Swansea University
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HAPPEN: THE HEALTH AND ATTAINMENT OF PUPILS IN A PRIMARY EDUCATION NETWORK

INVESTING IN HEALTH AND WELLBEING IS AN INVESTMENT IN EDUCATION

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SUMMARY

A complex relationship exists between health and education, with evidence demonstrating the importance of childhood health and wellbeing on academic outcomes. However, prioritising health and wellbeing within the school setting has been a challenge due to curriculum pressures and a lack of collaboration. To address these shortfalls, a primary school network, HAPPEN (Health and Attainment of Pupils in a Primary Education Network) was established. The overarching aim of this thesis is to develop HAPPEN, a network combining multidisciplinary expertise through a unified system of education, health and research specialists, using an action research model. This thesis examines whether HAPPEN can act as a platform to evaluate interventions in the school setting and disseminate evidence-based learning. This is presented through published research in Study 1; a qualitative analysis of curriculum-based outdoor learning and Study 2; a mixed-methods evaluation of The Daily Mile. This thesis also examines if HAPPEN can be used for observational epidemiology by identifying the factors associated with educational attainment. Study 3 presents the association between social, lifestyle and epidemiological factors with attainment at age 10-11 using linked health, educational and survey data. The final chapter presents a critical reflection of the development, scalability and sustainability of HAPPEN. Following an annual process of observation, reflection, planning and implementation, HAPPEN has expanded to a national primary school network and knowledge exchange infrastructure for schools and health professionals in Wales. The research through HAPPEN has demonstrated local, national and international impact and demonstrates the important contribution this thesis provides to the understanding of health and education. In conclusion, HAPPEN fills an important gap in the provision of a synergistic health and education tool for primary schools.

DECLARATIONS AND STATEMENTS

This work has not previously been accepted in substance for any degree and is not being

concurrently submitted in candidature for any degree.

Signed: [redacted] (candidate)

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STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Where correction services have been used, the extent and nature of the correction is clearly marked in a footnote(s).

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

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STATEMENT 2

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This PhD has been an incredible journey and I am excited to see what the future holds.

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LIST OF ABBREVIATIONS

20m SRT	20 metre multi-stage shuttle run test
A	Achieved
AHK	Active Healthy Kids
AYP	Active Young People
ALF	Anonymised Linking Field
ADHD	Attention Deficit Hyperactivity Disorder
ASD	Autism Spectrum Disorder
BMI	Body Mass Index
CRF	Cardiorespiratory Fitness
CSC	Central South Consortium
CAMHS	Child and Adolescent Mental Health Services
CHAT	Child Health and Activity Tool
COMPASS	Cohort Study on Obesity, Marijuana-use, Physical activity, Alcohol-use, Smoking and Sedentary Behaviour
COREQ	Consolidated Criteria for Reporting Qualitative Studies
CPD	Continuing Professional Development
CSI	Core Subject Indicator
DNA	Did Not Achieve
EAS	Education Achievement Service
ERW	Education through Regional Working
EAL	English as an Additional Language
ENHPS	European Network of Health Promoting Schools

HAPPEN	Health and Attainment of Pupils in a Primary Education Network
FFD	Fitness Fun Day
FSM	Free School Meals
GDPR	General Data Protection Regulation
HBSC	Health Behaviour of School-aged Children
HPS	Health Promoting Schools
IGRP	Information Governance Review Panel
IQ	Intelligence Quotient
KS2	Key Stage Two
LSOA	Lower-layer Super Output Area
MMR	Measles, Mumps and Rubella
MCS	Millennium Cohort Study
MVPA	Moderate to Vigorous Physical Activity
MICE	Multivariate Imputation by Chained Equation
NCPHWR	National Centre for Population Health and Wellbeing Research
NHS	National Health Service
NQA	National Quality Award
NEET	Not in Employment, Education or Training
OR	Odds Ratio
ONS	Office for National Statistics
PA	Physical Activity
PISA	Programme for International Student Assessment
QOF	Quality and Outcomes Framework

R&I	Research and Innovation
SHAPES	School Health Action Planning and Evaluation System
SHP	School Health Profile
SHRN	School Health Research Network
SHE	Schools for Health in Europe
SCQF	Scottish Credit and Qualifications Framework
SAIL	Secure Anonymised Information Linkage
SES	Socio-economic Status
SEN	Special Educational Need
TDM	The Daily Mile
UK	United Kingdom
UNCRC	United Nations Convention on the Rights of the Child
WIMD	Welsh Index of Multiple Deprivation
WHO	World Health Organisation

Chapter 1 Introduction and Background

The following chapter will provide a background to the concept of health promotion within the school setting. This will firstly be outlined through the historical context of health promotion in schools, beginning with the introduction of the Ottawa Charter (1986) by the World Health Organisation (WHO). The publication of the Ottawa Charter generated a shift in the public health sector's thinking from individual health behaviour change to the influence of the social and environmental structures on the health of the population. This socio-ecological perspective of health promotion will be discussed in relation to the 'healthy settings' movement developed by the WHO, in recognition of the importance of 'settings' on the health of the people who operate within them. One of the most prominent settings recognised within the healthy settings movement is that of schools. Schools provide access to a large population of children from a range of socio-economic backgrounds and thus are targeted as a key setting in health promotion.

With the importance of the school setting on the health of its pupils identified, discussions on the Health Promoting Schools (HPS) framework will follow. This integrated approach to improving school health has received global widespread uptake. In response, a number of regional and global networks were developed in order to strengthen the capacity of schools to become a HPS. These include the Schools for Health in Europe (SHE) network (formerly the European Network of Health Promoting Schools) in 1992 and the Global School Health Initiative in 1995. However, the depth and complexity of the HPS framework generates challenges in its evaluation. Findings from these evaluations will be discussed in addition to research into its implementation which has identified a range of barriers and facilitators. Furthermore, the wider challenges of school-based health promotion and programme implementation will be considered. In order to overcome the challenges that will be discussed, the public health and education sectors have advocated for collaboration and knowledge exchange.

With this said, the integration of research within school health networks provides great potential in creating evidence-based change to school health

promotion and practice. Established school health research networks will be outlined next including the COMPASS (Cohort Study on Obesity, Marijuana-use, Physical activity, Alcohol-use, Smoking and Sedentary Behaviour) longitudinal study in Canada. However to date, platforms incorporating research into school health promotion have targeted the adolescent period. Despite this being a critical period to target, the current public health agenda calls for prevention to be at the forefront. Therefore, the final component of this chapter will demonstrate that focussing efforts on the primary school years provides great potential in improving both the short- and long-term health, wellbeing and education outcomes of children. Finally, this chapter will conclude with a set of recommendations that emerge from the discussions thus far and support the case for the focus of this PhD thesis; the Health and Attainment of Pupils in a Primary Education Network (HAPPEN). HAPPEN provides a solution to address these barriers identified within evaluations of the HPS framework and other current examples of the integration of research into networks.

1.1 Healthy Settings – A History

The concept of schools playing a role in the health promotion of their pupils has gained significant momentum throughout the last three decades. This movement has largely been driven by the development of the 'healthy settings' approach to health promotion in the 1980s by the WHO. During this period, the first international conference on health promotion was held in Ottawa, Canada in 1986, whereby the Ottawa Charter was published[1]. Within the Ottawa Charter, health promotion is recognised as;

> *"The process of enabling people to increase control over and improve their health. Health is seen as a resource for everyday life, not the objective of living. Health promotion is not just the responsibility of the health sector, but goes beyond healthy lifestyles to wellbeing"*[1]*(p.1)*

The WHO state that the Ottawa Charter was developed in "response to growing expectations for a new public health movement around the world"[2]. Within the Charter, education was recognised as one of nine fundamental conditions and

resources for health, and stated that improving health required a secure foundation in these prerequisites. Furthermore, 'supportive environments' was identified as one of five key action areas, demonstrating the link between health and the wider environment. The Ottawa Charter encouraged health promotion through multi-sectoral collaboration to achieve the goal of "Health for All" by 2000 and beyond. To this day, it remains a global milestone in health promotion and is the foundation of a number of frameworks that have changed the way health promotion is valued, advocated for and delivered in the school setting.

Historically, school health was viewed from a health education perspective of promoting individual behaviour change through the development of skills and attitudes to healthy lifestyles[3]. This was grounded in theories based on individual behavioural intentions and their links to attitudes such as the Health Belief Model[4] and the Theory of Reasoned Action[5]. This was traditionally delivered throughout the 1970s and 1980s as a teacher-led activity presenting information about health risk behaviours with the aim of influencing behaviour by developing pupils' knowledge. This focus on healthy lifestyles was constructed through the foundations of preventing the development of health risk behaviours that are commonly adopted during the school years. These include smoking, alcohol consumption and skin protection. However, decades of research evaluating the effectiveness of this focus on individual behaviour change has produced little evidence demonstrating significant reductions in health risk behaviours[3]. For example, the behavioural models focussing on individual behaviour change that were advocated for by the health promotion field failed to acknowledge the wider contextual influences on health[6].

Indeed, individual behaviour does not drive change alone. Behaviour is constructed and shaped by the social environments in which we operate and thus, individual behaviour is heavily influenced by the wider political and economic contexts[7]. It has been suggested that simply encouraging individual behaviour change will not be effective without supportive environments and policies that support the wider contextual influences that elicit long-term behaviour change[8]. For example as Sallis states[8], simply providing education about healthy lifestyle

choices without supportive environments such as policy will only generate weak and short-term changes in behaviour. In comparison, the provision of resources such as fruit and vegetables to encourage behaviour change does not guarantee that individuals will access these resources. Therefore, any significant long-term changes in health behaviour requires individual, environmental and policy-level efforts. Following the recognition of the link between individual's health and the environment within the Ottawa Charter, the healthy settings approach shifted focus from individual behaviours to the importance of setting-wide influences on health for the population.

The foundation of the settings approach to health promotion positions itself from the socio-ecological perspective of health promotion, whereby individuals are viewed within the wider social units that construct their lives. This socio-ecological model of health promotion focusses attention to the social and environmental factors and assumes that influencing the social environment, translates into changing individual-level behaviours[9]. It recognises that individuals are embedded within their wider social systems and environments across multiple, interactive levels[8]. The theme of supportive environments within the Ottawa Charter supported the basis of a socio-ecological approach to health, in which the complex relationship between individuals and their environment influences health outcomes.

Within the Ottawa Charter, it was acknowledged that "Health is created and lived by people within the settings of their everyday life; where they learn, work, play and love". This settings-based approach to health promotion encompassed the notion of societal wide influences on health and enlisted a whole system approach, drawing on the idea that networks and resources for improving health are dependent on their setting. The conceptual basis of a *setting* is recognised by the WHO as "the place or social context in which people engage in daily activities in which environmental, organisational, and personal factors interact to affect health and wellbeing" (p.4)[10]. Furthermore, a setting has physical boundaries, a range of people with defined roles and an organisational structure. Types of healthy settings include homes, hospitals, communities and workplaces. However, the concept of schools as a setting for health promotion gained significant momentum from a global

standpoint, and has been recognised as the second most widespread settings-based approach to improving health[11].

The healthy settings approach utilises the school setting as a place for the curriculum to be delivered and supported through health promotion, and embodied by the overall ethos through the school's physical and social environment and school structure. Within the Ottawa Charter, health education is recognised as one of many approaches to improve the health of children. Furthermore, the Charter called for a holistic view of health behaviour that incorporated a more comprehensive approach to school health through the recognition of the wider environmental influences at both a school and community level. This holistic, whole-school approach to school health supported the WHO's shift from individual behaviour change to organisation and policy change from the socio-ecological perspective and in line with the principles of the Ottawa Charter. The WHO state that school health programmes that coordinate the delivery of both health and education services whilst promoting a healthy environment could be one of the most significant global mechanisms in improving the wellbeing of the population[12]. A school health programme (also referred to as school-based programme, school-based intervention) is recognised as a "strategic means to prevent important health risks among children and adolescents to engage the education sector in efforts to change the behaviours that impact health"[13]. These phrases will be used interchangeably throughout this thesis.

The basis for schools as a key setting for health promotion models itself on a number of factors. Firstly, a school's existing structures and systems through which the curriculum is delivered allows for the integration of new knowledge and learning[14]. Childhood is a period of significant formative development in which health behaviours and attitudes are established. In particular, the primary school years prior to adolescence are a strong influential period in a child's life. Evidence has demonstrated that health behaviours such as nutrition choices and physical activity can be tracked from childhood into adulthood[15,16]. Furthermore, children spend the majority of their waking hours in the school setting and are therefore viewed as a captive audience. Schools also provide access to large populations from a range of socio-economic backgrounds and are an important setting in targeting universal

school-based programmes. Finally, the benefits of school health programmes can reach families, communities and all of society[13].

To this day, the healthy settings movement and more specifically, the school setting is still recognised and promoted within the WHO's most recent policy and strategy reports. The Health 2020 policy framework has been adopted by all Member States within the WHO European region[17]. Health 2020 aims to achieve the strategic objective of improving health for all and reducing health inequalities through the health sector working with the wider sectors such as education. This commitment to the framework by Member States ensured that countries develop integrative policies that enable sectors to work together in achieving these objectives. Within this report, the WHO state that joint investment between health and education can significantly improve the health and wellbeing of the population. Investing in education is an investment in health and vice versa. Strengthening the link between the health and education sectors and creating synergy can help to create school environments than enable children to reach their educational potential and grow into healthier adults[18]. Thus, much of this can be achieved through the school setting.

For decades and since the inception of the Ottawa Charter and healthy settings approach by the WHO, schools have been viewed as a key setting to target in improving the health and wellbeing of its pupil population through health education, school-based health programmes and more complex, integrated approaches, with the most notable being the Health Promoting Schools framework.

1.2 Health Promoting Schools

The Health Promoting Schools (HPS) movement was introduced following the development of the settings-based approach to health promotion and inspired by the WHO's endorsement of the importance of education as a prerequisite for health within the Ottawa Charter. This movement was also founded on the widespread evidence of the relationship between health and education, whereby healthier children achieve higher educational attainment, and better education results in

improved outcomes throughout the life course[19]. Thus, schools are a key setting to simultaneously foster positive health behaviours and improve educational attainment and a range of long-term outcomes for children.

A HPS is recognised broadly as "one that constantly strengthens its capacity as a healthy setting for living, learning and working"[20]. This movement includes preschools, primary, secondary and other types of schools and covers pupils aged between 3 and 20 years old[21]. A HPS is not solely a school that delivers health promotion through education activities and individual behaviour change. Rather, it is a holistic approach that "implements a structured and systematic plan for the health, wellbeing and the development of social capital of all pupils and of teaching and non-teaching staff"[22]. Furthermore, a HPS embeds activities and health provisions within the curriculum, the physical and social school environment, school policy, family and the wider community, highlighting its position from a socio-ecological perspective[22].

The framework of a HPS is wide ranging but focussed on health playing a central role to school life both within and outside of the traditional school curriculum and outlines three central components; (1) a formal health curriculum, (2) the school environment and ethos, and (3) the school's links with the wider community[23]. Activities and resources that focus on these elements are typically directed by schools themselves. Historically, health promotion activities targeted at schools followed a 'top-down approach', dominated by experts with little involvement or input from schools themselves. However, the HPS framework facilitates a 'bottom-up' approach to health promotion activities in which schools take the lead in the decision-making and delivery of health promotion activities. Research has demonstrated that bottom-up approaches to school health promotion are favoured by schools and act as a facilitator in the effective implementation of school health promotion programmes[24]. The term implementation has been defined as a "specified set of activities to put into practice an activity or program of known dimensions"(p.5)[25]. Implementation generally follows a number of stages; adoption (deciding to start the intervention), implementation (delivering the intervention) and sustainability (the ability to continue the intervention after initial implementation) [25]. These phrases

will be used throughout this thesis in relation to the adoption, implementation and sustainability of school-based health interventions.

Although wide ranging, this ethos of autonomy ultimately encourages schools to embrace culture change and develop into environments that are conducive to healthy learning. These broad aims and objectives of HPS provide the basis of the concept of a *whole-school approach* in improving the physical, social and emotional wellbeing and educational outcomes of their pupils. With the growth of the HPS movement, the WHO developed regional and global networks in order to strengthen its capacity in delivering the health promoting ethos to schools. Furthermore, the HPS framework is now embedded within national health and education strategies across a number of countries worldwide[26].

1.3 Health Promoting Schools Networks

Formerly named the European Network of Health Promoting Schools (ENHPS), the SHE network was launched in 1992 and is considered one of the most influential movements in engaging the education sector with the field of health promotion. The SHE network was launched by three international agencies in Europe, the European Commission, the WHO Regional Office for Europe and the Council of Europe. This innovative collaboration between health and education set out to create school environments that not only provided children with the knowledge and skills for adult life, but also environments to learn and work that facilitated positive physical, mental and social health for the whole school population. This aim is delivered by integrating health promotion into every aspect of the formal curriculum, school environment and policy. Encouraging partnership working between the different sectors underpinned the SHE movement through local, cultural, organisation and political support. The SHE network now consists of 43 member countries from across Europe[21], with each member country appointing a national coordinator responsible for the delivery of the framework within schools. The strength of the SHE network was driven by an agreement by the ministers of health and education from each member country to the commitment to the network[27].

Following the successful development of the SHE, the WHO aimed to spread the HPS movement worldwide through the launch of the Global School Health Initiative in 1995. This initiative was intended to 'mobilise and strengthen health promotion and education activities at the local, national, regional and global levels' by using schools as a tool in improving the health of students, school staff, families and the wider community. Underpinned by the Ottawa Charter, this global initiative also aimed to increase the number of health promoting schools worldwide. Since its launch, the HPS movement has been established across all six WHO regions[27]. To date, the HPS framework has been adopted through the development of a number of networks worldwide including the Comprehensive School Health Program (Canada)[28], Whole School, Whole Child, Whole Community (United States of America)[29] and the Australian Health Promoting Schools Association[30]. However, the WHO state that the WHO European Region, represented by the SHE network exhibits the largest network and resources globally. Within the United Kingdom (UK), the HPS framework has been developed through Healthy Schools England, Healthy Schools Scotland, Health Promoting Schools Northern Ireland and the Welsh Network of Healthy Schools Scheme[31].

Within Wales, the Welsh Network of Healthy Schools Scheme was established in 1999 to encourage the wider uptake of the HPS framework. The aim was to develop a "healthy school network with local partners to promote the dissemination of good practice and develop an inclusive approach to recognising schools' progress in health promotion"(p.14)[32]. The scheme was further supported in 2001 when funding was provided for a healthy school coordinator in each of the twenty-two Local Authorities, with the role of establishing and maintaining the scheme[33]. The model in Wales involves schools working through and evidencing five phases of work in order to achieve a National Quality Award (NQA) status.

1.4 Evaluation of Health Promoting Schools Framework

Evaluation of the effectiveness of the HPS framework is challenging due to the complexity of the initiative as it encompasses a broad range of health promotion

activities targeting students, staff, community, school ethos and the wider environment. Furthermore, whilst the adaptability of the HPS framework fosters autonomy for schools and allows health promotion to be tailored to the individual contexts between schools and across the different contexts of member countries, this also generates its challenges[34]. The variations in its design and approaches produce significant challenges relating to the level of implementation and this variance in delivery of the HPS framework has been identified both between and within member countries[21]. In part, the level of adoption by schools and implementation across countries is dependent on the political climate and education policy priorities. However, the abundance of research demonstrating the important relationship between health and education favours and promotes a political standpoint that embeds the HPS framework within school policies[21]. Current research highlights that about two thirds of countries across the SHE network have embedded the HPS framework within their school policies[35].

Aside from the evaluation of the HPS framework on health and education outcomes for children, there is widespread research exploring and understanding the processes behind successful implementation of the framework [24,26,36]. Through this research, a number of factors have been identified that support the successful implementation of the HPS model. A Scottish process evaluation of HPS highlighted a number of themes associated with successful transfer of HPS principles into practice. These included ownership and empowerment by schools, particularly in relation to staff 'buy in'; leadership and management, typically the involvement by the headteacher or senior management in embedding the principles within school practice; partnership working through pupils, parents, external professionals and the health sector; and the integration of new initiatives within the school[26]. Furthermore, the WHO state that one of the most important factors for success is partnership working and collaboration between different sectors at both a local, national and international level.

However as stated previously, the complexity of the framework and the flexible delivery result in a number of challenges regarding implementation and sustainability. The WHO state that some of the biggest challenges for the HPS

framework relate to funding and resources, the long duration of time required for long-term change and the contextual differences between schools requiring a shift away from a 'one size fits all' model[37]. Furthermore, a lack of communication both between and with the health sector was identified as a barrier[38].

Beyond research into implementation and process evaluation, there are questions regarding the effectiveness of the HPS framework on the health and education outcomes of pupils. Furthermore, with the relationship between health and education documented in the literature, it is essential for such widely adopted health promotion approaches targeted at the school setting to demonstrate positive effects on health and education outcomes. Langford and colleagues' review examining the effectiveness of the HPS framework on the health, wellbeing and academic achievement of children aged 4-18 years is the largest to date[39]. This review comprises of research from 67 cluster-randomised controlled trials covering a wide range of health behaviours including physical activity, nutrition and mental health. However, the quality of evidence included in the review was deemed 'low to moderate' and few studies measured effects on academic related measures including attendance, attainment and school wellbeing, identifying a strong need for future research to include assessments of academic impact. Overall the HPS framework showed positive effects for interventions targeting Body Mass Index (BMI), physical activity, physical fitness, fruit and vegetable intake, tobacco use and bullying. However, the authors commented on a heavy reliance on self-report data, high attrition rates and a lack of long-term follow up, and could not conclude its effectiveness on improving academic achievement[39]. Furthermore, the review advocated for future research to include measures of impact on academic attainment and behaviours in combination with health outcomes.

As outlined above, evaluations of the HPS scheme have identified a number of barriers to implementing health promotion activities within the school setting. These barriers are not limited to the HPS framework but rather, to the wider constructs of health engaging with the education sector. These barriers will be further discussed below, to provide context to the rapidly evolving relationship between health and education, and to offer a solution that addresses these barriers.

