with a range of £1.30 to £3.80.

The London School of Economics (Knapp et al., 2012) carried out a study on the economics of community capacity building and found that three interventions, time banking, community navigators and befriending all provided a net economic benefit. Time banking, for example, showed a net economic benefit of £667 per year, rising to £1312 per year if improvements in quality of life were accounted for.

The Children's Inclusion Partnership is based in Glasgow. This partnership uses a community development approach in order to enable parents and children to think about what is going on in their communities and to have a voice as to how to bring about positive change (Children's Inclusion Partnership, 2013). Although there are some examples of SROI calculated on a whole community level there is little evidence about what works specifically for children and even less on their SROI.

Key messages:

The current fifth wave of public health focuses on health assets which are internal and external resources that individuals in a community have that can protect against poor health.

There are some examples of SROI calculated on a whole community level; however there is little evidence about what works specifically for children, especially in terms of their SROI.

6. Potential economic benefits from investment in Early Years

6.1 Some Lessons from Greater Manchester

Greater Manchester are bringing services together in a way that might work for Wales. Based on the experience in Manchester, below we set out some questions for us to think about in Wales and consider what potential returns might look like for Wales. Early Years

Greater Manchester has a population of 2.8 million, a little less than the population of Wales. This is an urban population and ethnically diverse which makes it different to the population of Wales in many ways, but there are lessons to be learnt from the clear cross-sectoral commitment to public health and prevention. The recent health and care devolution in Greater Manchester will focus on preventative and targeted services to help the population of Manchester to stay healthy, able to work and have a better family life. The unique move for Greater Manchester places more emphasis on prevention and early intervention to stop people becoming ill – so that they can remain independent and have the best family, work and lifestyle opportunities. An important part of this cross-sectoral systems approach to improving public health is a focus on Early Years.

In one of five major programmes of work Greater Manchester recognises that there are significant consequences of a poor start in life, limiting children's lifetime potential. This also has consequences for the area's future skills base and economic activity with rates as high as 40% of the area's children not being school-ready.

Manchester have estimated that 25% of children do not receive the targeted services that they require in Early Years. Providing these services to an additional 10,000 children per year they estimate will generate substantial savings over a 25-year horizon to multiple agencies including Her Majesty's Revenue and Customs (HMRC), the Department for Work and Pensions (DWP), National Health Service (NHS), Police and Probation, Criminal Justice System (CJS), Local Authorities (LA), Department for Education (DfE), and Registered Social Landlords (RSL).

Of these 10,000 children requiring additional services, 4,000 are estimated to need parenting, behaviour or mental health interventions, a further 4,000 requiring speech, language and communication support and 2,000 children born to teenage mothers and may benefit from interventions such as the Family Nurse Partnership.

Their proposed new delivery model of Early Years services (outlined in box below) is estimated to require £38 million p.a. above the existing Early Years budgets to implement and yield benefits of around £215 million over a 25-year period (£145 million at net present value). This equates to a

Key messages:

The total spend on children's services under the age of eleven across Welsh Government, UK Government, Local Authorities and the NHS was estimated to be £3.65 billion in 2014/15.

Wales could receive comparable returns through investment in Early Years to those predicted by Greater Manchester's New Delivery Model and the best UK transport schemes.

benefit cost ratio of 4:1, with every £1 invested a total of £4 return can be expected.

They estimate that of these benefits expected over the 25 years that over a third will fall to the DWP (AME) (approximately £74 million). Local Authorities will see the next greatest share of the total return with 24.4% (approximately £ 52 million) and then the NHS can expect 22.8% of the share of benefits (equating to around £47 million). The remainder of the benefits over the 25 years will be spread across the Police, Probation Services and other Criminal Justice Services (Public Health England, 2015).

Greater Manchester Early Years New Delivery Model (NDM)

The NDM consists of:

1. A shared outcomes framework, across all local partners;
2. A common assessment pathway across GM: eight common assessment points for an integrated ('whole child' and 'whole family') assessment at key points in the crucial developmental window, using expanded existing assessment points, and with the remaining HCP visits to continue as standard;
3. Evidence-based assessment tools to identify families reaching clinically diagnosable thresholds for intervention or having multiple risk factors as early as possible;
4. Needs assessment triggers referral into an appropriate evidence-based targeted intervention;
5. A suite of evidence-based interventions is being developed, to be sequenced as a package of transformational support to families, with appropriate step-down packages of support rather than 'free fall', to help off-set the risk of re-entry to a high level of need in future. Areas will be able to 'top up' the suite of interventions with additional services according to local circumstances;
6. Ensuring better use of day-care: new 'contract' with parents eligible for Targeted Twos day-care to drive engagement in education/ employment/ training/ volunteering, and introducing new common terms and conditions to drive improvement in all day-care settings;
7. A new workforce approach, to drive a shift in culture: enabling frontline professionals to work in a more integrated way in support of the 'whole family' and with other services to collectively reduce dependency and empower parents;
8. Better data systems to ensure the lead professional undertaking each assessment has access to the relevant data to see the whole picture, to reduce duplication and confusion, to track children's progress and in particular support the most vulnerable and disadvantaged;
9. Long-term evaluation to ensure families' needs are being addressed and add to national evidence for effective early intervention.

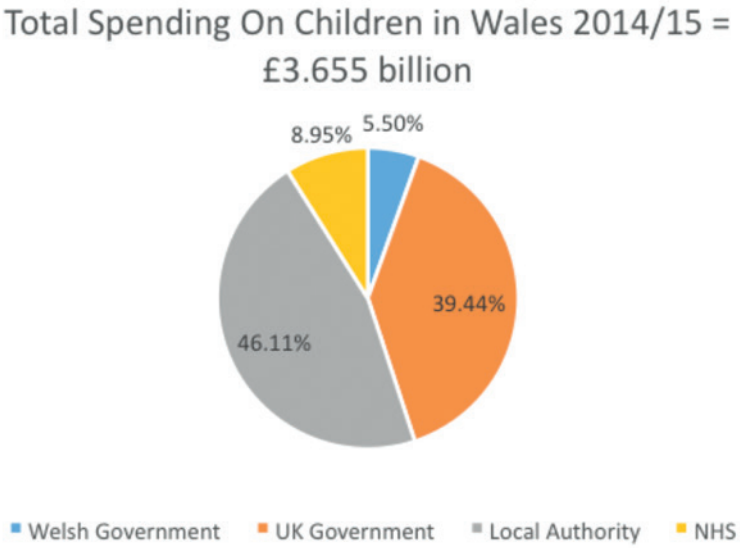
If Wales were to adopt a similar approach to that of greater Manchester, the following questions would be important to answer:

1. What is currently being spent on Early Years across Wales – we have compiled an initial programme budget to support this report (available from the authors on request).
2. How many families and young children are not currently receiving adequate Early Years support across Wales?
3. How many children are not school ready across Wales?
4. Where are the hotspots for where the greatest number of children are known not to be school ready, indicating an unmet need for targeted interventions?
5. Is there an opportunity for some disinvestment / reinvestment to allow spending in evidence based targeted and universal programmes?
6. What would a New Systems Based Delivery Model look like across Wales, taking into account the need for both urban and rural service delivery?
7. What would be the requirement for any additional investment to facilitate this new delivery model across Wales?

6.2 Who currently pays for children's service in Wales?

A preliminary program budget was carried out alongside this report in order to inform current spending on children's services in Wales (Johnson & Edwards 2016). Children under eleven[17] are considered because it is not possible to gather financial data for our definition of Early Years exclusively.

Figure 8: Public spending on children's services in Wales 2014.



Source: Johnson & Edwards (2016)

[17]Based on mid-year population estimates from Welsh Government (2015e).

The total spend on children's services under the age of eleven across Welsh Government, UK Government, Local Authorities and the NHS was £3.655billion in 2014/15. The largest proportion of spending on children's services in Wales is made by local authorities. The Welsh public sector spending on children's service was £2.213billion in 2014/15 representing approximately 14.5% of the overall public sector budget for 2014/15 of £15.3 billion (Welsh Government, 2016b). This preliminary programme budget may however be an underestimation of spending on children's services in Wales as spend in the third sector and investment in child protection by police, fire, and public health was not included.

6.3 What returns could we expect from additional spending on Early Years in Wales?

There is every reason to expect that Wales could receive comparable returns through investment in Early Years to those predicted by Greater Manchester's New Delivery Model and the best UK transport schemes. Evidence from the US suggests a return of 10% annually from investment in 0-3 years through evidence based targeted and universal programs (Heckman, 2012). In order to get the 10% internal rate of return as suggested by Heckman (2012) we would expect to invest in Early Years interventions that had a high BCR of over 3:1. This can be seen as a highly cost effective use of money and emulates some of the best transport projects in the public sector in terms of value for money (Department for Transport, 2013).