1.5 Improving School Health: The Challenges

As discussed thus far, the school setting provides an important opportunity in targeting health promotion activities that improve both the health and education outcomes of its pupils. Evidence demonstrates the cyclical relationship between health and education. Healthier and happier children achieve higher educational attainment[19]. Higher educational attainment is associated with improved health outcomes throughout the life course and influences socio-economic trajectories of the population[19]. With this said, promoting the health and wellbeing of school children appears on the surface to be a win-win for schools in simultaneously improving pupil's health and education outcomes. Headteachers have also recognised the important link between child health and learning and the role of schools[40], with many schools engaged and committed to incorporating health promotion activities within their school. However, despite the wealth of evidence demonstrating this, schools are still faced with a variety of challenges when attempting to prioritise the health and wellbeing of their pupils and successfully implementing school-based programmes and health promotion. As Langford *et al.* identified, even when schools are committed to health improvement such as implementation of the HPS framework, a variety of challenges and barriers prevent effective practice and change[41]. The work of Christian *et al*.[42] will be discussed throughout this section as this research formed the foundations of the establishment of this PhD project.

Without question, the key purpose of a school is to provide its pupils with an education delivered through a positive learning experience. With this key purpose defined, schools are primarily judged and rated by education inspectorates on academic-related measures. The study by Christian *et al*.[42] demonstrated that headteachers feel that educational achievement is dictated to as their main priority. Although schools must provide a level of accountability for the education outcomes of its pupils, this is at conflict with the important role that schools can play in both child development and fostering positive health and wellbeing through curriculum activities and school-based programmes. It is therefore unsurprising that curriculum

pressure and government priorities is one of the most widely cited barriers to implementing school-based programmes and improving pupil health and wellbeing[42,43].

Research by Bonell *et al*.[44] suggested that schools feel that investing time or resources into school-based health programmes is perceived to be counterintuitive. That is, they are directing attention away from academic targets and learning time and ultimately lowering educational attainment. This is at odds with the synergistic relationship that exists between health and education and the efforts that have been made to create integrated, comprehensive approaches to merging the two fields. Furthermore, research has demonstrated that when schools face academic pressures, health education is one of the first topics to be removed from the curriculum to make way for core subjects such as mathematics and science[45]. To overcome this, better implementation of programmes may occur when they are designed as a curriculum tool that considers learning outcomes, rather than a standalone programme[40]. Schools may also be far more likely to engage with the health sector if the educational benefits to programmes are clear and can be embedded within the curriculum. Findings from Christian's study[42] concluded that prioritising pupil health and wellbeing requires a shift in judgement and measurement from education inspectorates and government, and for them to value the role that schools can play in improving public health. In Wales, the curriculum is currently undergoing a reform. The proposed new curriculum places health and wellbeing as one of six Areas of Learning and Experience comprising the new curriculum[46]. For some, this will be a welcome change that will facilitate efforts in integrating health and wellbeing within school practice. For others however, this may be viewed as a move that conflicts with a school's 'core business' of academic targets. Ultimately, this curriculum reform creates the opportunity to embed health education throughout the curriculum in Wales.

Headteachers in Christian's study[42] also advocated for more autonomy and involvement when prioritising pupil health and wellbeing, with government–led statutory programmes resulting in little ownership or input from the school. Headteacher support and buy-in has been identified as a critical factor in both

adopting[40] and successfully implementing school-based programmes. Furthermore, teacher involvement has also been highlighted as an important factor as teachers are agents of change and required to deliver and implement programmes within the curriculum. One study demonstrated that the most frequently discussed facilitator to the success of a school-based programmes was headteacher and teacher support[47].

Furthermore, generic programmes lack the potential for adaptability and flexibility, highlighted as two important factors in the successful implementation of school-based programmes and health promotion activities[48]. Headteachers have discussed the challenges in sustaining programmes and maintaining pupils' enthusiasm[42]. To overcome this, flexible approaches that can be adapted to pupils' needs, wider school values and the dynamic nature of schools have been suggested by headteachers[42]. Therefore, given the wide contextual differences between schools, it is unlikely that a 'one size fits all' design will result in long term sustainability.

Other barriers suggested by headteachers in this study were that of initiative overload. This was discussed in relation to a lack of collaboration between schools and health initiatives. These headteachers advocated for more collaboration and partnership working with the health sector. It has been emphasised that to improve population level health, collaboration is required at all levels[49]. The recommendation by schools of improved collaboration and partnership working with the health sector suggests that on the surface, comprehensive approaches to improving school-based health promotion such as the HPS frameworks may not actually be implemented as desired; with collaboration at the centre.

At a time of education budget cuts, it is unsurprising that resources and cost have also been identified as barriers by headteachers. Headteachers have commented that the cost or financial investment of an intervention limits its initial adoption and sustainability[42]. Ultimately, it is important for school-based health promotion to be low-cost and offer schools value for money if they are to be implemented long-term.

In order to overcome these barriers and assist schools in delivering the factors that they have advocated such as collaboration, autonomy and involvement, it is essential to establish effective partnerships. Taking a contextual approach to understanding and improving education and health requires multi-sectoral partnerships and interdisciplinary collaborations[50].

1.6 Knowledge Exchange: Integrating Research into School Health Networks

Thus far, this chapter has highlighted the importance of the school setting in targeting health promotion activities that influence both health and education outcomes of children. Evaluations of the HPS framework demonstrate that schools can positively influence the health of their pupils[39]. As schools provide access to large populations from a range of socio-economic backgrounds, the school setting has the potential in improving population level outcomes and reducing inequalities that are present in health and education. However, this research targeted at the school setting and exploring children's health, wellbeing and education is often conducted as a by-product of frameworks such as HPS, rather than in conjunction with school health promotion.

The gap between research and public health practice has also been identified as a challenge that needs to be addressed by both sectors[51]. Schools face continual pressures in addressing the shortfalls of their pupils' health and wellbeing through acting as a setting for the implementation of health interventions. However, less than 30% of schools implement interventions that are evidence-based, highlighting the gap between research, policy and practice[52]. Furthermore, discrepancies in study design and data collection methods of school-based health promotion activities[39] call for a coordinated response to evaluating such programmes. However, researchers have suggested that a 'knowledge gap' exists in translating the evidence of school health programmes into practice, despite the widespread agenda of HPS and a whole-school approach to improving school health[53].

Neufeld and Kettner[54] suggested that the missing link in facilitating continual improvements for health promotion in the school setting is for research evidence and the evaluation of programmes that leads to shared knowledge development. They suggest that evaluations of the mechanisms behind the effectiveness of interventions should be shared across settings (e.g. between schools) in order to provide an evidence-based knowledge platform. Furthermore, collaboration and partnership between schools, the health sector and research is mutually beneficial in improving pupil health and wellbeing and contributing to academic achievement. They suggest this could be achieved through sharing resources, collaborating with curriculum development and developing research partnerships. Furthermore, the benefits of knowledge sharing is not limited solely to that of intervention effectiveness. A report that developed indicators for schools adopting the health promoting schools framework recommended the sharing of epidemiological data both on a school and national level[55]. Ultimately, these points imply a network-based platform that would facilitate evidence-based knowledge sharing, collaborating with schools, the health sector and research, with the shared purpose of improving pupil health, wellbeing and education.

A network has been defined as an interconnected group or system focusing on a shared purpose[56]. Networks within the healthcare sector have grown considerably in recent years. The Health Foundation state that a network can be a powerful tool for information sharing and generating solutions to address complex challenges that have not been solved through traditional models[56]. In the case of school health promotion, research within Wales suggests that a network structure works within the school setting, and advocacy for schools is facilitated through a network's ability to rapidly disseminate research findings [33]. However, the most recent WHO School Health Technical Meeting, attended by over 60 global experts in Bangkok identified a number of key factors for the effective implementation of school health programmes in the future[57]. The first featured recommendation was the need to establish systems for collecting better data, monitoring, reporting, and providing evidence for implementation. This method of data capture and knowledge exchange has been a common recommendation theme at WHO School Health

Technical Meetings. In 2007, the group identified the challenge of building evidence and capturing practical experience in school health and improving the implementation processes to ensure optimal transfer of evidence into practice[58]. This recurrence suggests that not enough is being done to attempt to address these recommendations and provide schools with better data collection and knowledge exchange systems.

Providing schools with context-specific, timely and meaningful evidence regarding their implementation of health promoting activities requires a collaboration with the research sector. With headteachers advocating for more collaboration and multi-sectoral partnership working and limitations in the evidence of school-based health promotion, one possible solution is to engage with the research sector through the establishment of network systems to generate evidence, communicate information and target resources to need. In response, the integration of research, data collection and evaluation into school health networks at local, regional and national levels has been observed in several examples worldwide. Furthermore, collaboration and partnership working is at the centre of networks, cited previously as important factors to improve the health and wellbeing of pupils and integrating education within the health sector.

The first of such structures developed to address these challenges was Canada's School Health Action Planning and Evaluation System (SHAPES). Established in 2000 and funded through the Canadian Cancer Society and the National Cancer Institute of Canada, the aim of SHAPES was to contribute to Canada's capacity to link research, policy and practice at a population level through school-level data collecting and reporting [51]. The SHAPES framework was based heavily upon the recognition of the contextual influences on children's health, and more specifically, the importance of the school setting. The purpose of SHAPES was to enable a rapid and wide-spread assessment of health-related information of school pupils to provide schools and communities with 'School Health Profiles' (SHP)[59]. Furthermore, the strengths of SHAPES are that it requires no skill or training to implement, it is low-cost and it fits within school routines i.e. it can be completed in one lesson.

The development of SHAPES involved consultation with health units (Ontario, Canada) and input from an advisory group consisting of stakeholders in public health, education and research. This consultation formed the development of a survey collecting health-related information based on identified need. Initially, the survey primarily collected information on tobacco use amongst pupils to create school smoking profiles. Later, the survey incorporated questions regarding physical activity and nutrition-related behaviours**.** Thus, the final version of the SHAPES survey provided schools with overall SHP reports for their pupils. The purpose of the school-level reports was to feedback health-related information to allow students, teachers, public health staff and stakeholders to gain an understanding of the profile of their school. Furthermore, the reports allow resources to be targeted to need, and interventions to be planned and directed according to the evidence base at both the school and community level. This method of data collection at individual school level and feedback of information through localised health profile reports are an essential component of SHAPES that facilitate a preventative approach to school health through the integration of research, evaluation, policy and practice[51].

The success and widespread implementation of SHAPES across schools in Canada is partly due to continued funding through research grants, national and state governments and community public health departments. However, the current economic climate has resulted in budget cuts in both academia and education, highlighting the need to reduce costs, yet deliver sustainable, widespread research networks that provide rapid feedback to schools. Furthermore, SHAPES relies on the organisational structures provided by the University of Waterloo's Centre for Behavioural Research and Program Evaluation. The integration of national programmes for school-level research are enabled by the infrastructure provided by University research centres[59]. However, the authors suggest that to further strengthen the collaboration between research, public health practitioners and schools, improved partnership is required with the education sector.

Despite widespread adoption of the HPS framework in the UK, a lack of integration exists between research, policy, practice, and communities to collaborate and develop school health improvement and sustainability. With this in mind and

following the SHAPES model, the School Health Research Network (SHRN) was developed in Wales in 2013. It aims to improve young people's health and wellbeing by (1) providing school-level health and wellbeing data for school, regional and national stakeholders, (2) work with policy and practitioners to co-produce school-based health and wellbeing research and (3) help and support schools to understand the evidence and how it can be used in school[60]. Secondary schools that are part of SHRN complete an electronic health and wellbeing survey every two years. This survey was developed from the Health Behaviour of School-aged Children (HBSC) survey and is delivered to pupils aged 11-18. In addition, schools complete a school environment questionnaire that explores the relationship between school policies, practice and pupil health. Since its inception, SHRN is now in 100% of secondary schools in Wales (n=212). Information from these questionnaires is shared with schools in the form of a Student Health and Wellbeing Report, covering a range of topics such as healthy eating and physical activity. This national adoption has been encouraged by formal partnerships with the Welsh Government and Public Health Wales who provide both funding and support for the network activities. Despite widespread adoption, there is a lack of research examining its feasibility and impact on secondary school health outcomes.

However, the benefit and use of a platform to disseminate school-level survey data in the form of a school health report has been demonstrated in findings from the COMPASS[53]. COMPASS is the world's largest and most comprehensive longitudinal study on school-based health. Based in Canada and building on the SHAPES study, the aim of COMPASS was to develop and implement a comprehensive research, evaluation and knowledge exchange system. The study involves students (aged 14-17 years) completing an annual electronic questionnaire, a modified version of the SHAPES survey, which collects individual student data on topics such as physical activity, sedentary behaviour, eating habits and tobacco use[61]. This information is shared with schools as a SHP, whereby health behaviour for a school's population is presented alongside local and national comparisons, evidence-based programme or intervention suggestions and curriculum-focussed resources targeting these health behaviours. The use of a SHP allows schools to assess their students'

health, identify priorities and create action plans through for example, implementing school-based programmes[62]. During phase one (2012-2016), ninety-one schools have engaged with the study.

Furthermore, schools gain access to a 'knowledge broker' who assists the school in connecting with school-based health programmes and public health stakeholders. This unique aspect facilitates programme adoption and collects process level information on programme implementation for evaluation purposes. This process creates a shared, cyclical generation of information on student level health behaviour, school decision-making, programme adoption, adaptation, implementation and evaluation. This cycle of knowledge exchange significantly contributes to the evidence-base of school health for schools, research and public health stakeholders[53]. The strength of COMPASS is the engagement and knowledge exchange between schools, school-based health programmes and researchers. Evidence suggested that schools engagement with a 'knowledge broker' was associated with positive changes to health behaviours such as healthy eating, physical activity and tobacco use[63]. Furthermore, qualitative findings exploring schools', researchers' and public health stakeholders' experience of the 'knowledge brokering' were also positive[62]. Results from this study demonstrated the value in providing schools with a SHP of their student population and the benefit of a platform that facilitated partnerships between researchers, schools and public health stakeholders. This partnership produced mutually-beneficial results for all groups. Schools were able to incorporate findings from the SHP into their school improvement plans based on priorities identified within the report and align this to curriculum delivery. COMPASS suggest that future work would benefit from the generation of a network to facilitate communication *between* schools allowing the sharing of best practice case studies.

1.7 School Health Research: The Future

Thus far, the scope for integrating research within schools has been demonstrated in examples of network infrastructures, providing rapid dissemination

of findings to encourage evidence-based health promotion activities. Furthermore, evidence has suggested the benefit of collaborating with public health stakeholders and the mutually-beneficial impact of providing a cycle of knowledge transfer between schools, research and the health sector. However, a clear point is evident from the platforms and networks discussed in this chapter; that they all are targeted at the adolescent period of age 11+ (i.e. secondary school age). It is without question that adolescence is an important period to target as it is characterised by significant biological, behavioural and social changes[64]. However, evidence demonstrates that increasing trends in the prevalence of health topics such as obesity levels[65] and physical inactivity[66] occur during the primary school years. In addition, the current and future political and public health agenda places a significant focus on the importance of prevention[67,68]. Therefore, this suggests a gap exists in providing support to primary schools and thus, targeting preventative activities to a younger age. For example, a recent study examining changes in physical activity of participants in the Gateshead Millennium study concluded that both future policy and research efforts should begin well before adolescence[66].

There is a need to generate a shift from conducting research *on* primary schools to conducting research *with* primary schools. Based on the picture of school-based health discussed throughout this chapter, the practical examples of school health such as the HPS framework, the research evidence and examples of school health and research infrastructures, there is an evident gap in the provision of school-based health and the integration of research platforms. Therefore, this chapter provides a set of clear recommendations for the future effective implementation of school-based programmes and improving the health and wellbeing of pupils:

- There is a significant gap in collaboration between and integration of research, school health promotion and the health sector.
- There is a need to target the primary school age as a method of prevention.
- There is a need for a platform that provides school-level health behaviour information on an individual primary school level, allowing the identification of school health priorities.

- This platform would involve the rapid dissemination of school health information and research findings to a local, regional and national level and engage with the health sector to target and implement school-based programmes tailored to pupils' needs.
- This platform would involve a cycle of evaluation of school-based programmes that is shared between schools (for school-level impact i.e. adapting programmes based on process evaluations) and the public health sector (where to target resources that produce the greatest benefit).
- The importance of a low-cost, sustainable infrastructure that is incorporated into the curriculum.
- The integration of school health behaviour data in addition to epidemiology and academic outcomes.
- The essential components must be that it employs a bottom-up approach, enables teacher autonomy, involvement and collaboration; it is not an add-on but rather complements the curriculum.

To conclude this chapter, these recommendations provide a clear rationale for the focus of this PhD thesis on the development of a primary school health, education and research network; HAPPEN (Health and Attainment of Pupils in a Primary Education Network). The following chapter will outline the methodology specific to the functioning of HAPPEN and its development from September 2016 to its current operation.

Chapter 2 HAPPEN Methodology

The historical context and background of primary school health discussed in Chapter 1 concludes with a list of recommendations for the future prioritisation and improvement of school-based health. To address the current gaps identified within these recommendations, the HAPPEN primary school health network was developed to provide a joined up approach to improving child health, wellbeing and education. The following chapter will outline the methodological procedures that have underpinned HAPPEN and its development throughout the last three years. This includes the protocols for data collection through Fitness Fun Days and The HAPPEN Survey. The process of knowledge exchange will also be outlined, followed by the developments to the methodology over the last three years. These developments will be described in chronological order in relation to the academic years that fall within this PhD, from September 2016 to September 2019, followed by a final refined model of HAPPEN for the 2019 to 2020 academic year. This will be categorised by phase (phase one: academic year 2016-2017, phase two: academic year 2017-2018, phase three: academic year 2018-2019, phase four: academic year 2019-2020). During this period, an iterative action research method guided the development of HAPPEN that will be outlined in this chapter. This action research model will be presented to demonstrate the amendments and adaptations to the methodology that occurred to allow progression and expansion of the network from a localised, county-level project to a national infrastructure, providing Wales with its first national primary school health network. At the time of writing, HAPPEN has engaged with over 12,000 children from over 150 primary schools across 18 local authorities in Wales.

2.1 Philosophical Underpinning

The epistemological framework of research is regarded as the way in which we gain knowledge of what we know[69]. Therefore, it is important to state the philosophical assumptions that guide the design and methodology of research to generate knowledge and answer research questions[70]. These philosophical assumptions are recognised as a belief system that allows a community of

researchers to agree on the most important research questions and subsequent methods in answering those questions[71]. Within this subsection, the philosophical worldview that is proposed within this study and has shaped the subsequent approach will be outlined.

Pragmatism is centred on problem solving through developing practical knowledge that can be applied to specific situations[72]. A pragmatism perspective adopts a real-world, practice orientated approach and is derived from actions, situations and consequences in order to understand what works and identify solutions to research problems[70]. This worldview is primarily focussed on the research question as opposed to the research methods. Rather, the research methods are chosen that best address the research problem in an attempt to generate knowledge and understanding about "what works"[69]. These methods can be mixed in their approach in order to create the best opportunity for answering important research questions. Thus, the purpose of a pragmatism perspective is to form action based on a research problem achieved through adopting the most suitable procedures that address the original research question[73]. With this said, the aims and objectives described in this study require a combination of approaches in order to *understand* participants' experiences of school-based programmes and *explain* the complex relationship between health and education. Thus, the studies presented in Chapters 3, 4 and 5 adopt a mixed-methods approach, utilising both qualitative and quantitative methods which will be discussed in more detail below.

2.1.1 Mixed-methods Approach

The adoption of a specific methodological study design is based upon utilising the most suitable methods that attempt to address the research questions[74,75] With this said, research questions often warrant the need to combine approaches grounded in both the qualitative and quantitative paradigms in order to answer both the "what and why" and the "what and how"[76]. This ultimately aims to understand "what works" in line with the pragmatism perspective of research. Recognised as the third methodological movement, the use of mixed-methods approaches involves the collection and analysis of both qualitative (exploratory; "what and why") and

quantitative (confirmatory; “what and how”) data[76]. The guiding principle of a mixed-methods study design is that it provides a better understanding of the research question that would not be achieved through one approach alone[69]. Furthermore, a strength of mixed-methods research is its ability to widen scientific inquiry through achieving both breadth and depth that can be missed through mono-method research bounded by restrictions. In this thesis, a mixed-methods approach to the HAPPEN research studies is presented in Chapters 3, 4 and 5 and allows both a deep exploration of pupils’, teachers’ and headteachers’ experiences of implementing school-based programmes (“what and why”), combined with quantitative analysis that uncovers and explains the relationship between the complex layers connecting health and educational attainment (“what and how”) [77]. This combination of approaches will allow for a more comprehensive understanding of “what works”, the complexities of school-based health research and in addressing the research aims and objectives outlined in the next subsection.

This study design is employed through the three HAPPEN studies presented in Chapters 3, 4 and 5. These three studies form the foundations of the case study design. In its broad sense, a case is recognised in this study as the primary school setting. Creswell and Plano Clark state that the adoption of a mixed-methods case study design is popular in the field of health sciences and education in which knowledge on a complex system (i.e. a school) is required[75]. The purpose of a case study design in this research study is to develop a detailed understanding of school-based programmes and the relationship between health and education through the combination of multiple data sources[75]. The three studies are not weighted in their importance but rather, viewed as equally contributing to the knowledge base generated from this overall research study.

2.1.2 Mixed-methods Action Research

The overall design and functioning of HAPPEN as a project is guided by an action research model. The method of action research is used to improve practice through action, evaluation and critical reflection[78]. Action research requires collaboration with and the active involvement of participants in the research in order

to elicit changes in settings or communities (e.g. schools)[75]. Furthermore, it as a continuous learning process in which the researcher learns and shares newly generated knowledge with its beneficiaries[78]. A significant benefit of utilising action research through mixed-methods approaches is its ability to translate research findings into practice through the collaboration and involvement of participants. As Ivankova states, combining mixed-methods approaches with action research can produce more scientifically sound and transferable results[79].