7. Discussion

Health economics highlights the fact that decisions about resource use involve choices that are ultimately trade-offs in the use of public sector resources, trade-offs between different groups in society and trade-offs between different stages in the life course.

The overall justification for investing in children has been made clear in recent policy documents (Field, 2010), however the economic arguments for investment have not been brought together and so thoroughly explored (Feinstein, 2015). This report fills a gap bringing together international evidence relevant to Wales on the likely return on investment (ROI) and cost-effectiveness of programmes and practice to support the Early Years of children living in Wales. There exists an opportunity to transform the lives of children and young people living across Wales, helping children flourish to become healthier adults and able parents for the next generation, producing both short-term and longer term economic benefits to the Welsh economy. It is important to invest in this generation so that spend more of their life expectancy healthy and that they are physically and economically able to support the ageing population. Welsh Government has recognised the issue of intergenerational sustainability in the Well-Being of Future Generations (Wales) Act (2015a). Investing in Early Years starts with pre-conception, promoting good health habits through pregnancy and ensuring healthy birth weights, supporting breast feeding and making it easy and accepted in public, and allowing working families to make the best use of maternity and paternity leave in a flexible way. Our thinking is far more about system change, investing in practice and programmes that synergistically enhance the chances of babies born today in Wales.

Central to discussions about investing in Early Years is the wider context of the Welsh economy and direct relationship between poverty, health and life chances, levels of which vary widely across Wales. There are multiple economic arguments explored throughout the course of this report particularly that investment in Early Years offers a means for government to generate simultaneously social and economic returns, and reduce lifetime inequalities (Marmot et al., 2010).

Inequalities are increasing in Wales with the least deprived expected to have nearly 19 more years of healthy life compared with the most deprived. Investing in Early Years may be a way of reducing disparities in a wide range of socioeconomic indicators in later life across the social gradient; this underpins the equity-based argument (Suhrcke & Kenkel, 2015). Ultimately the economic case is based around breaking an intergenerational cycle of poverty, economic inactivity and poor health, and an acknowledgement that the first few months and years of a child's life will have a large impact on their life chances, health and wellbeing, educational attainment and income ability.

Investment that focuses on the critical window of the first few years of life is likely to provide the most efficient use of public resources, yielding returns over and above other forms of financial investment and investment at other points of the life course; this underpins the efficiency argument for investment in Early Years (Suhrcke & Kenkel, 2015).

In order to maximise returns there is a need for rigorous evaluation of the implementation, effectiveness and cost-effectiveness or ROI of a multi-sector systems approach to investment in Early Years going forward. Wales has recognised the need to use a common set of indicators for monitoring the impact of investment over time and establish whether the collective action goes some way to address the current inequalities and disadvantage that children face (Welsh Government, 2016c). The ability to distinguish a successful from an unsuccessful research-based program requires specialized knowledge; we are well placed in Wales with international experts in Welsh Higher Education institutes that can lead on these evaluations to help determine where there are opportunities to use taxpayer funds in the best possible way.

Although it is well recognised that public health initiatives can have a lasting effect across the life course, political horizons and current economic recession mean that our focus should be on achieving measurable immediate and intermediate benefits within 2-5 years, which evidence tells us will yield sustained benefits for decades to come. Measurement and valuation, of these immediate outcomes may help generate an evidence base to put public health on an equivalent basis with clinical medicine; in terms of gaining a share of public sector resources, acknowledging that there may be additional significant medium and long term benefits from prevention more generally and these require an appropriate choice of discount rates e.g. 3.5% HM Treasury (2015) and 1.5% NICE (NICE, 2012). A cross-government programme budgeting and marginal analysis (PBMA) initiative is recommended to promote a systems approach to investment in Early Years over the next five years (Edwards et al., 2014). There is an economic argument for government to take a portfolio approach investing in a number of interventions, some expected to yield early returns, others with longer term yields. To some extent this spreads risk, as the benefit cost ratios generated by SRU for England and Wales are predictions. There is an economic argument for disinvestment in programmes without a strong evidence base and re-investment in programmes, both universal and targeted, with a strong evidence base of effectiveness and cost-effectiveness. Wales has the higher education research expertise to lead on the evaluation of any large-scale investment in Early Years. Currently, many schemes implemented by local government and schools are not evidence based. Together with the need for monitoring outcome, is the need to record the degree of fidelity with

which programmes that Wales decide to invest in are actually delivered. What is unlikely to work is, in the interest of keeping costs down, delivering watered down versions of evidence based programmes in an attempt to bring their key principles into current practice. There is a need to ensure the adequate resourcing of the delivery, monitoring and on-going evaluation of these programmes in Wales as a core part of investment in Early Years.

Specifically, there is a need for more research that builds on previous rigorous RCTs of Early Years interventions undertaken in Wales, ensuring a strong evidence base with economic evidence collected as a core component. In this way Wales will further add to the international evidence base. Once we know the cost of interventions, to identify the necessary effect size across a whole population that would deem an intervention to be cost effective at a population level. There is a need for more dismantling research that identifies what the core components of evidence based programmes are, how they can be delivered on a large scale but still keep fidelity. Building in a transparent measure of evaluating the success of programme implementation is crucial. Further implementation science **[see glossary]** and translational research into why evidence based programmes sometimes fail when delivered in practice and how success can be ensured at a reasonable cost (Hutchings & Williams, 2014). There is an increased need to reviewing the systems at play within Wales Early Years services research and understand the direction and magnitude of flows of resources and accrued benefits across Westminster, local and national governments and other agencies.

Estimates of the return on investment for specific evidence based programmes may be useful for initial appraisal at the investment stage, but the context must be looked at i.e. other on-going programmes need to be taken into account. Going forward we argue the emphasis should be on fidelity and implementation, monitoring and evaluation at a systems level to see if expected financial and social returns are achieved. ROI tools are gaining significant attention in England particularly through Public Health England and the NICE centre for Public Health Excellence to enable local commissioners to explore the potential ROI from investing in alternative prevention strategies. This has largely come about due to the Public Health functions being moved from the NHS into local government and due to the 'quasi-market' commissioning framework in England across the NHS and local government. Of note is that the existing ROI tools on the NICE website for example on smoking and exercise promotion, these however do not include an option to model ROI for Wales specifically. Wales must be data ready to make use locally of the ROI tools on specific topics relating to prevention programmes, being developed by NICE and Public Health England.

Looking at the pathway of children living in Wales, from pre-conception to seven years old (our definition of Early Years), there are existing universal and targeted services once needs are identified but we are not good at intervening to prevent problems. Currently Welsh Health Boards have an important role to play in the pre-conception to age 2 stages of children's lives. However, services are commonly reactive rather than preventative. There is a need for good universal services that have the capacity to step in to avert the impact of adverse childhood experiences before children start on a trajectory that will affect them throughout their lives. Alongside a philosophy of universal service provision there is a growing consensus that it would be more effective and there would be a greater ROI to step in in a preventative capacity to support high risk families with targeted programmes in this critical period of child development. This approach is consistent with proportionate universalism. There is an economic argument for changing the whole orientation of the public sector in Wales to a preventative model – this can only be done with a focus on Early Years. Public sector bodies, including NHS Health Boards and Local Authorities, would take advantage of adopting a preventive culture taking a systems approach that shares information, particularly about at-risk families. Children at risk who do not get what they need to thrive from their home environment are potentially set most to benefit now and throughout their later lives. On the ground, there is a movement in Wales to work towards a whole familiy approach to dealing with troubled families, with a systems approach or multidisciplinary model ensuring families access the specific services they need, in the right order, at the right time. Increasing uptake and reducing barriers to access to evidence based programmes is key. This systems approach has the potential to generate not only social benefits but economic benefits from more tailored, streamlined and joined up services. Evaluation of the success of a systems approach is necessary, and it is essential that monitoring of costs and benefits at a cross agency level is streamlined.

Integral to the case for investing in prevention, there is an economic argument for investing in the health assets of communities, specifically the resources that can help protect against poor health and reduce costs of treatment through the life course. Going forward Wales as a devolved nation has a unique opportunity to protect and enhance investment in Early Years. Preliminary modelling estimates suggest that Wales could receive comparable returns through investment in Early Years to those predicted by Greater Manchester's New Delivery Model and the best transport schemes. Investment in Early Years in Wales can contribute to the building of social capital and promote economic growth and should be considered in the same way as European or National investment in wider economic development.

Glossary

Adverse childhood experiences (or ACEs): traumatic events in the life of a child that can lead to bad health outcomes later on in life. They range from all forms of abuse and neglect and also include household dysfunction such as drug abuse and incarceration in the family.