With a key dimension of action research being collaboration and participation by beneficiaries, employing this model through knowledge exchange processes in HAPPEN ensures the sharing of new evidence with HAPPEN users (e.g. schools, public health field) and evidence-based approaches to improving school health and wellbeing. The use of action research within the framework of HAPPEN was achieved in two ways; at a school-level and project-level. Firstly, it was facilitated through a cyclical process of data monitoring and feedback on school-level health data through The HAPPEN Survey (Appendix 2:) and school report (Appendix 3: HAPPEN School Report). This will be discussed in more detail in the following subsections. Secondly, the planning and development of HAPPEN followed an iterative process through annual reflection and evaluation during the three phases of this PhD project. Therefore, applying an action research model to the development and functioning of HAPPEN enables effective translation of research findings to stakeholders, in addition to maximising study impact through integrating qualitative exploratory data with quantitative confirmatory findings[79]. The model of action research employed throughout the development of HAPPEN has created a data-driven school network that incorporates contextual differences and experiences of stakeholders (pupils, teachers, headteachers, public health practitioners).

The process of action research employed within the development of HAPPEN is reflected in O'Leary's (2004) cycles of research model in **Figure 1** presented below[78]. Within this model, action research is recognised as a process of continuous refinement of the methods and implementation as new knowledge emerges. This model converges towards a better understanding of the research problem and results in improved action and implementation. In the case of HAPPEN,

the cycles within O'Leary's model operated on an academic year basis as a process to develop, refine and plan for the next academic phase.

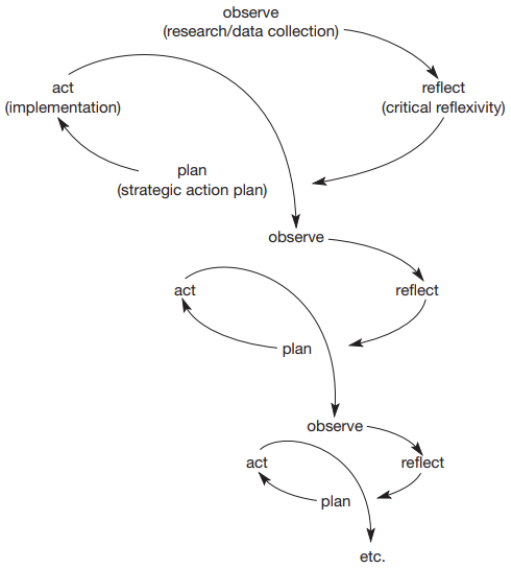

***Figure 1**: O'Leary's cycles of research model*

2.2 Aims and Research Questions

The research questions within this thesis are underpinned by HAPPEN, a network of health, education and research professionals aimed to improve the health, wellbeing and education outcomes of primary school children. As Tashakkori and Creswell state, a mixed-methods study requires at least one explicitly formulated mixed-methods objective[76]. Therefore, the overarching aim of this thesis is to develop HAPPEN: a network combining multidisciplinary expertise through a unified system of health, education and research specialists. The purpose of HAPPEN is to provide a knowledge exchange infrastructure for schools, health professionals and research. HAPPEN also provides a platform for the evaluation of school-based programmes, allowing rapid dissemination of evidence on the barriers and facilitators to school-based programmes to be shared with schools and the wider health and education sector. Ultimately, this thesis will explore whether investments in health and wellbeing can improve the education outcomes for children aged 9-11 years. This will be achieved through the following research objectives that utilise methods of action research and qualitative and quantitative investigation;

1) **To develop HAPPEN as a collaborative network of education, health and research professionals.**
2) **To examine if HAPPEN can act as a platform to evaluate interventions in the school setting and disseminate evidence-based learning.**
3) **To examine if HAPPEN can be used for observational epidemiology by identifying the factors associated with educational attainment.**

The first research objective of developing HAPPEN will be discussed in this chapter. Firstly, the protocol of data collection methods conducted through HAPPEN will be outlined, followed by the annual development of HAPPEN through an action research model. The second research objective will be examined through two exemplar case studies of primary school-based health and education programmes delivered as part of the curriculum; outdoor learning and The Daily Mile. These case studies are independent studies discussed as separate chapters and presented through their subsequent publications as academic papers. The published titles can be found below and feature as Chapters 3 and 4 respectively.

> **Study 1) Curriculum-based outdoor learning for children aged 9-11: A qualitative analysis of pupils' and teachers' views (Chapter 3)**[80]
>
> **Study 2) The Daily Mile: whole-school recommendations for implementation and sustainability. A mixed-methods study (Chapter 4)**[81]

The third research objective will be addressed from the epidemiological lens of the third study. This chapter will examine the association between child-collected health behaviour data (HAPPEN survey) and routine, electronic health and education data using the SAIL (Secure Anonymised Information Linkage) databank. The procedures underpinning SAIL will be outlined in this chapter;

> **Study 3) Factors associated with attainment at age 10-11, stratified by special educational need. A cohort study using linked health, educational and survey data. (Chapter 5)**

Thus, the three research objectives and studies outlined above aim to demonstrate how a primary school network can act as a platform to generate and share knowledge

with schools. This knowledge includes the evidence-based implementation of health and education school-based programmes. In addition, an epidemiologic perspective allows the examination of the wider health determinants of educational attainment through data linkage. The findings from the three studies aim to generate a deeper understanding into the complex relationship between health, wellbeing and education. The final chapter of this thesis will critically discuss and reflect on the development of HAPPEN and offer conclusions on its contribution to improving school-based health, its implications for practice, sustainability and future directions.

The full research methodologies for these studies can be found in detail within their respective chapters (Chapters 3, 4 and 5). As these studies present their own methodologies but are underpinned by HAPPEN, it is important to outline the methodological functioning of the network to provide context to the research aims. This chapter will outline the methodology specific to the functioning of HAPPEN. First, the protocol for HAPPEN will be outlined. This will include the procedures for data collection through Fitness Fun Days (FFD) and The HAPPEN Survey (formerly the CHAT questionnaire). Secondly, knowledge exchange processes with HAPPEN stakeholders will be discussed including the HAPPEN school report and HAPPEN conferences. Finally, the action research model applied to the development of HAPPEN including the amendments to the overall HAPPEN methodology will be discussed in chronological order. This reflects the academic years from September 2016 to September 2019 and is concluded with a final refined model for the expansion of the network during the 2019-20 academic year. This will be described in relation to the methodological developments that supported the roll out from a local project to a national infrastructure. All amendments to the methodology have received ethical approval from a research ethics committee. Details on ethical considerations will be discussed within each phase as opposed to a standalone subsection.

2.3 Pilot Research Prior to HAPPEN Development (Pre-2016)

The next subsection will provide an overview of the pilot work that was conducted prior to this PhD. It is important to outline this pilot work as this formed

the foundations of the research presented in this thesis and provides context to the development of HAPPEN and the data collection measures employed throughout the duration of this PhD project.

2.3.1 Developing an Objective Measure of Children's Fitness – Fitness Fun Days

The collection of objective fitness data for HAPPEN was achieved through a sub-project based in the School of Sport and Exercise Sciences named Swan-Linx. Swan-Linx was founded in the 2013-2014 academic year, and is a joint initiative between the City and County of Swansea (Active Young People team and Community Sports Development team) and Swansea University (School of Sport and Exercise Sciences and Medical School)[82]. The project is a continuation of the SportsLinx project from Liverpool that had widespread success between 1996 and 2013. SportsLinx was established in response to the priorities set out by the government in the "Sport – Raising the Game". This document advocated for schools and sporting communities to collaborate in providing better opportunities for children and young people to be active[83]. Thus, the aim of SportsLinx was to 1) offer a diverse range of sport and activities to children and young people and 2) increase levels of physical activity and promote a healthier lifestyle[84]. During its delivery, SportsLinx was the largest health and fitness programme in Europe. The project monitored the health, nutrition and fitness of children in Liverpool and offered children further opportunities to participate in sport and nutrition days and extra-curricular clubs through the following protocol demonstrated in **Figure 2** below.

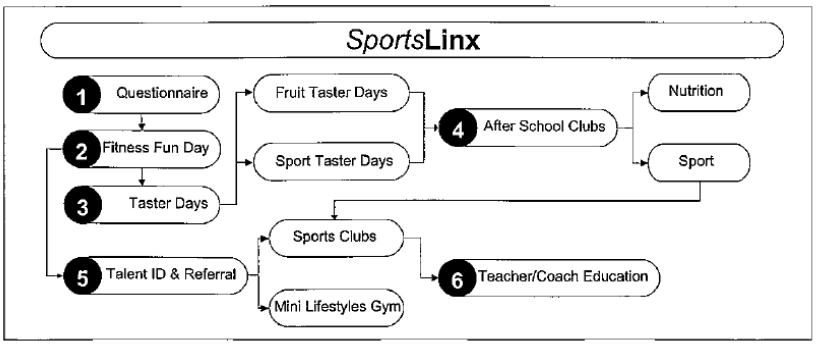

Figure 2: *SportsLinx model. Taken from Taylor (2004)*[84].

Following on from the success of SportsLinx in Liverpool and the relocation of the Principal Investigator to Swansea, the project was rebranded as Swan-Linx and piloted across the county with support from the Local Authority. Currently, the project is delivered as a strand of the HAPPEN project and as the objective fitness data collection tool for primary school pupils in years five and six (ages 9-11 years) through Fitness Fun Days. The protocol for Fitness Fun Days will be outlined briefly in the following subsections.

2.3.2 Developing a Self-report Measure of Children's Health Behaviour – The HAPPEN Survey

Accurately measuring children's health behaviour is essential for the effective development and targeting of interventions to improve child health and education outcomes. There is currently no 'gold-standard' method available in measuring health behaviours such as physical activity and nutritional intake within the public health arena. In addition, efforts have focussed on the measurement of individual health behaviours as opposed to an integrated tool combining assessments of multiple health behaviours[85]. Methods such as accelerometry (physical activity) and observation (nutritional intake) are bound by limitations associated with respondent burden, cost and time restraints[86]. Thus, self-report methods such as questionnaires are often the most suitable tool in collecting data on large populations of children due to their low-cost and ability to minimise respondent burden[85,87]. The 24-hour recall method is considerably favoured when applied to children aged eight years and older due to concerns about a child's ability to recall behaviours for periods longer than 24 hours[88]. Research suggests that recall is improved if the 24-hour tool follows a structured, segmented day format[89].

However, the nature of paper-based questionnaires is both time consuming for researchers and tedious for children to complete, particularly in today's 'digital age' in which technology plays a prominent role in children's lives. In recent years, the use of technology as a tool for assessment in this field has become increasingly popular. In particular, computer-based tools are highly engaging for children and offer a new and exciting possibility for the large scale, simultaneous assessment of

multiple health behaviours[90]. As study methodologies are commonly controlled by constraints and feasibility associated with cost and resources, web-based instruments offer a method that reduces the costs and researcher burden associated with data collection, input and processing[91]. In addition, they allow flexible self-administered data collection, reduce data input errors, minimise self-report errors and can be applied to large populations[90]. Importantly, a child-friendly interface can be developed and visual aids and pictures can be included to increase recall[92]. Thus, there is a growing demand for a tool that is valid, age-appropriate, engaging, cost-effective, simple and applicable to large populations.

The development of The HAPPEN Survey was based on an existing paper-style questionnaire from the SportsLinx project. These existing questions were reordered into the segmented, 24-hour recall format and the web-based questionnaire was designed to be child-friendly in terms of both style and usability. Pilot work prior to this PhD project contributed towards the initial development of The HAPPEN Survey (formerly named the CHAT questionnaire: Child Health and Activity Tool). This involved ten children aged 7-12 years completing the web-based questionnaire and provided feedback on understanding, usability and design. Furthermore, research into the validity of The HAPPEN Survey has demonstrated good validity and concluded that children can accurately report on health and lifestyle behaviours such as breakfast intake, waking up time and active travel[85]. Furthermore, validity research has suggested that items incorporating categorical responses produce higher accuracy from participants and better validity.

This pilot work prior to the start of this PhD formed the foundations of HAPPEN. This work was published by Todd *et al.* outlining the initial development of the network[93]. The following subsection will discuss the procedures for data collection, followed by the development of HAPPEN using an action research model within this PhD.

2.4 Data Collection

The process of HAPPEN data collection was conducted through two procedures in order to collect both objective measures of children's fitness and self-assessed health behaviour information. This was achieved through the following methods and is presented pictorially in **Figure 3** below.

1) Fitness Fun Days
    - objective assessment of the components of children's fitness
2) The HAPPEN Survey
    - collects self-report information on children's health, wellbeing, lifestyle and behaviour

Figure 3: *HAPPEN data collection process.*

Following on from the background and pilot work that contributed towards the development of the data collection tools within HAPPEN, the following subsections will outline the protocol for the measurement of children's objective fitness and self-report health behaviour data. In addition, the procedures underpinning data linkage will be outlined and the processes of knowledge exchange through which HAPPEN results are shared. Finally, the action research method

applied to the development of HAPPEN will be presented and discussed in relation to the methodological amendments throughout the phases of this PhD.

2.4.1 Fitness Fun Day Protocol

This subsection will outline the protocol and procedures of a Fitness Fun Day (FFD). All components of children's fitness measured at a FFD will be outlined in this section, however, components that feature as variables in statistical analysis will be discussed in further detail (20 metre multi-stage shuttle run test, 20m SRT). All pupils from years five and six (ages 9-11) are invited to participate in a FFD and attend the University's Indoor Training Centre as a school trip. The FFD is delivered as a morning activity (between 9:30am and 11:30am). It is free to attend for all schools, although schools are required to fund and organise their transport arrangements to and from the Indoor Training Centre.

Schools were recruited through a combination of approaches. Firstly recruitment was achieved directly through the HAPPEN network. This included direct emails to schools inviting them to participate in the project and through publicity events such as headteacher conferences and education events. Secondly, recruitment was facilitated through an existing partnership developed with the Local Authority's Active Young People (AYP) team from the Council's Sport and Health department. The AYP team work with primary schools across Swansea and are responsible for delivering a variety of sport and physical activity opportunities through school programmes and local communities. Thus, this strategic partnership allowed targeted recruitment through the AYP team's existing relationships with schools. Recruitment through the AYP team was directed towards targeting specific schools within each of the four cluster areas of Swansea.

The delivery of a FFD was led by a researcher based in Sport and Exercise Science and supported by between ten and fifteen members of support staff (e.g. Local Authority AYP officers, Young Ambassadors, University students, higher education students). On arrival, children receive a pre-assigned ID number for the purpose of data recording and anonymity. Children are then organised into groups

and rotate in a circuit style method through a range of activity stations measuring the different components of children's fitness. Each test takes about 10 minutes to complete and is delivered as an activity station, supported by at least two members of staff (researchers, six form college students). One member of staff was responsible for delivering the station and the other for data input. These fitness tests are based on the measures collected in SportsLinx which uses a modified version of the Eurofit Fitness testing battery[94], assessing both skill-related and health-related components of fitness. The Eurofit is the most widely used fitness testing battery in Europe. Developed by the council of Europe, the Eurofit was designed for school-aged children as a method of assessing a range of physical fitness components including flexibility, speed, endurance and strength. Its aims were (1) to provide a commonly agreed test battery, (2) to help in assessing the effectiveness of physical education in schools and (3) to help in measuring the health-related fitness of school children[94]. This protocol uses a battery of field tests to assess the components of children's fitness in a non-invasive, cost-effective and simple manner. The following components and tests are measured and employed at a FFD, presented below in **Table 1**. The measures with an asterisk have been used for statistical analysis in this thesis.

Fitness Component	Test	Equipment
Anthropometric measurements	(Height, weight, sitting height)	Weighing scales, height stadiometer, sitting height stadiometer
Flexibility	Sit and reach test	Sit and reach box
Power	Standing broad jump	Standing long jump mat
Strength	Handgrip strength test	Handgrip dynamometer
Speed and agility	10 x 5m shuttle run	Cones
Cardiorespiratory fitness*	20m multi-stage shuttle run test (20m SRT)	Sound system, audio recording, cones

Table 1: *Fitness components, testing protocol and equipment used in a Fitness Fun Day.*

Following completion of the morning and participation in the fitness measures, children would return to school and participate in The HAPPEN Survey in the school setting. The HAPPEN Survey is a self-report online tool that contains a range of health and wellbeing questions regarding children's lifestyle and health behaviours. The protocol for The HAPPEN Survey will also be discussed in detail in this chapter. Thus, the FFD provided a wealth of data on children's fitness, health, wellbeing and lifestyle. In line with an action research model, this information was fed back to schools as an individualised school report, comparing the average data for a school's year 5-6 cohort to county-wide averages. This model facilitates an evidence-based approach to improving school-level health and wellbeing.

2.4.1.1 Cardiorespiratory Fitness

The measurement and assessment of children's cardiorespiratory fitness is of great public health importance, given the relationship between cardiorespiratory fitness and markers of health[95]. The 20m SRT is a measure of children's cardiorespiratory fitness within the Eurofit fitness battery tests. Within a FFD, it is

delivered as the final activity station and either by whole-group or by year group (depending on school size). This is the only measure collected within the FFD that is used in the statistical analysis and will be explained further below. Please see the studies using cardiorespiratory fitness within Chapters 4 and 5 for full respective methodologies.

The test involves children running continuously and to perceived exhaustion between two lines spaced apart by 20m and marked by cones, in time recorded to beeps, in a similar set up to **Figure 4** below.

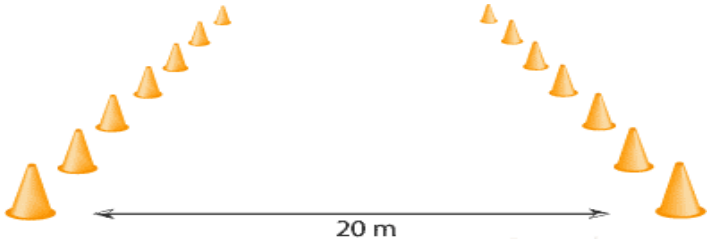

Figure 4: *20m Shuttle Run Test layout.*

The initial running velocity begins at 8.5 km/h and increases by 0.5 km/h every minute. The time between consecutive beeps decreases as the test progresses. The last lap the child achieved is recorded and the child is assigned a total number of shuttles run (minimum: 0 shuttles, maximum: 184 shuttles). The 20m SRT is delivered by all research staff present at a FFD. Prior to participating, a member of the research staff provides children with a physical demonstration and verbal instruction about the test. Children are also reminded they have the right to withdraw from the test and would provide additional verbal consent before participating. Children are classified as fit or unfit using the total number of shuttles run (fit: boys ≥33 shuttles, girls ≥25). These thresholds have been developed in relation to cardiometabolic risk scores in children of this age group[96].

2.4.2 The HAPPEN Survey Protocol

The HAPPEN Survey is a web-based, self-report questionnaire developed and designed with children that provides a quick and easy method in gathering information on a range of health behaviours[85]. Items within the survey include

physical activity, nutrition, sleep, wellbeing and mental health. The survey is completed by children aged 8-11 years (phases one and two – 9-11 years), takes around 30 minutes to complete and can be completed on a computer, laptop, iPad or tablet. It is administered in the primary school setting during curriculum time and in the presence of teachers or school staff (formerly in the presence of a researcher). The current HAPPEN survey will be discussed. This survey consists of five sections. An overview of these sections will be outlined below and is depicted in **Table 2** below. Information sheets and consent forms for pupils and parent/guardians is presented in Appendix 1: HAPPEN Information sheets and Consent Forms (pupils and parents/guardians).

Section	Topic
About you – Demographic information	Name, postcode, school, school year, gender, date of birth
1 – Yesterday – The school day	Waking up time, breakfast, active travel, lunch, break time activity, fruit and veg intake, oral health, bed time
2 – The last week	Physical activity, sedentary behaviour, tiredness, concentration, nutrition
3 – Sport and activity	Physical competency, sport club participation
4 – You and your feelings	School competency, autonomy, general competency, wellbeing, mental health
5 – Your local area	Safety, access to facilities, happiness with area, in school and out of school changes

Table 2: *HAPPEN survey structure*

At the start of the questionnaire, children provide demographic information. The first section of the survey displays items in chronological order of the previous school day, starting with wake up time. This section follows a timeline of the previous

day, with questions on breakfast, active travel, lunch and break time activity and nutrition, oral health and sleep. The next section 'The last week' follows a weekly format with items relating to typical health behaviours including physical activity, sedentary behaviour, nutrition and concentration. This allows for comparison with government guidelines on topics such as weekly physical activity and screen time. The third section covers items on physical competency and sport participation. These items are included for the purpose of the Local Authority's AYP, allowing trends in sport club participation by school to be examined. Furthermore, an item asking children what sport or physical activity they would like to try that they haven't tried before is fed back to the AYP team and provision for this is offered to the school where possible as a follow up. The fourth section, 'You and your feelings' includes validated measures on wellbeing and mental health. To measure wellbeing, this section incorporates questions from the Good Childhood Index developed by The Children's Society which measures children's subjective wellbeing. This index was developed following extensive research with children and young people, exploring what is important in their life[97]. The second component incorporates the 'Me and My Feelings' questionnaire, a validated assessment of children's emotional and behavioural mental health difficulties. This school-based measure is the only validated, self-report measure for children of this age group (8+ years). It consists of a 16-item measure, constructed by a 10-item measure of emotional difficulties and a 6-item measure of behavioural difficulties. Total scores are summed and cut-points have been assigned to categorise children's emotional and behavioural mental health difficulties as either *normal*, *borderline* or *clinical*[98]. The fifth section focusses on the local area and covers topics such as safety, play and the built environment. The final question is an open ended question exploring children's in school and out of school wellbeing. This question undergoes screening by an independent researcher to allow for any safeguarding responses to be identified and passed on to the wellbeing officer within the primary school.

During phases one to three, the raw data generated from the survey was coded using STATA (version 15) to produce a coded dataset. This dataset is then merged with data from a FFD (phases one and two) to create a final core dataset of

children's fitness, health and wellbeing. Within this dataset, identifiable information are removed and a unique participant ID number assigned to each participant. From phase four onwards, this process was refined and automated through the use of R software designed by a trained data analyst. With parental consent and child assent, this core dataset is uploaded to the SAIL databank. Data linkage between HAPPEN data and existing datasets within SAIL will be outlined in the following subsection.