Allocative Efficiency: This is the idea that economies can allocate resources efficiently. It refers to the state of affairs where the allocation of resources is such that any re-allocation would make at least one person worse off.

Benefit-Cost Ratio (BCR): This compares total costs and total benefits directly. It is the ratio of total benefits to total costs. A BCR of 8.1:1 means that for every £1 spent a return of £8.10 will be generated. This however *does* include the original £1 invested. The net effect would be £7.10 – the same as the ROI.

Child poverty: the proportion of children living in households receiving income less than 60% of the median.

Discount Rate: The discount rate is a way of dealing with the fact that we need to discount future costs and benefits to reflect their present value. In the public sector it is preferred to use a mandated discount rate of 3.5% however it can be argued that a 1.5% discount rates for health benefits is more appropriate for public health programmes.

Early Years: We are defining Early Years as being from pre-conception to seven years old.

Fidelity: This refers to how faithful the running of the intervention, when it is rolled out, is to the original design of the intervention.

Implementation Science: Implementation science or translational research looks at the methods behind transferring research findings into practical real-world situations. It formalises the study of how interventions are 'rolled-out' once they are proven to be effective and cost effective on a small or pilot level.

Internal Rate of Return (IRR) on Investment: This is the rate of return that occurs when costs are equal to benefits, that is when net present value (NPV) is zero. That is, if a certain amount is invested, what is the rate of return needed for this investment to break even. For example, assume a one-year project with an initial investment of £10,000 that yields a return of £15,000. To bring the NPV for this project to zero, the annual IRR must be 50%.

Multi-agency (or multi-sector): This perspective on economic analysis includes the NHS, Social Care, the voluntary sector, judicial system and local authorities.

Net Present Value: The difference between the present value of cash inflows (benefits) with the present value of cash outflows (costs).

PBMA: Programme Budgeting and Marginal Analysis seeks to identify current levels of investment in services and then aims to find out what would happen if one were to disinvest from some services and re-invest in others.

Pro-rate: In this report we often pro-rate figures from the UK or England so they are relevant for Wales. This is done on the basis of population only and no account is taken of the level of need unless otherwise stated.

Public Health (or Population Health): In this report we use the term public health although we fully acknowledge in wider terms that we are talking about population health. Population health has been defined as "the health outcomes of a group of individuals, including the distribution of such outcomes within the group"(Kindig & Stoddart, 2003, p. 380).

Public Health Intervention: This is a programme that is aimed at improving a public health problem. For example, a smoking cessation programme will aim to reduce the prevalence of smoking in a given population.

Quality Adjusted Life Year (QALY): This is defined as a year of life adjusted for its quality of life. Patients may gain added years of life from a treatment or intervention. This time is adjusted by the quality of life during that period.

Randomised Control Trial (RCT): Randomised Control Trial is the most robust method to test whether an intervention or a drug can be considered effective and cost effective. From a sample population some individuals (usually half) are randomly assigned to a treatment group, where they receive the intervention/drug and the others are then randomly assigned to a control group where they are given treatment as usual or a placebo. Their results are then compared in order to ascertain whether or not the treatment was effective in that population group.

Return on Investment (ROI): This is the net economic return for each pound invested in a Public Health Intervention. It is expressed as either a percentage or it can be stated that each £1 invested will generate e.g. £7.10 in economic returns. The £7.10 does *not* include the original £1 invested.

Social Return on Investment (SROI): This metric considers the triple bottom line of social, economic and environmental returns. It is calculated as the present value of benefits in financial terms divided by the total inputs into the project.

Targeted Interventions (or Targeted Programmes): These are interventions aimed specifically at certain segments of the population. Interventions are targeted at sub-groups of the population according to certain characteristics, for example lone parents.

Technical Efficiency: This is the relationship between inputs and health outcomes. The idea is to get the maximum level of outcomes given the level of inputs.

Universal Interventions (or Universal Programmes): These are intervention aimed at the whole population.

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List of supplementary resources available from cheme@bangor.ac.uk

- Report technical appendix
- Johnson & Edwards (2016). Children's services in Wales: preliminary programme budget. CHEME unpublished report.
- Lloyd-Williams et al. (nd). Modelling the impact of deprivation on potential investment. CHEME unpublished report.
- Lloyd-Williams et al. (nd). Modelling, a portfolio approach to investment in Wales. CHEME unpublished report.

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