Following an action research model using annual process evaluation, The HAPPEN Survey has undergone a number of developments between phases one and three to facilitate the expansion of HAPPEN from a county-wide project to a national primary school network. These will be discussed in detail in the following subsection on an academic year (phase-by-phase) basis and following a reflective account, identifying key barriers and facilitators to the effective functioning and development of HAPPEN.

2.5 The SAIL Databank: Data Linkage with HAPPEN

Based at Swansea University, the SAIL databank is a data repository that stores routinely collected, anonymised electronic health and education records of the Welsh population. SAIL was established in 2007 through funding obtained from Health and Care Research Wales and Welsh Government and holds over 10 billion de-identified person records[99]. It operates through a safe and secure governance structure that abides by strict legal and ethical requirements concerning person-centred data and in accordance with the Data Protection Act 1988[100].

HAPPEN has received approval by SAIL's Information Governance Review Panel (IGRP). The core dataset generated through HAPPEN including objective fitness data and self-reported health behaviours and wellbeing is uploaded to SAIL. This process is achieved through two methods by which the dataset is split into two components, File 1 and File 2: (File 1) Demographic data including identifiable information (e.g. name, gender, date of birth, postcode) collected through The HAPPEN Survey and the participants' unique ID number (from HAPPEN core dataset) are sent to a trusted third party, in this case the National Health Service (NHS) Wales

Information Service (NWIS). NWIS anonymise and encrypt the demographic data and assign each individual participant an Anonymised Linking Field (ALF). The ALF and unique participant ID are sent back to SAIL (File 2). The anonymised HAPPEN health and wellbeing core dataset (including unique participant ID) is uploaded to SAIL. Both datasets (excluding identifiable information) are then recombined using the unique participant ID and ALF. This final SAIL dataset is then ready to be linked to existing datasets within SAIL. A schematic diagram representing this process is displayed below in **Figure 5**:

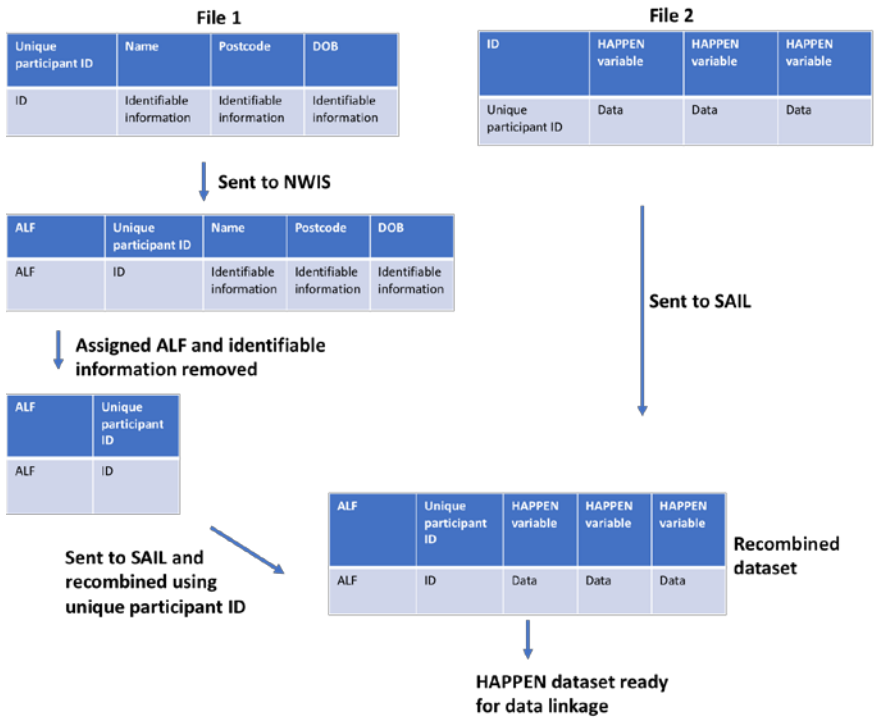

Figure 5: *Process of data linkage between HAPPEN dataset and SAIL datasets*

The full methodology for data linkage can be found within study three, presented in Chapter 5. The use of data linkage is a novel aspect of this thesis and allows both data linkage with HAPPEN datasets and large scale population data linkage.

2.6 Knowledge Exchange

2.6.1 Overview

A network is recognised as an interconnected group or system focusing on a shared purpose[56]. Therefore, it is essential to integrate knowledge sharing amongst HAPPEN partners to achieve the overall goal of improving the health, wellbeing and education outcomes of children. A critical component of HAPPEN is the knowledge exchange of evidence-based information on children's health and wellbeing with schools, the health sector and the wider health and education fields. This component also acts as a key feature in the action research model employed within the function of HAPPEN. Initial qualitative pilot work prior to this PhD, outlined in detail in Chapter 1, highlighted the barriers and facilitators of the effective delivery of school-related health promotion. This research identified a number of recommendations by schools (headteachers, teachers, health and wellbeing coordinators) who advocated for more collaboration and autonomy in improving pupil health and wellbeing[40,42]. Furthermore, the gap between research and public health practice has been highlighted as an area that requires action[51]. This 'knowledge gap' requires a multi-sectoral, coordinated response in order to facilitate long-term impact for school-based health, given the positive evidence of schools adopting a HPS framework. The concept of knowledge sharing through network structures in the field of school-based health has been demonstrated in projects such as the COMPASS and SHAPES study[51]. In the case of HAPPEN, knowledge exchange has acted as a primary feature. Furthermore, the use of knowledge exchange between HAPPEN users is an important component within the action research model, facilitating collaboration and evidence-based action. This has primarily been achieved through two methods; (1) HAPPEN school report of health and wellbeing data and (2) annual HAPPEN conferences attended by headteachers, teachers and stakeholders in health and education. These methods will be outlined further in the following subsections.

2.6.2 HAPPEN School Report

The use of school-level health related information through local data collection and feedback systems have been identified to be an instrumental factor in integrating research, evaluation, policy and practice[51]. This was demonstrated in the COMPASS study whereby a system of data collection and feedback was developed to share school-level health behaviour information in the form of a 'School Health Profile' report. Knowledge exchange was achieved through the feedback of annual, school-level reports containing survey-collected health-related information of pupils. These report were tailored to allow for county comparisons, evidence-based suggestions on health interventions aligned to topics within the report, ideas for curriculum links and information on local resources e.g. local public health teams[53]. Evidence has demonstrated the value in providing schools with tailored reports on the health profiles of their pupils[62]. Collecting important health-related data of children is meaningless if it is not shared with the recipients (e.g. schools) to encourage evidence-based action at the ground level. If this data is only shared amongst an academic audience, we are inadvertently widening the gap between research, policy and practice. Thus, with an established data collection system of school-level fitness, health and wellbeing data, the structure of HAPPEN provides the perfect opportunity for facilitating knowledge exchange with schools and stakeholders in health and education. Furthermore, a network structure allows the rapid dissemination of these findings amongst partners through pre-established communication arrangements (e.g. mailing lists, social media, website).

The purpose of the HAPPEN school report is to share school-level data on children's health and wellbeing with the aim of facilitating evidence-based action targeted to school need. Information collected at a FFD and through The HAPPEN Survey provide a wealth of information on children's health and wellbeing. The HAPPEN school reports are fed back using two methods; (1) individual school-level reports following participation in a FFD and/or The HAPPEN Survey and (2) an overall HAPPEN report at the end of each academic year, presenting average results of the total sample that participated that academic year, shared with all HAPPEN partners

and stakeholders in health and education. With regards to the school-level report, this information is shared with schools on a group basis and structured by health themes.

The HAPPEN school report has been developed annually to align with current trends in health and education. During phases one and two, the report was structured to fit within the Welsh Network of Healthy Schools scheme topics (food and fitness, mental and emotional health and wellbeing, personal development and relationships, substance use and misuse, environment, safety and hygiene)[101]. This allowed the presentation of school-level pupil health data to be synonymous with an established structure in which schools engage with. Within each health theme, average results for each school are presented and compared with county-wide averages. The purpose of this is to facilitate the bottom-up, autonomy element that headteachers advocated for[42] as opposed to top-down enforcement by 'experts'. Thus, schools are able to identify areas within the report that they may wish to prioritize for example, within their school development plan. In addition to school-level and county-level data, each health theme is presented alongside health guidelines and messages (for example 60 minutes of physical activity per day), and links to local, school-based health programmes (e.g. third sector and Local Authority projects) and resources. From phase three, the school report was restructured to align with the newly proposed Curriculum for Wales 2022[102]. From 2022, the new curriculum in Wales will be delivered through six 'Areas of Learning and Experience', one of which is health and wellbeing. This restructure aligned the HAPPEN school report with the discourse within the new curriculum and reframed the focus of the network from a public health tool to a curriculum tool. This will be outlined further within the action research model below. In this third phase, summary research findings of the two exemplar case studies; outdoor learning and The Daily Mile were included within the report. The purpose of this was to share the benefits, barriers and facilitators to successful implementation. This ensures that schools are provided with evidence-based information on school-based programmes that are often widely adopted with little acceptability research, resulting in a lack of sustainability. The school reports are provided to schools within four weeks of pupils participating in

data collection, ensuring the rapid dissemination of findings and facilitating action based on evidence. A copy of the latest school report can be found in Appendix 3: HAPPEN School Report.

2.6.3 HAPPEN Conferences

Efforts to promote the school-based health of children requires multi-sectoral action at an individual, school and community level. With collaboration at its centre, a conference provides the ideal setting to bring together stakeholders with the purpose of knowledge exchange, networking and action planning. Indeed, the Ottawa Charter and the principles that have defined school-based health promotion over the last 30 years was announced and published at the First International Conference on Health Promotion in 1986[2]. Hosting an annual HAPPEN conference has been an integral component in facilitating the collaboration and knowledge exchange that is at the core of the network. Since phase one, HAPPEN has provided a conference for schools and stakeholders in health and education. Year on year, the appetite for a HAPPEN conference has grown substantially, with this reflected in the increase in the number of attendees (phase one n=50, phase two n=80, phase three n=110). Every year, attendees have included headteachers, teachers, healthy school coordinators, health initiatives, local authority AYP officers and education staff members, local public health teams and third sector initiatives.

The annual HAPPEN conferences have four purposes (1) to disseminate the latest HAPPEN findings and research, (2) to showcase external speakers discussing current health and education topics, (3) to provide a platform for networking, collaboration and knowledge exchange and (4) to generate feedback about HAPPEN from HAPPEN partners to inform future network activity planning. Over the last three years, external speakers have included headteachers, pupils, Estyn inspectorates and Welsh Government curriculum leads. A copy of the conference agendas can be found in Appendix 4: HAPPEN Conference Agendas.

The national rollout of HAPPEN during phase four (2019-2020) had an impact on the sustainability of the HAPPEN conferences in their current form. For example,

the geographical nature of a national network provided limitations with the universal offering of a conference. In order to address this and to continue providing schools with another avenue of knowledge exchange and collaboration, phase four trialled the delivery of a regional workshop. This workshop, in partnership with the education regional consortia ERW (Education through Regional Working) offered schools the chance to work through their school report and plan activities directly to the new curriculum with the support of ERW staff. These developments are outlined further in the action research model presented below.

2.7 Phased Development of HAPPEN – An Action Research Model

The following section will outline the phased developments of HAPPEN using an action research method and guided by O'Leary's cycles of action research model[78]. This model considers action research as a method to continually refine the methods, data and interpretation of findings in relation to knowledge gained in a previous cycle[78]. More widely, O'Leary considers action research as a cyclical and participatory process (with stakeholders) addressing practical problems in a specific context (e.g. school setting) in order to implement solutions within that context. Thus, these tenets recognised by O'Leary reflect the process that has been applied to the development of HAPPEN throughout the phases of this PhD. The following section will demonstrate these developments in line with the four cyclical components of O'Leary's cycles of action research model; observe (research data collection), reflect (critical reflexivity), plan (strategic action plan), act (implementation). The observation component (observe) involves the use of a variety of approaches, methodologies and methods to gather data and generate knowledge. Next, the critical reflection (reflect) of the first stage allows important information regarding these processes to be evaluated and reflected upon in order to develop a strategic action plan based on this new knowledge. Finally, this is addressed by implementing changes and amendments required to improve the initial design. In the case of HAPPEN development, these stages will be discussed from two angles, data collection (FFDs, HAPPEN survey) and knowledge exchange (HAPPEN promotion, conferences).

This is presented on a phase-by-phase basis as displayed in **Table 3** below. Although distinct, these phases outlined below provide clarity in the development of HAPPEN and its infrastructure from a county-level project to a nationwide primary school network:

HAPPEN Development Phase	Academic Year
Phase one	September 2016 – August 2017
Phase two	September 2017 – August 2018
Phase three	September 2018 – August 2019
Phase four	September 2019 – August 2020

***Table 3**: HAPPEN development phases*

To provide additional school context to reflect the phased development of HAPPEN, a summary of school participation during phases one to four is presented in Table 4 below. This table includes the number of schools in each local authority that participated specifically in The HAPPEN Survey, in addition to information regarding the range of free school meal eligibility within schools by local authority. Thus, the expansion of HAPPEN depicted below can be observed in relation to the successful pilots delivered within new local authorities from phases one to three, leading to the national expansion presented in phase four. This table also highlights the variation in schools that have engaged with HAPPEN as reflected by the wide range of free school meal eligibility.

Phase (year)	Local Authority	Number of schools	FSM (range, median)
0 (pre 2016)	Swansea	29	4-57%
1 (2016-17)	Bridgend	14	6-57%
	Swansea	14	10-48%
2 (2017-18)	Bridgend	4	2-47%
	Cardiff	2	14-44%
	Swansea	18	4-15%
3 (2018-19)	Bridgend	7	4-46%
	Newport	2	10-44%
	Swansea	11	10%
4 (2019-20)	Anglesey	3	12-29%
	Blaenau Gwent	6	3-41%
	Bridgend	18	4-35%
	Caerphilly	28	5-58%
	Carmarthenshire	3	4-30%
	Denbighshire	1	26%
	Flintshire	1	55%
	Monmouthshire	11	5-27%
	Neath Port Talbot	1	58%
	Newport	22	3-35%
	Swansea	13	1-56%
	Torfaen	3	4-33%
	Wrexham	2	17%

***Table 4**: A summary of school participation by local authority and free school meal eligibility from phases one to four (2016-20)*

Furthermore, at the time of writing the number of schools that have registered through the HAPPEN website expressing an interest in participating in The HAPPEN Survey during the 2020-21 academic year is presented below. This table represents the growing interest for engagement with HAPPEN as a result of significant development, promotion and publicity, in addition to changing priorities for schools as a result of the new curriculum for Wales.

Phase (year)	Local Authority	Number of schools
5 (2020-21)	Anglesey	8
	Blaenau Gwent	8
	Bridgend	40
	Caerphilly	35
	Cardiff	17
	Carmarthenshire	20
	Ceredigion	7
	Conwy	2
	Denbighshire	6
	Flintshire	1
	Gwynedd	8
	Merthyr Tydfil	3
	Monmouthshire	19
	Neath Port Talbot	1
	Newport	41
	Pembrokeshire	21
	Powys	39
	Swansea	70
	Torfaen	10
	Vale of Glamorgan	3
	Wrexham	12

***Table 5**: List of schools registered through the HAPPEN website for 2020-21 academic year (as of October 2020)*

2.7.1 Phase one (September 2016 - August 2017) – Data Collection

Observe	Reflect	Plan	Act
Fitness Fun Day data collection	• Staff support a significant burden. • Limited capacity to deliver FFDs. Dependent on availability of AYP officers, research students.	• Approach relevant partners that can provide support and staffing for the delivery of FFDs.	• In collaboration with Sports Science, developed a mutually beneficial partnership with Gower College to embed FFD within curriculum for higher education students.
HAPPEN survey v1	• HAPPEN survey v1 hosted through external company. Cost issues with amendments and limited control over survey.	• Scope free survey platforms. • Redesign and launch on Google Forms allowing full control over amendments. • Code through STATA	• HAPPEN survey v2 developed on Google Forms platform. • Generated STATA script to automate coding.

	• HAPPEN survey requires annual reflection and evaluation to ensure it remains in line with current public health trends and collecting data that is being reported back or analysed.	• Informal discussions with teachers highlighted significant mental health issues in schools. • Incorporate a mental health measure validated, for this age group within HAPPEN survey. • Amend questions	• Integrated 'Me and My Feelings'[98] mental health questionnaire. • Added question on safety playing, wellbeing life, afternoon break. • HAPPEN survey v2 ready for phase two
	• HAPPEN survey is sustainable and scalable to a larger area. • Scope the potential to pilot in another LA.	• Develop partnership with Bridgend AYP team. • Plan pilot project in Bridgend LA for phase two.	• Pilot expansion to Bridgend for next academic year to examine feasibility in expanding and scalability.
Ethical considerations	• Existing ethical approval through Engineering Research Ethics Committee (PG14/2014/007).	• Efficient HAPPEN expansion requires ethical approval from	• Begin draft ethics application to Medical school REC for phase two.

		Medical School (HAPPEN base).	

Table 6: *Phase one (September 2016 - August 2017) – Data Collection*

2.7.2 Phase one (September 2016 - August 2017) – Knowledge Exchange

Observe	Reflect	Plan	Act
HAPPEN school report	• HAPPEN logo and school report designed during initial pilot work prior to 2016.	• Rebrand current HAPPEN logo and school report.	• Designed new HAPPEN logo, branding and school report.
HAPPEN website	• Pre-existing HAPPEN website (www.happen-swansea.ac.uk). Used to disseminate county wide HAPPEN school reports. Features network section promoting local school-based health initiatives across Swansea.	• Continue developing website as a platform to disseminate county wide HAPPEN reports and promote HAPPEN partners.	• Website updated throughout phase one.
HAPPEN promotion	• Lack of local awareness and understanding of HAPPEN amongst health, education and research sector. • A need to increase local HAPPEN visibility within health, education and research sectors.	• Relaunch HAPPEN across Swansea in line with rebranding.	• Established partnership with Swansea local authority education unit and public health teams. • Promotion through social media, newsletters and events.

			• Presented at Swansea University Patient and Population Health Informatics seminar series.
	• Lack of national awareness and understanding of HAPPEN amongst health, education and research sector. • HAPPEN expansion requires national HAPPEN visibility within health, education and research sectors.	• Use rebranding and launch to promote wider.	• Promoted HAPPEN through Farr Institute case study publication '1000 ways of using data to save lives' (Appendix 5: Impact and Public Engagement) • Published article in The Conversation 'Schools shouldn't be left to deal with child health and wellbeing any longer'[103] • Invited to write article in Public Sector Focus magazine 'Investing in Health and Wellbeing is an Investment in Academic Achievement'[104]

			• Public Health Network Cymru Research in Wales conference poster • Swansea University Medical School Postgraduate Research Conference (Poster winner) • Pan Wales Sports Science Conference • National Centre for Population health and Wellbeing Research Conference presentation
HAPPEN conference	• Prior to 2016, HAPPEN events branded as a 'network meeting'.	• Rebrand as a conference to widen audience and engagement from stakeholders. • Conference plan: o EM to present latest HAPPEN findings	• HAPPEN conference, Village hotel, Swansea. • 60+ attendees from health, education and research. • Appendix 4: HAPPEN Conference Agendas

		o Local headteacher (implementing outdoor learning) o Estyn inspector (wellbeing inspection framework)	
	Send HAPPEN conference attendees evaluation feedback forms.	• Overall conference feedback positive. • Key points to inform phase two conference: o Larger venue o Include opportunities for roundtable discussions on conference topics	• Integrate group workshops into phase two conference. Plan workshops around conference themes and presentations. • Stagger attendee registration with priority to schools

Table 7: *Phase one (September 2016 - August 2017) – Knowledge exchange*

2.7.3 Phase two (September 2017 - August 2018) – Data Collection

Observe	Reflect	Plan	Act
Fitness Fun Day data collection	• Initially the partnership with Gower College provided staff support to deliver FFD. • However, issues with sustainability due to change in staff.	• No additional support identified. • Lack of capacity and resources to deliver for phase three.	• Pause FFD delivery while a solution is found. • Use phase three to focus solely on HAPPEN survey expansion.
HAPPEN survey v2	• HAPPEN survey v2 hosted and launched through Google Forms • Requires annual reflection and evaluation to ensure it remains in line with current public health trends and collecting data that is being reported back or analysed.	• Amend questions for phase three (HAPPEN survey v3)	• Added physical competency questions • Removed parental activity questions
	• Prioritise and develop HAPPEN survey protocol to facilitate national expansion.	• Minimise researcher burden and increase capacity for delivery.	• Pilot teacher-led HAPPEN survey in phase three. • Positive feedback from schools.

	• Researcher burden - current HAPPEN survey delivered by a researcher within the school setting.	• Develop HAPPEN survey as a teacher-led tool.	
	• First year of pilot expansion to Bridgend successful, facilitated through Bridgend AYP team. • Attended termly 'HAPPEN planning meetings' with schools in Bridgend. • Presented at Bridgend wellbeing event. Shortlisted for 'Innovation' award at Bridgend Inspired for Life awards.	• Meet with education lead for Bridgend LA with AYP to discuss expanding across the LA. • Incorporate into 'service level agreements' between AYP team and primary schools. • Integrate feedback from HAPPEN planning meetings into HAPPEN survey and report.	• Further expansion across Bridgend phase three. • Bridgend AYP to target primary schools for recruitment in collaboration with new PhD student.
Ethical considerations	• HAPPEN expansion requires ethical approval from Medical School Research Ethics Committee (HAPPEN base).	• Apply to Medical School Research Ethics Committee.	• Ethical approval for HAPPEN by Medical School Research Ethics Committee (2017-0033)

	• GDPR law change 25/05/2018.	• Examine how this might impact HAPPEN delivery. • Ensure HAPPEN is GDPR compliant. Liaise with Swansea University's GDPR compliance officer.	• Developed GDPR statement and published on HAPPEN website.

Table 8: *Phase two (September 2017 - August 2018) – Data Collection*

2.7.4 Phase two (September 2017 - August 2018) – Knowledge Exchange

Observe	Reflect	Plan	Act
HAPPEN school report	• Bridgend pilot expansion – resources listed within school report are localised to Swansea.	• Develop Bridgend school-based health initiative resource book for phase three.	• Bridgend school-based health initiative developed in collaboration with Bridgend AYP team. • Limited engagement from Bridgend health initiatives.
	• Resources within school report currently localised. • National rollout requires national resource scoping.	• Informal discussions with schools suggest the resource list is a beneficial component of HAPPEN. • Limitations – changing contact details, short-term projects, limited free resources for schools, how to judge initiatives on featuring in resource pack.	• Develop a national resource pack featuring nationwide, free school-based health initiatives and resources for schools. • National resource pack developed and published on website: https://happen-wales.co.uk/resources-for-members/

HAPPEN website	• High cost to run HAPPEN website, hosted through 1&1 website services. • In line with national roll out, relaunch website as a national HAPPEN website. • Develop HAPPEN website to receive school registrations and sign up to HAPPEN survey. • Develop national resource pack for schools and share on website (removed from school report to shift focus on new curriculum).	• Scope other website hosts that allow more flexibility and control over website development. • HAPPEN website rebuilt using wordpress and with a new national domain (www.happen-wales.co.uk).	• New website developed during phase two. • Incorporated additional dissemination features e.g. HAPPEN latest research findings, parent and family section. • New website acts as school registration platform. • Electronic parental opt-out consent received through website.
HAPPEN promotion	• Local and national HAPPEN visibility and awareness growing. Continue HAPPEN promotion across Wales and further. • HAPPEN integrated within the National Centre for Population Health and Wellbeing Research.	• Scope potential conferences to further promote HAPPEN and facilitate national expansion.	• Presented at national Welsh Public Health Conference 2017. • Presented at Education through Regional Working (ERW) event to headteachers from six local authorities in South West Wales.

			• Presented at WISERD conference
	• Invited to represent Swansea Healthy Cities (WHO programme) at the WHO International Healthy Cities Conference, Belfast, following presentation at Welsh Public Health Conference.	• Submit abstract to WHO International Healthy Cities Conference, Belfast.	• Abstract accepted to present at WHO International Healthy Cities Conference taking place in phase three.
	• Increase HAPPEN's credibility to research audience.	• Submit application to Swansea University's Research and Innovation (R&I) Awards.	• Shortlisted for 'Outstanding Impact on Health and Wellbeing' award at R&I awards.
HAPPEN conference	• Incorporate feedback from phase one.	• Scope larger venues and increase attendee numbers. Conference plan: o HAPPEN latest findings (Daily Mile)	• HAPPEN conference, Liberty Stadium, Swansea. 100+ attendees. • Local media coverage.

		○ Pupil presentation from Daily Mile school ○ Estyn inspector (wellbeing inspection arrangements) ○ Workshop planning sessions	• Appendix 4: HAPPEN Conference Agendas.
	• Send attendees conference evaluation feedback form.	• Overall conference feedback positive. • Key points to inform phase three conference: ○ Different conference room ○ Continue opportunities for networking and joint planning for attendees.	• Continue incorporating group workshops within phase three conference. • Utilise opportunity to gather feedback specifically on HAPPEN and in relation to HAPPEN expansion. • Continue staggering attendee registration with priority to schools.

***Table 9**: Phase two (September 2017 - August 2018) – Knowledge exchange*

2.7.5 Phase three (September 2018 - August 2019) – Data Collection

Observe	Reflect	Plan	Act
Fitness Fun Days	• FFD delivery requires one permanent member of staff. • Staff changes - no staff support identified to deliver FFDs. • Pause FFD delivery for phase three.	• Focus efforts on preparing HAPPEN expansion and national roll out of HAPPEN survey.	• HAPPEN data collection delivered solely through HAPPEN survey.
HAPPEN survey v3	• Requires annual reflection and evaluation to ensure it remains in line with current public health trends and collecting data that is being reported back or analysed.	• Amend questions for phase four (HAPPEN survey v4).	• Added environmental questions

	• Pilot teacher-led HAPPEN survey. • Prioritise developing HAPPEN survey and resources to facilitate national expansion.	• Utilise website as a registration site for teachers to receive instructions on delivery: o Develop a step-by-step guide for teachers. o Create an instruction video for pupils.	• Checklist, instruction guide and booklet on delivering HAPPEN developed for teachers. • www.happen-wales.co.uk/thehappensurvey/ • www.happen-wales.co.uk/runningthesurvey/ • Sent directly to teachers that register in HAPPEN website as phased instruction emails containing information on running survey. • Information video for pupils developed. • HAPPEN survey action plan designed by a pilot expansion school. Included within every school report. Appendix 6: Individual School Impact and Action Plans
	• Informal discussions with teachers asking for HAPPEN survey to include younger years.	• Validated components of questionnaire are valid for children in year 4 (age 8-9)	• Increase age range of HAPPEN survey to years 4-6 (ages 8-11).

	• Coding data using STATA is efficient but requires researcher input to create school reports. • HAPPEN expansion requires automation. • Automate stages of data collation, coding and separation for SAIL.	• Work with data analyst to produce R software automation script.	• Data automation script created by data analyst for coding, data separation, mail merge to school report.
	• Efficient HAPPEN expansion requires school input to facilitate bottom-up approach.	• Launched HAPPEN consultation to schools to generate feedback on HAPPEN expansion and identify priority areas. Priorities identified: o Align school report data to new curriculum. o Provide evidence on what works (school-based interventions)	• Align school reports to Health and Wellbeing Area of Learning and Experience new curriculum. • Include HAPPEN findings on school-based interventions in school report (outdoor learning and Daily Mile)

	• Draft curriculum for Wales announced. Health and Wellbeing one of six 'Areas of Learning and Experience'. • Informal discussions with teachers raises uncertainty over how to deliver new curriculum.	• Scope alignment with new curriculum and Health and Wellbeing Area of Learning and Experience.	• Relaunch HAPPEN survey in phase three as a 'curriculum tool', supporting schools delivering new curriculum and aligned to pupils' needs based on school report data.
	• Pupil voice identified as key component in new curriculum. • Reflections of HAPPEN process identify a lack of pupil involvement.	• Collaboration with Lleisiau Bach Little Voices (Wales Observatory on Human Rights of Children and Young People, Swansea University). • Pilot project developed utilising pupil voice groups to work through HAPPEN school report and identify priority areas.	• HAPPEN Little Voices pilot project launched in one primary school. • Six week workplan developed and delivered by HAPPEN and Little Voices team. • Project facilitated pupil-directed change and impact. • Reflections post project - incorporate pupil voice into school report.

		• Develop six week HAPPEN/Little Voices led workplan.	
Ethical considerations	• HAPPEN survey expansion, processing paper consent will be a significant burden.	• Identify alternative procedure for consent – electronic consent. • Submit ethical application to SUMS REC for electronic consent, distributed by schools through existing communication with parents.	• Ethical application for electronic consent approved.
	• Electronic consent piloted. • Provides viable option but issues remain with consent return and differences by deprivation.	• Scope health survey literature. • Submit ethics application to SUMS REC for parental opt out consent. • Child assent obtained electronically through HAPPEN survey.	• Ethics approved for electronic parental opt out consent for HAPPEN survey roll out.

Table 10: *Phase three (September 2018 - August 2019) – Data Collection*

2.7.6 Phase three (September 2018 - August 2019) – Knowledge Exchange

Observe	Reflect	Plan	Act
HAPPEN school report	• Curriculum reform. Draft curriculum for Wales announced. Health and Wellbeing one of six 'Areas of Learning and Experience'.	• New curriculum an opportunity to align HAPPEN school report and resources to new curriculum for phase three. Use consultation feedback to inform alignment and planning.	• Integrate new curriculum within school report, HAPPEN materials and discourse. • Reorder topics and themes within school report to new curriculum.
	• Monitoring school-level impact required.	• Co-produce a 'School Action Plan' in collaboration with primary schools to track school-level.	• Developed a 'School Action Plan' to be included within each school report. • Allows schools to plan and monitor their priorities and workstreams based on school report. Appendix 6: Individual School Impact and Action Plans

HAPPEN website	• High cost to run HAPPEN website, hosted through 1&1 website services. In line with national roll out, relaunch website as a national HAPPEN website. • Develop HAPPEN website to receive school registrations and sign up to HAPPEN survey. • Develop national resource pack for schools and share on website (removed from school report to shift focus on new curriculum).	• Scope other website hosts that allow more flexibility and control over website development. • HAPPEN website rebuilt using wordpress and with a new national domain (www.happen-wales.co.uk).	• New website developed during phase three – incorporated more dissemination features e.g. HAPPEN latest research findings, parent and family section. • New website acts as school registration platform. • Electronic parental opt-out consent received through website.
HAPPEN promotion	• Improved awareness of HAPPEN research across Wales from health, education and research sectors.	• Further promote HAPPEN across Wales and further afield.	• Research posters at Welsh Public Health Conference. • Presented at regional education consortium event (ERW – Education through Regional Working).

			• Outdoor learning research published (Chapter 3)[80]. Altmetric score – in the top 5% of all research outputs scored by Altmetric. • Conversation article published on outdoor learning research[105]. 38,000+ reads, global media coverage e.g. CBS Boston[106], World Economic Forum video[107]. • Outdoor learning research recognised by Estyn and school inspection assessment (Excellent – Wellbeing and attitudes to learning)[108]. • Conversation article on afternoon breaks published[109]. Republished in Daily Mail[110].

			• Featured in Chief Medical Officer's annual report 'Valuing our Health'[111].
	• Attended and presented at WHO International Healthy Cities Conference, Belfast.	• Submit abstract to 5th European Conference on Health Promoting Schools. Health, Wellbeing and Education: Building a Sustainable Future, Moscow Russia.	• Abstract accepted to present at 5th European Conference on Health Promoting Schools. Health, Wellbeing and Education: Building a Sustainable Future, Moscow, Russia in phase four.
	• Efficient and effective HAPPEN national rollout would be facilitated through collaborations with local and regional stakeholders. • In addition to new curriculum changes, four new regional education consortia established. These consortia merged education responsibilities for local authorities into one regional body and	• Develop collaborations with regional education consortia: o West Wales: ERW (Education through Regional Working) o South East Wales: EAS (Education Achievement Service)	• Use a regional phased approach to consortia collaborations. • During phase three, developed a collaboration with ERW and EAS. Initial collaboration involved promotion of HAPPEN to

	were established to focus on school improvement. Each consortium includes remits for health and wellbeing in line with new curriculum. • Opportunity to collaborate and develop mutually beneficial partnership.	o Central South Wales: CSC (Central South Consortium Joint Education Service) o North Wales: GwE (North Wales School Effectiveness and Improvement Service)	schools within ERW and EAS regions. • Phase four to include formal mutual activities. • Arranged meetings with CSC and GwE for phase four.
HAPPEN conference	• Incorporate feedback from phase two. • Utilise group sessions to gather feedback on HAPPEN and expansion priorities.	• Scope different rooms within same venue. Conference plan: o HAPPEN latest findings o Little Voices Children as Researchers, pilot project presentation (EM, Little Voices researcher and pupils from pilot school). o Lead of Health and Wellbeing Curriculum, Welsh Government presentation on new curriculum.	• HAPPEN conference, Liberty Stadium, Swansea. • 120+ attendees. • Appendix 4: HAPPEN Conference Agendas.

		o Workshops to gather HAPPEN expansion feedback	
	• National rollout causes issues with future conference provision. • Geographical limitations and funding.	• Scope other avenues for knowledge exchange in phase four.	• Explore the feasibility of regional workshops in collaboration with regional education consortia.

Table 11: *Phase three (September 2018 - August 2019) – Knowledge exchange*

2.7.7 Phase four (September 2019 - August 2020) – Final Refined HAPPEN model

Observe	Reflect
Fitness Fun Days	• Fitness Fun Days resumed for phase four and lead by funded PhD (Bridgend) and Masters (Swansea) postgraduate students (funding obtained through Sport and Exercise Science).
HAPPEN survey	• HAPPEN survey delivered as teacher-led, online questionnaire for children in years 4-6. Appendix 2: • HAPPEN survey branded as a curriculum tool to support schools to deliver new curriculum (Health and Wellbeing Area of Learning and Experience). • Registration through HAPPEN website. Schools receive instruction email and resources to deliver the survey. • School report aligned to new curriculum and received within four weeks of participating. • Inclusion of school action plan to implement school-level changes from report and record impact. • Schools encouraged to utilise pupil voice groups with school report in identifying workplan. • HAPPEN expansion across Wales in progress. Facilitated through partnership with ERW and EAS. • At the time of writing, 12,000 children from over 150 schools in 18 local authorities have completed HAPPEN survey.
Ethical considerations	• Electronic parental opt out consent and child assent successfully incorporated into HAPPEN survey roll out.

HAPPEN school report	• HAPPEN resources rebranded to align with new curriculum. Report restructured to follow new curriculum themes (Appendix 3: HAPPEN School Report)
HAPPEN promotion	• Attended and presented at the 5th European Conference on Health Promoting Schools. Health, Wellbeing and Education: Building a Sustainable Future, Moscow, Russia. • Daily Mile research published (Chapter 4)[81]. • Conversation article on The Daily Mile published[112]. • Appendix 5: Impact and Public Engagement
HAPPEN conference	• Regional workshop pilot in collaboration with ERW education consortium. • Attended by 20 schools and 10 ERW staff to for schools to: o work with ERW curriculum staff to plan Health and Wellbeing curriculum Area of Learning and Experience with HAPPEN action plan. o further develop HAPPEN action plan and align with new curriculum

Table 12: *Phase four (September 2019 - August 2020) – Final refined HAPPEN model*

2.8 Summary

The final revised model of HAPPEN is displayed in **Table 12** above. This model has been developed following the three phases of action research outlined in the previous subsection and adapted using O'Leary's cycles of research. The application of O'Leary's model allowed for annual reflective evaluations based on observations during each phase. Thus, this final HAPPEN model has been revised annually in order to develop the necessary infrastructure and resources to expand nationally and provide Wales with its first primary school health network.

Following the description of the HAPPEN methodology outlined in this chapter, the subsequent three chapters will present the research studies conducted through HAPPEN. These studies demonstrate HAPPEN's ability to perform two main functions aside from network activities. Firstly, the network provides the opportunity to research and evaluate current school-based health programmes being implemented in the primary school setting. Results from these evaluations are fed back to schools in order to provide evidence-based information regarding implementation and outcomes. These findings are also shared on a wider scale through avenues such as 'The Conversation' news website. The school-based programme research conducted during the period of this PhD are a qualitative analysis of outdoor learning (Study 1) and a mixed-methods study on The Daily Mile (Study 2). Both research sub studies have since been published in peer-reviewed journals and received significant global impact and media coverage. The first of such studies, *Curriculum-based outdoor learning for children aged 9-11: A qualitative analysis of pupils' and teachers' views*[80] is presented in Chapter 3. The second, *The Daily Mile: whole-school recommendations for implementation and sustainability. A mixed-methods study*[81] is presented in Chapter 4. Secondly, the annual child-collected health behaviour data collection through The HAPPEN Survey and objective fitness data are uploaded to the SAIL databank. This data collection mechanism and utilisation of the SAIL databank allows for data linkage with anonymous, routinely collected electronic health and education records. Thus, study three is presented in Chapter 5 and demonstrates HAPPEN's ability to perform epidemiological research.

Chapter 3 Curriculum-based Outdoor Learning for Children aged 9-11: A Qualitative Analysis of Pupils' and Teachers' Views

This chapter presents the first study of this PhD thesis. The study titled '*Curriculum-based outdoor learning for children aged 9-11: A qualitative analysis of pupils*' and teachers' views' was conducted through HAPPEN's function of evaluating school-based programmes. This qualitative research study aimed to explore the experiences of implementing a regular programme of outdoor learning within the primary school setting from the perspectives of pupils, teachers and headteachers. Through interviews with teachers and headteachers and focus groups with pupils, this study provides important insights into the whole-school experiences of a non-traditional approach to teaching using outdoor learning. In addition, this chapter demonstrates HAPPEN's ability to evaluate education programmes delivered through the primary school curriculum.

This study has been published in PLOS ONE and at the time of writing has received over 20,000 views[80]. Following publication, the paper was summarised and published as a news article in The Conversation. To date, the article has been read by over 38,000 people across the world. In addition, the article has been republished in a range of news websites and received widespread media coverage. For example, the study was discussed by news presenters on CBS Boston News, the lead author (EM) was invited to discuss the findings on a live Canadian radio station (900 CHML) and it was featured as a commentary article by Channel News Asia, one of the largest television news channels across Asia and Australia. Most notably, the research findings were summarised as a short video by the World Economic Forum which has been viewed over one million times across the different platforms.

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3.1 Abstract

The relationship between child health, wellbeing and education demonstrates that healthier and happier children achieve higher educational attainment. An engaging curriculum that facilitates children in achieving their academic potential has strong implications for educational outcomes, future employment prospects and health and wellbeing during adulthood. Outdoor learning is a pedagogical approach used to enrich learning, enhance school engagement and improve pupil health and wellbeing. However, its non-traditional means of achieving curricular aims are not yet recognised beyond the early years by education inspectorates. This requires evidence into its acceptability from those at the forefront of delivery. This study aimed to explore headteachers', teachers' and pupils' views and experiences of an outdoor learning programme within the key stage two curriculum (ages 9-11). We examine the process of implementation to offer case study evidence through 1:1 interviews with headteachers (n=3) and teachers (n=10) and focus groups with pupils aged 9-11 (n=10) from three primary schools. Interviews and focus groups were conducted at baseline and six months into implementation. Schools introduced regular outdoor learning within the curriculum. This study found a variety of perceived benefits for pupils and schools. Pupils and teachers noticed improvements in pupils' engagement with learning, concentration and behaviour, as well as positive impacts on health and wellbeing and teachers' job satisfaction. Curriculum demands including testing and evidencing work were barriers to implementation, in addition to safety concerns, resources and teacher confidence. Participants supported outdoor learning as a curriculum-based programme for older primary school pupils. However, embedding outdoor learning within the curriculum requires education inspectorates to place higher value on this approach in achieving curricular aims, alongside greater acknowledgment of the wider benefits to children which current measurements do not capture.

3.2 Introduction

A mutual relationship between health, wellbeing and education exists. Evidence demonstrates that healthier children have higher educational attainment[19]. This association is mirrored, with research showing the social impact of education on health outcomes throughout the life course[19]. Thus, investing in a child's learning has potential in maximising future achievement, employment prospects and health and wellbeing during adulthood. The school setting provides an opportunity to deliver a curriculum that engages children to reach their academic potential and define their future health outcomes and socio-economic pathway, reducing inequalities in health and education.

However, with schools currently facing a multitude of external, top-down pressures on educational attainment and health and wellbeing inequalities[42], there is a need for learning experiences that simultaneously improve health, wellbeing and school engagement whilst addressing curriculum needs. The opportunity to provide high-quality teaching experiences to engage children in learning is not solely restricted to the classroom setting, in which children act as passive, unengaged learners[113]. Taking learning outside the classroom and into the natural environment provides the opportunity for an integrated, cross-curricular approach to achieving education aims[114]. Furthermore, research has demonstrated the positive impact of immersion in nature on wellbeing, creativity, brain function and mood[115], highlighting the potential of the outdoors in engaging children with learning. Despite this, opportunities for children to access the natural environment are diminishing and children are spending less time outdoors due to parental concerns over safety, traffic and crime[6]. Modern environments have observed a reduction in open green spaces, in addition to reliance on technology and increased sedentary time providing competition against children's choice to engage with the outdoors[7]. Therefore, the school setting holds arguably the greatest responsibility and potential in providing children with access to natural environments through the school grounds and teaching activities.

Outdoor learning encompasses a spectrum of curricular school activities that take place in the natural environment within school grounds or in the context of the local area. This ranges from broad nature-based learning such as Forest Schools, residential trips and outdoor adventure, to learning programmes tailored specifically to the core curriculum. This huge variation in the practice and understanding of outdoor learning means that the evidence base, whilst growing, shows huge variability in terms of the duration and type of outdoor learning offered, the target population involved and the outcome measures assessed[116].

In recent years, curriculum-based outdoor learning delivered by teachers in school grounds or the local area has gained momentum and is receiving attention from education experts and political figures alike[117]. This growing movement of outdoor learning is reflected in recent government investments including the Natural Connections project[118] and Nature Friendly Schools[119]. The Natural Connections project, delivered in 125 schools across southwest England demonstrated a positive impact of learning in the natural environment on pupils' enjoyment of lessons, connection to nature, social skills, engagement with learning, health and wellbeing, behaviour and attainment. Indeed, there is a large body of literature highlighting the benefits to exposure with the natural environment and outdoor learning on children's physical, mental, social and emotional health[113,120–122]. This is particularly important as research suggests children's wellbeing and mental health is declining and regular physical activity and engaging with the outdoors could potentially improve health, wellbeing and education outcomes[123–126]. The cognitive benefits of contact with nature have also been identified, including improved concentration, awareness, reasoning, creativity, imagination and cognitive functioning[127,128]. Furthermore, the outdoor environment encourages skills such as problem solving and risk taking which are important behaviours for child development[129]. Therefore, delivering lessons in the outdoor environment can enrich learning and engagement, widen skill development and improve health, wellbeing and enjoyment in school[130].

Outdoor learning shows great potential as a tool for health promotion and improving educational outcomes and a key component for the development of

children[131]. Efforts to integrate outdoor learning into the curriculum have been witnessed alongside curriculum reform across the UK[132]. In 2010, Wales introduced the Foundation Phase curriculum stage for ages 3-7, with a vision of encouraging 'children to be creative and imaginative, and make learning more enjoyable and effective'[133]. This curriculum framework facilitates experiential learning through outdoor learning. However, despite its recognition at policy level and government recognition of the benefits of outdoor learning in enhancing children's social, physical, creative, cultural and personal development[134], outdoor learning provision is still underutilised in primary schools, particularly beyond the early years[135]. Although research has demonstrated its ability to engage all ages and applicability across the whole school, there is a marked decline in outdoor learning experiences between the early years and the later stages of primary education[113,136], In addition, conflict exists between the wider benefits to education attributed to outdoor learning, and the lack of measurement and the value placed upon these by education inspectorates.

As with many school interventions, the implementation of outdoor learning within the curriculum has not come without its challenges and a number of barriers prevent schools from implementing regular outdoor learning in the older primary school age groups. Common barriers cited by teachers and headteachers include; existing curriculum pressure, the high demand on teachers' time, teachers' confidence and self-efficacy, safety, cost and access to resources and training[137–141]. Teachers have also expressed a conflict between the autonomy in choosing outdoor learning as a teaching method yet lacking acknowledgment and support from colleagues and the wider school network[142]. Recommendations to overcome barriers and integrate outdoor learning within the school setting include providing schools with a clear evidence base[137]. Ultimately, despite research highlighting the benefits and policy recognising the value of outdoor learning, the wider uptake of outdoor learning within school practice requires training and resources designed to support teachers and school-wide culture change[143].

Whilst research regarding the benefits of outdoor learning has examined cognitive, affective, interpersonal, social, physical health and behavioural

impacts[121], there is a lack of research exploring the acceptability and mechanisms behind how outdoor learning can be effectively implemented on a regular basis by primary schools[144]. Furthermore, much of the literature aiming to gain the viewpoint of stakeholders has focussed solely on teachers and outdoor specialist staff [139,140,145,146], highlighting the lack of experiences cited by pupils. If we are to create both meaningful education experiences in the outdoor environment, and ensure effective implementation of school-based programmes, it is essential to gain the viewpoint of not only those at the forefront of the delivery, but those who are recipients of such interventions, the pupils. Thus, the aim of this study was to examine the acceptability of an outdoor learning programme and to explore headteachers, teachers and pupils' views and experiences of outdoor learning within the Key Stage Two (KS2) curriculum (pupils aged 9-11). In addition, we examine the process of implementation to offer case study evidence to other schools who would like to offer outdoor learning to KS2 pupils.

3.3 Methods

This study adopted a qualitative design in order to examine the acceptability of an outdoor learning programme within primary schools. Interviews and focus groups were employed at two time-points (baseline and follow-up) with headteachers, teachers and pupils. Open-ended questions allowed for deeper exploration of participants' views and opinions. Thematic analysis was used to generate themes and gain a holistic understanding of participants' experiences of outdoor learning from a whole-school perspective.

3.3.1 Approach

This study adopted a qualitative approach, viewed widely as the most suitable methodology in exploring barriers and facilitators of programme implementation[147]. Semi-structured interviews and focus groups were employed in order to gain an insight into the implementation of regular outdoor learning in the primary school setting. Interviews and focus groups are considered the most appropriate methods in examining the acceptability of interventions[148]. The

process of thematic analysis generated themes and sub-themes from the data. The schools participating are members of the HAPPEN Network, which aims to evaluate and share the evidence base for interventions currently delivered in primary schools, in order to improve children's health, wellbeing and education outcomes[93]. The reporting of this study design is in accordance with the Consolidated Criteria for Reporting Qualitative Studies (COREQ)[149] (Appendix 7: Consolidated Criteria for Reporting Qualitative Studies checklist (Outdoor Learning)).

3.3.2 Participants

A convenience sample of three schools (School A, B and C) who expressed an interest in outdoor learning provision for their KS2 pupils were invited to take part in the research study. This sampling method was chosen to gather information-rich cases from schools committed to an outdoor learning programme[69]. Schools were contacted via a telephone conversation with the headteacher and were existing HAPPEN schools. The percentage of pupils eligible to receive free school meals at all three schools was below the national average (19%)[150]. Following headteacher consent, the lead researchers (EM and CT) presented about the research study at a school assembly to pupils aged 9 to 11 years (year 5 and 6 pupils) at each of the schools. Information sheets and consent/assent forms detailing the study aims were distributed to pupils, their parents and teachers within the school. Each assembly also provided the pupils and teachers an opportunity to ask questions related to the research project.

To participate in the research, children needed to provide written assent and parents needed to provide consent. Purposive sampling was used to recruit pupils for focus groups, ensuring an equal representation of age and gender. If any pupils were unavailable on the day, another person from this consented list was recruited. All three headteachers consented to take part in 1:1 interviews. Teachers from years five and six were invited to participate in a 1:1 interview. A purposive sample of consented teachers was selected to ensure an equal representation of gender.

3.3.3 Implementation

There was a general agreement among all schools that they intended to deliver at least one lesson outdoors a week. School A (the more urban of the three schools) chose to initially run outdoor learning in the school grounds but then became more involved with an outdoor activity provider utilising outdoor adventure as a key part of delivery as the project progressed. School B took a combined approach, initially delivered by a designated teacher trained in forest schools outside the school ground followed by teacher delivery. School C (the most rural of the three schools) took a teacher led approach utilising the local environment.

3.3.4 Ethics

Ethical approval was granted by the College of Human and Health Sciences Research Ethics Committee (approval number: 070117). All participants over the age of 18 (headteachers and teachers) provided informed written consent prior to participating. Pupils were required to provide informed written assent and parent consent in order to participate. All participants were reminded of their right to withdraw from the research at any point. All personal data such as names and school names was anonymised. Paper based data (consent) was stored securely in a locked cupboard and electronic data (interview transcripts) was stored in password protected documents on a secure University server.

3.3.5 Data Collection

This qualitative research study used focus groups with pupils at baseline (n=4) and follow up (n=6), 1:1 interviews with teachers (years 5 and 6) at baseline (n=4) and follow up (n=6), and 1:1 interviews with headteachers (n=3) at follow up. Interviews were conducted at two time points; baseline (beginning of intervention) (January 2017) and 6-month follow up (July 2017) in order to gather views at the start of the intervention and once outdoor learning was embedded within the curriculum. Interviews with headteachers and teachers were conducted according to individual preference, either by telephone or face to face on the school premises by one

researcher (EM or CT). Pupil focus groups were completed within a private room at the school setting, with two researchers present (EM, CT, RC, SB, SD, HJ). Lead researchers were both female, trained to Masters level and had previous experience in conducting interviews and focus groups with both adults and children. Each focus group consisted of between six and eight pupils[151], aged 9-11 years of mixed genders. All interviews and focus groups followed a semi-structured topic guide (Appendix 8: Interview and Focus Group Topic Guides (Outdoor Learning)), allowing deeper exploration of subjects including experience, views and opinions on outdoor learning, as well as suggestions for effective implementation in other schools. Applying open-ended questions to interviews allowed participants' views to be explored further and topics to be discussed in a natural manner with the interviewer[152]. A lead researcher facilitated the interview process (CT or EM), whilst the other researcher (RC, SB, SD, HJ) provided technical support (digitally recording) and made field notes on key responses. These notes were verbally summarised to interviewees at the end of each interview in order to gain respondent validation[153]. In order to achieve neutrality, researchers reminded the participants at the start of interviews and focus groups that they remained impartial and of the study aims. Participants' personal viewpoints were encouraged, and researchers emphasised that there were no right or wrong answers. Interviews lasted between 12 and 52 minutes overall (average length: pupil focus groups 30 minutes; teacher interviews 22 minutes; headteacher interviews 33 minutes).

3.3.6 Data Analysis

All interviews were digitally recorded and transcribed verbatim. Each transcript followed an open coding process by two researchers (EM, CT, SD, RC) independently and their responses were compared. Open coding allowed participants' views to be summarized by assigning words or phrases to quotes. Codes were compared between researchers to ensure accuracy and consistency. If there was a discrepancy or disagreement in coding a third researcher adjudicated. All topics were compared with the written notes taken on the day of the focus group that had been agreed with the participants as an accurate account of their responses.

Following this, two researchers worked together through an extensive process to discuss all codes and categorise them under theme and sub-theme headings (Appendix 9: Themes and Sub-themes (Outdoor Learning)).

3.4 Results

Three key themes emerged from the transcripts; (1) Expectations and experience of outdoor learning, (2) Factors influencing outdoor learning and (3) Perceived impact on learning, health and development, all of which will be discussed in this section, alongside any suggestions in relation to each theme.

3.4.1 Expectations and Experience of Outdoor Learning

A prominent theme was the expectations and experiences of pupils and teachers regarding outdoor learning. This theme comprised of three sub-themes including feeling free, exposure to environment and safety and pupil engagement.

3.4.1.1 Feeling Free

At baseline, pupils believed that outdoor learning would provide an escape from the uncomfortable and restricted conditions of the classroom. This escape from the classroom excited pupils, with discussions of freedom at both time points;

> *"So if you're in a cramped classroom you don't have that much room, if it's wet play you don't have that much room to do activities but if it's outside you have loads of room". (Pupil, School B, Baseline)*

Pupils also highlighted associations between fresh air, feeling more energised and an increased engagement with learning;

> *"And when we're outside, like we get the fresh air, on a hot day if we're in class we're just boiling we won't do as much work and we won't do it as good". (Pupil, School B, Follow up)*

Teachers believed the freedom allowed pupils to express themselves;

> *"I know lots of children that don't cope very well with being in one classroom all day every day, they find it difficult to sit down but also for children who are more creative, they've got more opportunities*

to show that outdoors, I mean it's the freedom and the movement and the expression and being able to use their bodies not just their voices and their hand". (Teacher, School B, Follow up)

In addition, outdoor learning offered pupils the ability to engage with play, an essential element of childhood;

"And it's like really fun, because like the whole class goes out and if you're like… most of the yard is by yourselves, because it's kind of like playtime but you're learning". (Pupil, School A, Baseline)

3.4.1.2 Exposure to Environment and Safety

Pupils suggested that the addition of outdoor learning to the curriculum would increase their exposure to the environment and their engagement with nature, expanding their learning;

"You learn about the outside world, you notice things about nature you never knew and you do different topics". (Pupil, School A, Baseline)

This exposure to the natural environment was viewed as a positive aspect of outdoor learning during follow-up interviews, allowing pupils to learn about the outdoors. The opportunity to engage with nature at follow-up also encouraged an element of play;

"Because [being in the] woods like it's more adventurous because you can just pick up sticks and start playing with them". (Pupil, School C, Follow up)

However, increased exposure to the environment was also felt to pose a risk to pupils and teachers regarding safety. At baseline, safety fears by pupils included physical injuries such as hurting themselves, or worries over getting lost from the rest of the class, something that the security of having physical boundaries in the classroom eliminated;

"You might hurt yourself on some bad things outside". (Pupil, School A, Baseline)

Despite perceived safety fears, pupils expressed frustration at the level of protection by teachers in the outdoor environment;

"That's why a lot of people go off on that day because like the teachers are like really, they treat you like babies in the woods, they won't even let you run". (Pupil, School B, Follow up)

Safety was initially a worry for teachers, however developing clear rules and boundaries and embedding outdoor learning into school life reduced the likelihood of any injuries;

"…initially there was things like trips and falls and head bumps and things like that and, touch wood, I'm not seeing so much of it so it's embedded in the rules and things that we talk about. And when they climb the trees if it's wet they're only allowed up to an adult's hip, if it's dry they can go up to the shoulder and higher, they have to hold on, and there's clear rules there and they really do stick to it". (Teacher, School C, Follow up)

3.4.1.3 Pupil Engagement

Outdoor learning engaged pupils of all abilities including those with behavioural difficulties and additional learning needs;

"They've [pupils] engaged in all activities that have been provided outdoors. So they definitely, it definitely engages all the children, whether they've got behavioural difficulties or not". (Teacher, School B, Baseline)

"So there are children who sit there very, very still and know how to, who know how they should behave socially or, you know, institutionalised, you know, they're happy to do that, write neat, those kind of things that fit all those parameters, but for those children who don't…I think that it's more suited to them…It gives them, you know, an outlet and so yeah, I do think it's for those children who learn perhaps in different ways". (Teacher, School A, Follow up)

The headteacher from this school also attributed the engagement by boys to the approach of outdoor learning;

"The teachers report as well how engaged they are, you know, with this style of learning and, you know, some of our perhaps more challenging boys particularly, you know, really enjoy the sort of the methodology". (Headteacher, School A, Follow up)

Engagement with learning was voiced by both teachers and headteachers, with a continuation of engagement during the follow up work in the classroom;

> *"I think it's too much of a coincidence to say it's not down to outdoor learning, because it's an approach as well, you know, it's not only the sessions outdoors, it's what the sessions outdoors bring back into the classroom as well, isn't it, and it's the whole knock-on effect and it's all about experience". (Headteacher, School C, Follow up)*

In addition, how outdoor learning helped engage different styles of learners was discussed;

> *"Sometimes your very academic children they're the ones that actually need it the most, because perhaps they're quieter, they're a little bit more book-based learners, the visual learners, so I think for those learners in particular, you know, so obviously you engage the learners who are kinaesthetic but also, you know, those other children, the ones that perhaps need it because potentially, you know, in the future they could be the ones who are, you know, in terms of looking after themselves and their wellbeing and so on, you're perhaps hitting the mark with them and their sort of style of learning etc". (Headteacher, School A, Follow up)*

Suggestions around increasing engagement and maintaining enthusiasm, related to ensuring the lessons conducted outdoors were fun and not more than once or twice a week, ensuring a novelty aspect.

> *"If we're going to enjoy doing outdoor learning I think the lesson's got to be fun… if it's just like something boring and I'm not going to enjoy it as much and we'll just start talking a bit". (Pupil, School A, Baseline)*

> *"We'd get bored of it, I wouldn't do every lesson, I think once or twice a week is enough". (Pupil, School A, Baseline)*

3.4.2 Factors Influencing Outdoor Learning

Another theme to emerge from the transcripts encompassed the factors that influence the delivery of outdoor learning including motivations, curriculum pressure and accountability as well as natural and physical resources, support and teacher confidence.

3.4.2.1 Motivations

The implementation of outdoor learning was driven by headteachers and teachers' motivations, including personal passion, passion of a colleague, pedagogical

beliefs and a need to improve wellbeing outcomes. However, central to this subtheme was that of the rights of a child. Headteachers believed children had a right to be outdoors and that schools had a degree of responsibility in ensuring children were exposed to the outdoors in their learning;

> *"Every child is entitled, it's their right to get outdoors and we have them all day, we have them for most of the daylight hours at certain times of year and so it's our responsibility, I don't think there's a choice, I don't think we can choose, shall we do it or shan't we, we have to". (Teacher, School B, Follow up).*

Other key motivations focussed on improving pupil wellbeing and providing more opportunity to be outdoors;

> *"There's far too much time where children aren't playing outside, they aren't walking outside, they aren't just outside, and I think a lot of that, with increasing volumes of children accessing counselling, spending a lot of time on social media, spending a lot of time on Xbox, a lot of time watching TV, they just don't know the impact being outside has on their health and their wellbeing, and I'm really committed to developing pupils' wellbeing". (Headteacher, School B, Follow up)*

However, the high level of pressure placed upon schools by education inspectorates and the resulting resistance by the workforce was reinforced by one headteacher. This headteacher believed that in order to implement an initiative such as outdoor learning, an element of bravery was required by the school;

> *"You have pressures put on the school from Government, that goes down through the inspectorate, that passes onto the regional consortia, that's passed onto schools, i.e. Headteachers, Governors, Senior Leaders, that's passed onto the teachers, it's passed onto the teaching assistants and it's passed onto the pupils so it's like a big pressure cooker and the whole system, you know, so until there's that change in emphasis right at the top, you know, I think it will always be the brave schools that actually say 'no, this is what I believe in and this is what we'll do'". (Headteacher, School A, Follow up)*

3.4.2.2 Curriculum Pressure and Accountability

The baseline interviews with teachers conveyed a feeling of overburden with some feeling that outdoor learning was an added pressure enforced by senior management at a time of high focus on academic literacy and numeracy targets;

> *"Until we're up and running it seems like too much to do at the moment because all the emphasis is on literacy and numeracy all the time, that's what the big push is at the moment and targets, so it just seems to be another new thing and another new pressure". (Teacher, School A, Baseline)*

Despite teachers generally feeling positive about outdoor learning, the academic pressures relating to evidencing work was at odds with the concept of teaching outdoors. This was particularly due to these teachers being responsible for a key stage that includes additional pressure and testing;

> *"Like the main concern for us, obviously, upper key stage 2 is obviously evidence of work, because there's such a pressure now to have evidence, recorded evidence for every session or something in box, there's a big pressure in that…Again, lots of activities don't provide evidence, so, it's difficult then to gauge the amount of learning that they've done, apart from the bit of feedback basically". (Teacher, School B, Baseline)*

Some teachers found it hard to design lessons with meaningful activities that could both encompass the concept of outdoor learning and meet the requirements of the curriculum.

> *"We're at that early struggling stage looking for ideas of meaningful activities that we can do outdoors that do suit the outdoor environment and you're not trying to directly lift a classroom activity into an outdoor activity, you're trying to make it, you know, something that will work outdoors and there is a benefit". (Teacher, School A, Baseline)*

3.4.2.3 Natural Resources

The schools included in this study had varied access to local natural environments, and this was acknowledged with reference to the types of lessons that were suited to this;

> *"We've got access to the woodland area. We're in a, you know, a really good spot that we can use, you know, we can use a lot more of it, it's not just going outside, going into the yard, we can use the woodland which is great, you know, for Science, Geography-type lessons as well". (Teacher, School B, Baseline)*

One headteacher highlighted that schools in a less fortunate position in terms of outdoor opportunities may struggle;

> *"In [city] lots of schools have aspirations to develop outdoor learning, but different schools have different challenges and different opportunities, isn't it, other schools, perhaps who are in the middle of [city], number one, they don't have woodland on their doorstep, so their opportunities to visit woodland would be limited". (Headteacher, School C, Follow up)*

Indeed, utilising the immediate school grounds was raised as a challenge. One teacher at the more urban based school of the three felt that using the immediate school grounds was not enough for the older pupils, with the school later relying on external trips to provide pupils with an enhanced experience;

> *"Well, the stimulus is the trips, without the trips, as I, when I spoke to you the first time, you really struggle because you're just using the school grounds, and lower down the school that's not such a problem with building up their skills but by the time you get to the top end of the school, you need to branch out, you need to go further…But apart from identifying, we've got a little, we've got a small wooded area but apart from that it's just grass really, so it was the trips that were the stimulus for, you know, all the extra ideas". (Teacher, School A, Follow up)*

However, another school suggested relying on external trips would come at a cost, with parents having to fund the transport and staff needed to attend the trips. Teachers provided some suggestions to other schools;

> *"Prioritise anything that's within walking distance of your school, so you know, if you have a river nearby or if you have a park nearby, that's within walking distance, you know, utilise that as much as possible" (Teacher, School A, Follow up)*

3.4.2.4 Physical Resources

In addition to the natural resources, the physical resources and time required to prepare new resources for outdoor learning were raised, with one teacher

expressing their concerns over the transferability of traditional classroom lessons into the outdoor environment;

> *"Well because we don't teach outdoors. We teach in the classroom, the things we do in the classroom, the resources we use are in the classroom and now we've got to, you either try and transfer those activities to an outdoor environment which is more challenging because of the resources, you know, the resources not being there". (Teacher, School A, Baseline)*

Another barrier highlighted by teachers was the clothing required for lessons, having to cancel if some children forgot coats. At follow up, one school had gained financial support, investing it in staffing and outdoor learning specific clothing;

> *"Supported financially, the school have bought waterproofs so that the weather's not a barrier for the children and yes, they are funding me to continue in September for another year, so yes, very supported". (Teacher, School B, follow up)*

Indeed, staff numbers were highlighted by schools as an obstacle to outdoor learning;

> *"Staff ratio, sometimes it, you know, when you want to do an activity you'd quite like it to be a group going out…we just haven't got the staff sometimes to do these things or to go out". (Teacher, School A, follow up)*

Funding was mentioned by all schools at follow-up. Improved access to funding resulted in resources moving from a barrier to outdoor learning to a facilitator;

> *"Like having ease of access to equipment has been another problem, so we're trying to change that by we raised some money like I said doing this walk, trying to get equipment that can be accessed by the children and easily and not in a place where, you know, you need a member of staff to go with them". (Teacher, School A, Follow up)*

3.4.2.5 Support

The level of school, governor and parent support was highlighted by teachers and headteachers as an important factor. School B commented on the parental support throughout and how despite some initial concern and beliefs, general feedback and support from parents was positive;

> *"I did think we'd have a little bit of resistance at the beginning, because some parents believe children only learn by sitting at a desk, and indeed one grandparent did write on our Twitter account that, "A pity the children weren't sitting at desks writing"…So, yes, the parents are very positive about the direction that we're going". (Headteacher, School B, Follow up)*

Support from parents was also suggested by schools to overcome barriers associated with resources;

> *"..and when we were doing some outdoor activities we asked them to bring, you know, cardboard boxes and, you know, shelter making equipment and that kind of thing…So yeah, we did lean on parents somewhat". (Teacher, School A, follow up)*

In addition to parents, support amongst the staff within school and utilising a whole-school approach was identified by one teacher as an essential element to effective implementation of outdoor learning;

> *"It's obviously up to the school, you know, if they didn't believe in it and they're just going out for the sake of doing it, than I think it's quite pointless then but if you are true believer in it and you can see value in it, I think you know you have to have your colleagues on board as well for it to work as a whole school initiative". (Teacher, School C, Follow up)*

Teachers and headteachers commented on the support for outdoor learning by senior management and school governors, facilitated by communication between all levels of staff. Governor support was highlighted by all three headteachers as crucial, owing to the financial support, decision-making and strategic delivery that governors are responsible for.

> *"…So we wanted to involve all those partners within that model [of outdoor learning], and you know, that has come at a financial cost as well but the Governors were very committed and have released funds for that". (Headteacher, School A, Follow up)*

Suggestions to overcome many of the resource and support difficulties experienced were often based upon shared practice both within and between schools;

> *"The Foundation [ages 4-7] first started it earlier than us originally so we, as a key stage 2, spoke to them, see what they did, went down to their classrooms and sort of spoke to them to see the kind*

of things they did. So I think it's just communication as well isn't it". (Teacher, School B, Baseline)

With regards to between-school shared practice, School B also had a trained outdoor learning specialist and thus, were proactive in sharing their resources and providing training to other schools. The other two schools discussed a less formal approach, relying on sharing their experiences of outdoor learning with one another but these schools advocated for more shared practice and resources to aid implementation.

3.4.2.6 Teacher Influence

Both pupils and teachers made links between the personality of a teacher and their enthusiasm with delivering outdoor learning. At baseline, teachers had mixed opinions of both their own and their colleagues' confidence to deliver outdoor learning. Some felt a lack of knowledge left them in a position of low confidence, whilst others felt more confident in their ability to adapt lessons to the outdoor environment;

"As I say not at the moment, not personally…If I knew what I was doing yes but it's coming up with the ideas in the first place, so I guess not". (Teacher, School A, Baseline)

"I think it's brilliant, I feel confident that I can do it, I feel enthusiastic about it, I think it's great for children to be given that freedom of being outside, and doing something which is going to help their learning, just because I think children find it difficult to be stuck behind a desk for so much of the time". (Teacher, School A, Baseline)

Teacher confidence was also influenced by the expected workload and traditional learning approaches associated with this key stage;

"Right, initially, I thought, "Oh, no!", because it's upper school, you tend to focus a lot of written work in class, and obviously foundation phase are used to doing it, so it was a case of, "Oh, where do I start?", initially. That was my first thought… No, I feel more confident now, now that it's sort of implemented into my teaching. I do feel a bit more confident in preparing outdoor resources". (Teacher, School B Baseline)

In addition, one teacher felt that for colleagues to buy into outdoor learning and feel confident to deliver the programme, it was important for learning objectives to be clear;

> *"…so long as they can see a point to outdoor learning, because there was a big myth when it started that we were just going to go out to the woods and play and it was going to be a free for all and I think that was the bit where they were saying "Oh what's the point in this", not just using it as a PE lesson, if they can see that there is a learning objective to it then I think it's much more". (Teacher, School C, Follow up)*

Those that had received prior training in formal outdoor programmes such as Forest Schools expressed higher confidence levels in delivering outdoor learning compared to those with less training;

> *"I'm quite confident myself, I've been forest school trained so it's something that I'm more confident... I think we've had a lot of training now with it and the more we do it, obviously the more confident we get so". (Teacher, School C, Baseline)*

The associations between consistent training, access to resources and teacher confidence was alluded to by a headteacher from another school, with this confidence impacting on how much outdoor learning was delivered at ground level. One headteacher also commented on the increase in confidence they had witnessed as the programme developed, indicating that increased experience in delivery resulted in higher levels of confidence;

> *"The other then is the confidence where, [name of teacher] has led, from just being apprehensive about taking children up to the woods, which is on our doorstep, as you know, all of a sudden he's walking children on a five mile walk…you know, where that's, in the past, a similar trip, we'd have had to pay for a guide to do that, he has the full confidence". (Headteacher, School C, Follow up)*

3.4.3 Perceived Impact on Learning, Health and Development

The perceived impact of outdoor learning on pupils' learning and development emerged as a theme in relation to behaviour, concentration and memory, skill development and benefits to health and wellbeing.

3.4.3.1 Behaviour

There were mixed responses regarding the perceived impact on pupils' behaviour. Those that believed it would have a negative effect at baseline made particular reference to the excitement of outdoor learning fuelling disruptive behaviour;

> *"If we were out, maybe like more start being hyper, because in class we probably have got discipline, once we start getting out and it'll be exciting". (Pupil, School B, Baseline)*

In comparison, other pupils felt that outdoor learning could improve behaviour through increased access to space;

> *"I think it'll change our [behaviour], like if we do once or twice a week, then it would change our behaviour in a way, inside school like, so outside we're not like fidgety, if we're outside, it's better". (Pupil, School B, Baseline)*

At the start of the programme, teachers recognised an improvement in classroom behaviour and even an improvement in the quality of work produced by pupils;

> *"Yeah, because when you come indoors they've had their fresh air, they're more likely to come in and you have that calm down time...and you get the better behaviour because they've had that chance to go …when they've been out, it's just so much more, there's just a better working atmosphere, so when you… the more opportunities to get out and about, up and down, not just doing something at a desk, the more quality work you're going to get from them when you do ask them to sit at their desk I think". (Teacher, School A, Baseline)*

This was also discussed in follow-up focus groups, with pupils making references to the effects of outdoor learning on subsequent behaviour in the school day;

> *"I kind of think it's better with outside, but then when you go inside for class, or everyone's a bit more tired". (Pupil, School C, Follow up)*

From the teachers' perspective, improved behaviour and engagement with learning was displayed by children with additional learning needs and behavioural difficulties;

> *"We do have children that have challenging behaviour, but we find they are far more engaged outdoors than indoors". (Headteacher, School B, Follow up)*

Indeed, while improved behaviour was voiced by all schools, particularly with regards to follow up work, others also believed behaviour was better during outdoor learning than in classroom-based lessons;

> *"No, we've got quite clear boundaries for them as well so it's not sort of a case of we go down the woods and it's a free for all, there's very strict rules as to behaviour in the woods, they stick to the... in fact, I'd say they stick to rules better when we're outdoors than they do when we're inside but I think it does, you know, you can see the impact back in the classroom then after we've been, definitely". (Teacher, School C, Follow up)*

The headteacher of this school recommended less affluent schools utilise pupil deprivation grants for outdoor learning as a suggestion to improve pupil behaviour;

> *"So, you know, I would urge, if I was a headteacher in one of those schools, I would…and the big deprivation grant…h I would definitely look to utilise some of that deprivation grant to encourage outdoor learning, and I'm sure it would have a positive impact on pupil behaviour. And the thing is, it's a vicious circle, isn't it, if children aren't behaving, they're not learning". (Headteacher, School C, Follow up)*

3.4.3.2 Concentration and Memory

Pupils suggested at baseline that the introduction of outdoor learning within their school day would have an impact on their concentration and memory. From a positive perspective, this was discussed in relation to the feelings of comfort experienced by pupils;

> *"Yes, because when you're outside you're not all sweaty and you like can't really concentrate that much when you're like really sweaty but if you're like outside you're like nice and cool so it'll help you listen better and concentrate better". (Pupil, School B, Baseline)*

However, the impact of distractions on concentration was also brought up during follow up focus groups, whereby pupils commented on greater distractions outside. Indeed, whether being outdoors had a positive or negative effect on their

concentration was debated among pupils and even internally by one pupil who demonstrated both sides of the argument;

> *"I think it does [improve concentration] but then it doesn't because it like helps people get more excited and it makes you listen more but then also it doesn't because we're all talking all the time outside and it's a lot louder so a lot of the time we don't listen to what the teacher says". (Pupil, School A, Follow up)*

> *"You could get distracted by cute dogs walking past, you could get distracted by trees blowing, you could get distracted by say if another child or pupil or class has been let out to play early, get distracted by them, a netball match or anything like that, you can just easily get distracted outside rather than in the classroom". (Pupil, School B, Baseline)*

The increased space offered by learning outdoors was discussed by teachers who believed that this made pupils more focussed on their learning;

> *"The only difficulty is I suppose is that sort of making your voice travel, and keeping them focussed, but then you know, in class that there's as much trouble there keeping them focussed, because they're sat close to each other on the carpet, you know, poking each other and stuff like that…I think if it's clear, they go out, they're focussed on the task, they've got their own space to do it in, they're not looking around, they're not looking for distractions, they're quite focussed on what they're doing". (Teacher, School A, Baseline)*

3.4.3.3 Key Skills Development

Pupils and teachers discussed the range of skills that they could develop through engagement with outdoor learning, including communication and teamwork;

> *"I think that like it makes us like learn how to work as a team". (Pupil, School C, Follow up)*

> *"They were much more able to collaborate outside as it's kind of freedom of the class, they might work in different groups and, you know, you're not expecting them, they share more easily". (Teacher, School A, Follow up)*

A range of other skills were discussed by teachers, including problem-solving, discussion skills and independence skills.

> *"The opportunity to work as a group, you know, they love the activities, and they get challenge activities, so they've got to use their problem solving skills, they've got discussion skills". (Teacher, School B, Baseline)*

Aside from learning specific skills, one headteacher believed that outdoor learning ensured children developed in a holistic way;

> *"Because it develops the whole child and it enables all of the children to develop those skills that children just don't seem to have. For us, we see children that haven't got the resilience, especially Year 6 children, they don't have the resilience to deal with such normal childhood situations and matters because they haven't interacted enough, they haven't risk-taked…so we want the children to develop, the whole child, the ability to be good citizens, but if they've never worked in teams, if they've never lost, if they've never failed, they haven't got those resilience, and then they haven't got the perseverance then to keep on trying". (Headteacher, School B, Follow up)*

3.4.3.4 Health and Wellbeing

During the interviews, there was a feeling among pupils that an increase in utilisation of the outdoors would help to increase physical activity and fitness. Outdoor learning was seen as a means of providing an opportunity to reduce sedentary time associated with traditional classroom based lessons:

> *"Without going outside you can't really keep fit and like indoors we're pretty much just sitting down at a desk writing". (Pupil, School B, Follow up)*

Indeed, many pupils advocated for increased opportunities to be active during outdoor learning lessons;

> *"More exercise and like maybe more games because what we did was looking around and just marking things off". (Pupil, School A, Follow up)*

This included opportunities for increased physical activity as well as the addition of structured sports;

> *"If we were doing sports with it, not so much learning, but like sports as well learning". (Pupil, School B, Follow up)*

Alongside the physical health benefits, pupils remarked upon the emotional health benefits in terms of a feeling of happiness and how this had a knock on effect with willingness to attend school;

> *"Yes, less bored and I think it's much happier to go to school". (Pupil, School B, Follow up)*

The discussion around wellbeing centred on the reduced sense of stress resulting from pupils learning outdoors;

> *"I think that they like us being outdoors because maybe they don't like us feeling stressed because we could be stressed in the classroom and instead of being stressed we're outdoors and we're happy". (Pupil, School B, follow up)*

This stress reduction was not limited to children, with one teacher also commenting to feel less stressed as a result of the outdoor learning programme;

> *"And I just think it's, yeah, I think it's stress relieving for teachers as well as children". (Teacher, School A, follow up)*

Indeed, for a few teachers, the introduction and responsibility of delivering outdoor learning provided them with a sense of increased personal wellbeing and in particular, job satisfaction at a time of extreme pressure;

> *"Just that happy that it's happening really… felt like a breath of fresh air and there …, being told by management and the head, let's get outdoors, it's like feeling like someone's taken the shackles off us and oppressive feeling, so it have felt like a bit of fresh air around the school and there's a new buzz…my feeling is just like, wow, this is just what I came into teaching for, this feels like teaching, whereas before it didn't feel like teaching to me, it felt like Orwellian nightmare [laughs]". (Teacher, School A, Baseline)*

3.5 Discussion

The overall positive and enjoyable experience of outdoor learning reported by children in this study is echoed by a high number of studies reporting children's experience of the outdoors[146,154,155]. Pupils described how outdoor learning provided them with feelings of freedom and fun and discussed this in relation to an

escape from the restricted, physical environment of the classroom. This also provided the opportunity for pupils to engage in and learn through play. This sense of freedom is reinforced in some of the earlier literature on outdoor learning, in which one of the main advantages of using the outdoor environment was the ability for children to learn through moving freely and play[156]. This freedom of the outdoors also provides children with important multisensory experiences that contributes towards improvements in motor development[157] and motor and sensory stimulation[158].

Pupils and teachers in this study commented on increased engagement with learning in the outdoors and overall school engagement. Research has demonstrated the ability of the natural environment to promote a desire to learn[155] and a positive relationship between learning and school motivation[159]. Teachers in our study suggested pupils' learning was facilitated through the experiential pedagogy of outdoor learning. Greater pupil engagement is reinforced in the literature in relation to experiential learning and the different pedagogy of outdoor learning, such as less confined outdoor spaces and outdoor resources[139].

The notion felt by headteachers in this study that children have the right to be outdoors is supported by others[113,160]. The United Nations Convention on the Rights of the Child (UNCRC) movement[161] within schools has improved the understanding and application of children's rights in recent years[162]. Teachers also felt that children have lost access to outdoor play environments. Indeed, the number of children participating in unstructured, outdoor play is decreasing and opportunities to access the natural environment are diminishing [163]. With this in mind, outdoor play through outdoor learning may be one of the only opportunities children have to experience the natural environment[121,164]. This engagement with and exposure to nature was cited as a benefit by pupils and teachers. At a time when environmental issues and sustainability are high on both the education and political agenda, outdoor learning provides the opportunity to encourage children to become environmentally aware and engage in pro-environmental behaviours throughout their life[165].

Whilst the positives of the environment and exposure to nature were discussed, safety was initially a concern by both pupils and teachers and has been mirrored in other outdoor learning studies[166,167]. However, whilst some pupils were concerned over safety in our study, feeling restricted by teachers was a negative by others. Research into teachers' pedagogical practice outside the classroom found that teachers' fears of class control outdoors triggers increased authoritative teaching practices[168]. Indeed, many pupils may thrive over the physical and risk taking challenges the outdoor environment offers[169] and removing all elements of risk may remove the fun aspect reported by pupils. Once outdoor learning was embedded in this study, teachers did not report any incidents and felt safety was less of a concern as children were more aware of boundaries. The need for an initial adjustment period has been raised in the literature, whereby once outdoor learning became embedded and students adjusted to the different learning environment, discipline became less of an issue and the rewards more apparent[140]. For the effective implementation of outdoor learning, it is essential for schools to consider the balance of risk and benefit in relation to perceived safety fears and opportunities for outdoor play.

Pupils also discussed the potential for distractions when working outdoors. Indeed, the outdoor environment transfers learning to a different learning space that requires children to balance their learning with background noise and distractions caused by the natural environment. Furthermore, the outdoor environment requires adaptations to teaching practice, and findings from this study suggest some teachers found transferring teaching from the classroom to the outdoors a challenge. Although the context of the outdoor environment provides different stimuli from the classroom that can distract pupils from learning, this also raises the question of teaching practice and the teachers' ability to deliver meaningful activities that maintain pupils' attention. Changes in teaching practice are a long-term process and require pedagogical development based on experience[168]. The teaching practice of outdoor learning was not assessed in this study and future research could incorporate this as a means of demonstrating best practice.

A key point of discussion by teachers was curriculum factors and accountability. This is unsurprising given the large amount of research showing curriculum pressure as a barrier to delivery of interventions in the school setting[40,42]. In relation to outdoor learning, research suggests that teachers' values may be influenced by top-down, external curricular pressure, suggesting incongruity exists between the narrow measurements children are judged on and the wider aims of education[139]. In this study, teachers discussed feeling overburdened and initially viewing outdoor learning as an additional pressure. For outdoor learning to be successful, schools need to value it as a means of achieving curricular goals, not merely an add-on initiative or an activity in isolation to their teaching[144]. Indeed, research with teachers has suggested a clear focus on curriculum related benefits would encourage a higher uptake of outdoor learning[170]. Conversely, it is essential for education inspectorates to view and support outdoor learning as a method in achieving curricular aims and this should be mirrored in testing requirements in which schools are judged.

In this study, teachers highlighted the barrier of evidencing work in the outdoors. Possible methods to overcome this have been suggested including taking pictures of work conducted outdoors and asking children to annotate this, advocating for more shared practice with regards to methods of evidencing work done outdoors[154]. A report by the Welsh Education Inspectorate (Estyn)[117] evaluating outdoor learning in Foundation Phase concluded that teachers assessed children's learning 'less often' and 'less well' outdoors than in the classroom, allowing for important developmental milestones to be missed. With the current focus by education inspectorates on academic targets, particularly in the higher key stages, it is essential that educators develop appropriate methods and tools to assess these skill developments in line with curriculum testing requirements in order to find value in the outdoors as a setting for learning.

Teacher confidence as a barrier to outdoor learning was identified by teachers in this study and has been cited in previous research[121]. Teachers are considered agents of change in delivering school-based programmes[171] and factors such as teacher confidence and level of training can influence the delivery of these

programmes[172]. Developing teacher confidence requires school-based, outdoor learning specific Continuing Professional Development (CPD) training[137]. However, research into teacher CPD demonstrates that it takes about 30 hours of training to make a significant change in pedagogy[173]. This level of contact required with teachers is unlikely to be feasible within the scope of inset and training days, and given the current high demand on teacher workload. A longer term solution would be to provide more focus on outdoor learning specific training for older aged children in teacher training, though this would not support current teaching staff in need of development and training.

All schools in this study referred to the need for financial support. However, a report by Natural England stated that simply providing funding for outdoor learning activities was not the answer to increasing education outside the classroom, with many schools on low budgets demonstrating excellent practice in outdoor learning[170]. In addition to financial support, teachers in this study highlighted the importance of senior leadership and governor support and advocated for a whole-school approach through all levels of school staff. Research has demonstrated that senior staff support was a strong enabler for the uptake of outdoor learning, in addition to passionate, committed and enthusiastic teaching staff[170]. Furthermore, wider support from parents and communities facilitates teachers' intrinsic motivation to deliver outdoor learning[142].

Perceived improvements in concentration highlighted by both pupils and teachers in this study is supported by research on the role of the natural environment and concentration using 'attention restoration theory'[174,175]. This theory suggests mental fatigue and concentration can be improved through the effective restorative environment of the outdoors. Improvements in behaviour were also cited by teachers, particularly the ability of outdoor learning to engage pupils with behavioural difficulties or additional learning needs. In addition, pupils and teachers commented on the positive impact on key skill development such as interpersonal and social skills and the enhancement of relationships through teamwork, all of which are recognised in the literature[121].

Pupils and teachers also discussed the health and wellbeing benefits of outdoor learning. Becker [123] highlighted physical activity (PA) and mental health as understudied outcomes. A benefit voiced by pupils in this study was the opportunity to be physically active and the reduction in time spent being sedentary. Pupils advocated for more opportunities to be active in outdoor lessons. With research demonstrating higher levels of PA being exhibited on outdoor learning days[176] and current upwards trends in sedentary behaviour, providing opportunities to be physically active during outdoor learning sessions could contribute to children's overall physical activity.

Improvements in both pupil and teacher wellbeing were also highlighted in this study and findings support outdoor learning as a means of improving children's mental health and wellbeing. Research has demonstrated that exposure to the natural environment in primary school plays a significant role in improving positive mental health and wellbeing for pupils[177,178]. Results from a recent systematic review also demonstrated the importance of access to green space on child mental wellbeing, overall health and cognitive development[179]. Teachers also reported feelings of increased job satisfaction and wellbeing, a finding that is mirrored in the literature[118]. Teacher wellbeing is considered a critical factor in creating a stable environment for pupils to learn[180] and has been associated with academic achievement[181]. However, much of the discourse around teacher wellbeing has focussed on the reported stress, burnout, workload and decline in teacher retention in recent years[182,183]. With this in mind, the benefits to teacher wellbeing and increased job satisfaction cited in this study suggest that outdoor learning may provide an avenue in fostering teacher wellbeing and creating learning contexts for pupils to succeed and reach their full potential. With research highlighting the relationship between health, wellbeing and education outcomes[19], results from this study highlight the potential for outdoor learning as a means of improving the health, wellbeing and education outcomes for children.

3.6 Strengths and Limitations

Findings from this study explore detailed experiences of outdoor learning from those at the forefront of delivery and implementation, headteachers and teachers. In particular, this paper contributes to the gap in experiences reported directly by pupils. The knowledge gained through interviews and focus groups from a whole-school perspective provides an opportunity for schools to reflect on the facilitators and potential challenges of implementing outdoor learning. This understanding of the barriers that schools have experienced encourages prospective schools to design and deliver tailored outdoor learning programmes.

There are a number of limitations to review when considering the findings from this study. The schools participating in this study all had a percentage of pupils eligible to receive free school meals below the national average (19%) and thus would be considered less deprived. Another limitation is the small sample included in this study, in particular the homogeneity of the schools and participants in relation to ethnicity. This may limit the transferability of the findings and requires future research to include larger sample sizes of socio-economic, ethnically, culturally and geographically broader populations. The schools included in this study all had access to green space or the natural environment within close proximity to the school setting. However, access to and availability of the natural environment was not recorded in this study. It is important for future research to explore the experiences and implementation processes of schools with limited access to the natural outdoor settings. In addition, research into the investment of school grounds to increase green space would be welcomed, thus bringing nature to schools. Despite these limitations, this study contributes towards the understanding of barriers and facilitators of an outdoor learning programme within the primary school curriculum. These findings provide schools committed to implementing outdoor learning with case study examples to ensure effective implementation to improve the health, wellbeing and education outcomes of pupils. Further research involving quantitative assessments of health, wellbeing and education outcomes would strengthen the knowledge base for schools and education inspectorates.

3.7 Conclusions

Participants in this study supported the case for outdoor learning in the KS2 curriculum, identifying benefits ranging across the personal, social, physical and curricular domains. The schools in this study reported a variety of benefits of outdoor learning for both the child and the teacher and for improving health, wellbeing, education and engagement in school. Findings highlight that outdoor learning has the ability to enthuse, engage and support children of all learning abilities in reaching curricular aims alongside positive improvements to health and wellbeing. With the relationship between education and health well documented throughout the life course, this study supports outdoor learning as a method of facilitating pupils in achieving their academic potential, improving educational experiences and attainment and ultimately improving future health outcomes and employment pathways.

Importantly, this study contributes to the gap in experiences reported by both pupils and teachers of outdoor learning programmes in the older ages of primary schools. Findings from this study offer schools important insights into the barriers and facilitators of implementing a regular outdoor learning programme within the KS2 curriculum. However, these findings highlight the gap that exists between the health, wellbeing and wider educational benefits achieved through outdoor learning, the lack of tools in evidencing these and the narrow measurements in which schools are judged on by education inspectorates. Results from this study advocate for additional help and support from education inspectorates to enable schools to feel that 'non-traditional' learning methods are valued and can address the curriculum pressures in which schools are measured on. More support, training and engagement for schools as well as direction from inspectorates is required if outdoor learning is to become a more mainstream method in addressing curriculum aims.

3.8 Author Contributions

Conceived and designed the study: EM, CT, SB. Conducted data collection: EM, CT, SB, RC, SD, HJ. Conducted data analysis: EM, CT, RC, SD. Wrote the paper: EM, CT. Provided critical input: DR, GS, RD. Provided supervision: SB, RL. RD acts as a school advisor to the HAPPEN project.

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Chapter 4 The Daily Mile: Whole-school Recommendations for Implementation and Sustainability. A Mixed-methods Study

Following on from the previous chapter, this study presented in Chapter 4 demonstrates HAPPEN's function of evaluating public health programmes delivered within the primary school setting. The Daily Mile is a universal school-based running programme that was developed by a headteacher in Scotland in 2012 in an effort to improve school children's physical activity levels. Since it was established, it has been delivered in thousands of schools across the world despite limited research existing on its anecdotal benefits. Therefore through HAPPEN, the primary aim of this mixed-methods study was to explore whole-school experiences of The Daily Mile from the perspectives of pupils, teachers and headteachers and to understand how implementation affected experience. The secondary aim of this research study was to understand the impact of The Daily Mile on children's cardiorespiratory fitness from high and low socio-economic areas. The findings from this study provide an important contribution to the literature through the form of a set of whole-school recommendations on the effective implementation of The Daily Mile to ensure that pupils' enjoyment and positive experiences of physical activity are at the centre of delivery.

This study has subsequently been published in PLOS ONE and has also been summarised as an article in The Conversation[81]. Following its publication, the results were presented to The Daily Mile Research Advisory Group and were shared by The Daily Mile Foundation as a press release. This created the opportunity for the findings to be filmed by ITV Wales. At the time of writing, the lead author (EM) is currently collaborating with The Daily Mile Foundation and London Marathon Events (official partner of The Daily Mile) in order to develop a branded schools information sheet promoting the whole-school recommendations featured in the published research.

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4.1 Abstract

Regular physical activity (PA) during childhood is associated with a range of positive health outcomes and higher educational attainment. However, only 2.0% to 14.7% of girls and 9.5% to 34.1% of boys are meeting the current PA guidelines of 60 minutes of moderate-to-vigorous PA daily. Schools are targeted as a key setting to improve children's PA levels. The Daily Mile (TDM), a teacher-led 15 minute PA intervention was established in 2012 and has been widely adopted globally. However, the dynamic school environment generates challenges for school-based interventions to follow a uniform implementation method resulting in sustainability issues and limited evaluation. The aims of this mixed-methods study were to (1) explore whether whole-school experiences of TDM were related to implementation and (2) examine the association between TDM and cardiorespiratory fitness (CRF) in children from high and low socio-economic groups. Focus groups with pupils (n=6) and interviews with teachers (n=9) and headteachers (n=2) were conducted to explore factors associated with successful implementation. Pupils (n=258 imputed) aged 9-11 from six primary schools in south Wales, United Kingdom participated in CRF assessments (20m shuttle run test) at two time-points (baseline, 6 month follow-up). Thematic analyses of qualitative measures and linear regression analyses of quantitative measures were used to assess the research questions. Qualitative findings identified implementation factors associated with a positive experience of TDM; flexible and adaptable, not replacing current play provision but delivered as an additional playtime, incorporate personal goal setting, teacher participation, whole-school delivery with community support. Both groups demonstrated equal increases in shuttles between baseline and follow-up (deprived: 4.7 ± 13.4, non-deprived: 4.8 ± 16.0). There was no significant difference in this increase for deprived compared to non-deprived children adjusted for age and gender. Findings from this study provide a set of recommendations for the future implementation and sustainability of TDM.

4.2 Introduction

Establishing healthy behaviours such as regular PA in childhood is important for maintaining healthy habits through to adulthood. During childhood, regular PA is associated with reduced body fat, more favourable cardiovascular and metabolic disease risk profiles, enhanced bone health and reduced symptoms of anxiety and depression[95]. Activity status during childhood is predictive of PA levels during adulthood[184] and benefits of regular PA during adulthood include a reduced risk of heart disease, stroke, diabetes, breast cancer, colon cancer and 20-30% lower risk of all-cause mortality[95]. The benefits of regular PA are not limited to health outcomes. Research has demonstrated the association between higher levels of moderate-to-vigorous physical activity (MVPA) and increased educational attainment[185]. PA is also the principle, modifiable determinant of cardiorespiratory fitness (CRF)[186], which reflects the cardiovascular and respiratory system's capacity to supply oxygen during long-term PA[187]. Higher levels of CRF during childhood have been associated with a range of positive health outcomes similar to those of regular PA such as cardiovascular health. Research has demonstrated the relationship between PA and CRF in children regardless of gender, age, ethnicity, economic status and school[186]. Current guidelines for PA recommend that children and young people aged 5 to 18 years should engage in an average of at least 60 minutes of MVPA per day to elicit positive health outcomes[188].

Globally, physical inactivity is a major public health concern and efforts to increase overall PA and decrease sedentary time across the population are encouraged[189]. Recent European objectively-measured PA data suggests that the proportion of children meeting the PA guidelines ranges from just 2.0% to 14.7% in girls and 9.5% to 34.1% in boys[190]. Furthermore, survey level data from the latest Active Healthy Kids Wales Report Card within Wales, UK suggests that just 34% of children aged 3-17 years are meeting these guidelines[191]. In response to this data, the expert research group concluded the need to strengthen efforts in creating opportunities that increase children's PA. This group also highlight the gap in nationally representative data[191].

However, accurately measuring children's PA levels presents a number of methodological limitations[192]. Self-report methods including questionnaires are associated with subjectivity issues such as recall bias and are not advised in children younger than 10 due to their limited ability to accurately report PA[192]. On the other hand, whilst objective measurements such as accelerometry can measure PA across the domains of frequency, intensity and duration, they require participant adherence and are high-cost for researchers. Thus, as increasing levels of PA in childhood improves CRF and higher levels of CRF are associated with positive health outcomes[193], measuring CRF in children through methods such as the 20m shuttle run test (20m SRT) provides a valid, low-cost and pragmatic approach to assessing health-related PA interventions[194].

Children spend a significant amount of time in school and schools provide access to large populations from a range of socio-economic backgrounds. With evidence demonstrating the rising levels of childhood physical inactivity, schools are targeted as a key setting to improve children's overall PA levels and health outcomes through implementing school-based running programmes[195]. Universal interventions directed at all children are attractive to schools due to their perceived lack of stigma, their ability to reach whole-classes and their potential in reducing health inequalities in later life[196]. Furthermore, teacher-led programmes that are low cost and require limited resources are favoured by schools in a time of education budget cuts and academic pressures. Comparable to other health behaviours, physical inactivity levels are higher amongst children from lower socio-economic groups[197]. Research has highlighted a scarcity of evidence examining child PA interventions across socio-economic groups[198]. However, the concern that intervention effects are stronger amongst children with better health outcomes as opposed to higher-risk children has been highlighted[199]. Thus, to avoid exacerbating the inequality paradox[200], it is important to examine the effects of universal school-based programmes across socio-economic groups.

With this said, an increasing number of running programmes are now available to schools[201], and in some cases are widely adopted despite limited evidence existing of their efficacy or effectiveness[202]. The Daily Mile (TDM) was

established in Scotland in 2012 by a primary school headteacher to address concerns over pupils' perceived lack of CRF. This daily, teacher-led activity involves primary school children walking, jogging or running for 15 minutes during class-time within the school grounds[203]. The intervention's simple design and replicability has resulted in rapid uptake and is now being delivered in over 480 schools in Wales, and over 10000 schools worldwide[204]. This expansion was partly encouraged by rapid media and government attention, despite at the time no published evidence existing regarding its anecdotal benefits such as improved CRF, behaviour and concentration. Authors of a recent pilot study suggest that TDM is effective in increasing MVPA and CRF, decreasing sedentary time and improving body composition[205]. However, this study has been widely critiqued due to methodological weaknesses such as a small sample size. In a response, Daly-Smith *et al.*[206] suggest a more cautious interpretation of these conclusions is required and call for further evidence of TDM in establishing an understanding of its impact, both positive and negative. Furthermore, a 'how to guide' has been published by the University of Stirling as an outline for schools regarding implementation and research findings[207].

The school environment is a complex system constructed of varying contextual factors[208]. This dynamic environment generates challenges for school-based interventions such as TDM to follow a uniform implementation method resulting in sustainability issues and a lack of evaluation[209]. Conflict also exists between the need for schools to strictly adhere to intervention design, recognised as intervention fidelity[210], and the variety of barriers and facilitators that influence the delivery and success of implementation such as adaptability and flexibility[211]. Previous research into school-based running programmes has demonstrated the variability in implementation across schools[48]. Interventions often lack foundation research assessing the acceptability and feasibility[212] which provide insights that inform future intervention implementation. In the case of TDM, the rapid adoption encouraged by media support and celebrity endorsement has resulted in wide global uptake at the detriment of feasibility studies assessing implementation factors. With evidence demonstrating that better quality implementation results in improved outcomes, this research is invaluable. Research has advocated that in order to

interpret the evaluation of intervention outcomes, it is necessary to also examine the intervention components and implementation factors[210].

Two recent qualitative studies exploring the implementation processes and participants' experiences of TDM identified a number of factors associated with intervention success[213,214]. These included a need for simple core intervention components, flexible delivery encouraging teacher autonomy and intervention adaptability. Benefits cited by teachers included improved teacher-pupil relationships and the positive impact on pupils' health, wellbeing and fitness[214]. In contrast, a number of barriers were identified such as weather, resources and the perceived impact on learning time. Furthermore, the delivery style varied widely between schools, warranting further investigation into how delivery affects participants' experiences. These studies provide an important contribution to the understanding of implementation and experiences of TDM. However, both studies focussed solely on teachers involved in delivering TDM and the authors called for further research to incorporate children's views. To date, no research exists examining implementation factors of TDM from a whole-school perspective i.e. from pupils, teachers and senior management. In order to develop and deliver effective interventions, it is vital to gain the viewpoint of the recipients of interventions; the pupils. In addition, it is important to understand the processes, barriers and facilitators of universal interventions from a whole-school perspective, incorporating objective measures of outcomes with qualitative research from a whole-school perspective of headteachers, teachers and pupils to improve understanding. This research is essential in informing the future delivery and sustainability of widely adopted interventions such as TDM.

The primary aim of this mixed-methods study was to explore the pupils', teachers' and headteachers' experiences of The Daily Mile and understand whether experience was related to implementation. The secondary aim of this study was to examine the association between The Daily Mile and children's cardiorespiratory fitness and compare this association between children in high and low socio-economic groups.

4.3 Materials and Methods

This mixed-methods study adopted a natural experiment approach with six primary schools interested in implementing TDM in south Wales, UK. Qualitative (headteacher and teacher 1:1 interviews, pupil focus groups) and quantitative measures (20m shuttle run test) were employed at two points (baseline and follow-up). Thematic analysis of qualitative measures was used to generate themes regarding the implementation of TDM and the associated experience of participants from a whole-school perspective. Multiple linear regression model analysis of quantitative measures was used to examine the effect of TDM on the CRF of children in high and low socio-economic groups.

4.3.1 Ethics

Ethical approval was granted by the College of Medicine Research Ethics Committee (approval number: 2017-0009A). Headteachers, teachers and parents provided informed written consent and children written and verbal assent prior to participating in the research study. All participants were reminded that their participation was voluntary and they had the right to withdraw from the research at any stage. All personal data such as school names and pupil names were anonymised. Paper based data (consent) was stored securely in a locked cupboard and electronic data (interview and focus group transcripts, quantitative data) was stored in password protected documents on a secure University server.

4.3.2 Study Design

This research study is a natural experiment with six schools who expressed an interest in implementing TDM. A natural experimental approach is considered the most suitable methodology when intervention implementation cannot be controlled by the researcher[215]. In the case of this research study, this was due to the rapid adoption of TDM encouraged by media and political attention[216]. In this research study, schools began delivering TDM at three time-points aligned with academic terms (School A – January 2017, start of spring term, School B – May 2017, start of

summer term, School C-F – September/October 2017, start of autumn term). Data collection was completed in two phases to reflect the two academic years (Phase one 2016-17- School A and B, Phase two 2017-18 – School C-F). Data collection was conducted at two time-points; baseline (before implementation) and follow-up (3-6 months post implementation). A diagram representing data collection periods across schools A-F is provided for clarity in the supporting information (Appendix 10: Schematic Diagram of Data Collection (The Daily Mile)). A mixed-methods approach utilising both qualitative exploration and quantitative analysis was adopted to examine the research aims. Implementation level of TDM was not directly measured in this study but rather, emerged anecdotally through qualitative analysis. The purpose of this study was to understand the experiences of participants in relation to implementation of TDM to inform future practice and sustainability rather than to develop new theory.

4.3.3 Participants and Setting

A convenience sample of six primary schools (School A-F) from south Wales, UK, who were about to implement TDM within their school agreed to take part in the research study. This sampling method was chosen with the aim to gather information-rich cases from schools committed to implementing TDM[69]. At the time of the study, there was political and public health support for primary schools within Wales to deliver TDM[216]. The schools participating in this research study were members of HAPPEN, which aims to evaluate and share the evidence base for interventions currently delivered in primary schools in order to improve children's health, wellbeing and education outcomes[93].

The initial school recruitment process was facilitated through an AYP Officer from the Local Authority's Sports Development team through an existing partnership with HAPPEN. The AYP officer had established links with all primary schools in their cluster area within the Local Authority and emailed these schools with an expression of interest in implementing TDM. Six primary schools (Schools A-F) responded and were subsequently contacted through HAPPEN via email regarding their intention to implement TDM. Recruited schools were then contacted via a telephone

conversation with the headteacher. The percentage of pupils eligible for free school meals ranged from 4-54% for the six schools (national average 19%)[217]. The school size ranged from 175 to 275 pupils. Schools had minimal experience of implementing previous whole-school running programmes.

Following headteacher consent, the lead researcher (EM) delivered an information session about the study and distributed information sheets and consent forms to pupils aged 9 to 11 years (years 5-6) and their teachers at a school assembly. Each assembly provided pupils and teachers with the opportunity to ask questions about the research study. All pupils from years 5&6 from schools A-F were invited to participate in both the qualitative and quantitative measures. Pupils had the option to consent to participate in one or both measures in consent forms. Headteachers and all teachers from years 5&6 from the six schools were invited to participate in the qualitative measure.

4.3.4 Instruments and Procedures

Data collection was completed in two phases through the existing HAPPEN project, presented in the supporting information (Appendix 10: Schematic Diagram of Data Collection (The Daily Mile)). Phase one (Schools A and B) baseline data collection was conducted in January (School A) and May 2017 (School B) and follow-up data collection was completed in July 2017. Phase two (Schools C, D, E, F) baseline and follow-up data collection was completed in September/October 2017 and March 2018. Both phases and time points followed identical protocols. Qualitative and quantitative assessments were carried out by trained researchers.

4.3.4.1 Qualitative Measures

A qualitative approach is regarded the most suitable methodology in exploring barriers and facilitators of programme implementation[147]. In order to explore the primary aim of this research study, semi-structured 1:1 interviews with headteachers and teachers and focus groups with pupils were employed to gain an insight into implementation and experience of TDM in the primary school setting. This consisted of focus groups with pupils at baseline (n=2) and follow-up (n=4), 1:1

interviews with teachers at baseline (n=3) and follow-up (n=6) and 1:1 interviews with headteachers at follow-up (n=2). Interviews with headteachers and teachers were conducted by one researcher during the school day either by telephone or face to face on the school premises according to individual preference. Pupil focus groups were completed during the school day within a private room at the school setting, with two researchers present. The lead researcher (EM) was female and had previous experience in conducting interviews and focus groups with both adults and children in the field of school-based research. The researchers ensured that interviews and focus groups were conducted with minimal disruption to the school day and at a time that was convenient for teachers and pupils.

Each focus group was conducted by year group and consisted of between six and eight pupils[151] aged 9-11 years of mixed physical activity ability and gender. Class teachers were provided with a list of consented pupils and selected pupils fulfilling this criteria. Teachers were reminded of the need to include pupils of a range of physical activity abilities. This list was discarded following selection of pupils and a final list of pupils participating in focus groups was not recorded to ensure anonymity. All interviews and focus groups followed a semi-structured topic guide, initially developed by EM and CT and reviewed by SB to address the qualitative research aims. In order to explore participants' experiences of TDM, it is important to consider the barriers, facilitators and factors affecting sustainability. These factors are consistently included in other research evaluating school-based interventions, and therefore framed the topics guides for this study[214]. The use of semi-structured topic guides facilitated a deeper exploration of subjects and allowed topics to form naturally during the interview process[152]. These topic guides were not piloted prior to data collection but were based on previous school-based programme research through HAPPEN[80]. Example questions included "How do you feel about implementing the Daily Mile?" (teacher) and "Would you like to carry on with the Daily Mile and why?" (pupil). Full topic guides for interviews and focus groups can be found in the supporting information (Appendix 11: Interview and Focus Group Topic Guides (The Daily Mile)). The duration of interviews ranged between 5 and 21 minutes and focus groups between 23 and 48 minutes. The lead researcher (EM) facilitated the

interview process, whilst the other researcher provided technical support (digitally recording) and made field notes on key responses. At the start of each interview and focus group, researchers reminded the participants of the study aims, guidelines on anonymity and confidentiality and encouraged participants' personal viewpoints. In order to achieve neutrality, researchers emphasised that they remained impartial and there were no right or wrong answers. In order to gain respondent validation, these notes were verbally summarised through member checking with interviewees at the end of each interview. To ensure trustworthiness, the researcher's interpretation of responses were summarised for corrections, clarification or confirmation by participants[153,218].

4.3.4.2 Quantitative Measure

In order to examine the secondary aim of this research study, children's CRF was assessed using the 20m SRT. The 20m SRT was conducted at the University's indoor athletics facilities and followed procedures outlined in the Eurofit Battery[94]. During this continuous running test, participants run between cones placed 20m apart in time with bleeps recorded on an audiotape. The initial running velocity of 8.5 km/h increases by 0.5 km/h each minute[219]. The time between consecutive bleeps decreases as the test progresses and the last shuttle a child is able to run is recorded. Cut points classifying children as fit and unfit were assigned according to total number of shuttles (fit: boys >=33 shuttles, girls >=25 shuttles) as these thresholds reflect cardiometabolic risk scores in children of this age group[96]. Prior to completing the 20m SRT, researchers provided verbal instruction about the test and a demonstration. Children were reminded of the study aims, their right to withdraw and provided additional verbal consent prior to participating.

4.3.5 Statistical Analysis

4.3.5.1 Qualitative Analysis

The qualitative component of this research study adopted an interpretive approach through thematic analysis in order to gain an understanding of participants' experiences of implementing TDM. All interviews and focus groups were digitally

recorded and transcribed verbatim in Microsoft Word. The process of analysing the interview and focus group data followed the steps outlined by Burnard (1991)[220]. To begin, each transcript was independently read several times by two researchers (EM and CT) to facilitate immersion in the data. The researchers (EM and CT) then followed an independent open coding process to allow participants' views to be summarized by assigning words or phrases to quotes or paragraphs. This initial list of freely generated categories following review of the transcripts aimed to encapsulate interviewees' responses and were subsequently grouped according to the overarching theme. Through this process, broader categories were combined to produce one higher-order heading that captured the overall meaning of responses. This process was repeated whereby similar categories were synthesised to produce a final list of themes and sub-themes. Both researchers (EM and CT) compared their lists of themes and sub-themes to ensure accuracy and consistency. If there was a discrepancy or disagreement in coding, a third researcher (SB) adjudicated. This method enhances the validity of categories assigned and attempts to reduce researcher bias[220]. The written notes taken on the day of the interview or focus group were compared with these topics to ensure an accurate account of participants' responses. Following this, the two researchers worked together through an extensive process to discuss codes and categorise them under final themes and sub-themes (Appendix 12: Themes and Sub-themes (The Daily Mile)). The lead researcher (EM) then manually worked through each transcript and coded the responses according to the final list of themes and sub-themes. All responses grouped by themes and sub-themes were compiled to a master copy document that was used for reference to write up the findings.

4.3.5.2 Quantitative Analysis

Analyses were performed in STATA (version 15). Multiple linear model regression analyses was used to examine the association of TDM on children's CRF. Schools provided date of birth (to calculate age) and postcodes (to calculate individual level deprivation) for consented pupils. Discrepancies in numbers within results tables are due to missing age and postcode data. The explanatory variable (individual pupil deprivation) was adjusted for confounders (baseline age, gender).

Analyses were also clustered by school to account for school-level differences. Deprivation was assigned as an area-based socio-economic measure using the Welsh Index of Multiple Deprivation (WIMD)[221]. Weighted scores for eight domains of deprivation are calculated as a WIMD score for each LSOA. WIMD scores are ranked from most to least deprived and grouped into quintiles (1=most deprived, 5=least deprived). For the purpose of this study, a binary *deprived* (WIMD quintiles 1, 2) and *non-deprived* (WIMD quintiles 3, 4, 5) variable was assigned representing low and high socio-economic groups.

A constraint of school-based research is the potential for missing data due to pupil absentee at random, through illness or other school commitments that prevent them from participating in data collection, contributing to bias in results [222]. To overcome this, missing data in this sample were imputed. The Multivariate Imputation by Chained Equation (MICE) method in STATA using baseline and follow-up data (shuttles, age, deprivation) was used to impute missing data for those missing at either time-point. Data were assumed to be missing at random (e.g. probability of being missing does not depend on the missing value) on the basis that there was no significant difference of baseline shuttles between groups (missing at follow up, present at follow up).

4.4 Results

4.4.1 Qualitative Results

The primary aim of this research study was to explore the pupils', teachers' and headteachers' experiences of TDM and understand whether experience was related to implementation. The overall implementation of TDM varied widely amongst schools. Although this was not measured directly, this variation in delivery styles emerged from the transcripts and is reflected in the overall experiences of participants. Two over-arching themes arose from the data; 1) The Daily Mile implementation and 2) impact on learning, health and wellbeing. Theme one, The Daily Mile implementation will be discussed in relation to the conflicting sub-themes that reflect the varying implementation and experience of participants; flexible vs

rigid principles, curriculum time vs playtime, competitive vs non-competitive, active teachers vs passive teachers, supported vs unsupported, and summer vs winter. Theme two, impact on learning, health and wellbeing will be discussed through the following sub-themes; behaviour and concentration, physical activity and sport, psychological benefits, social benefits.

4.4.1.1 The Daily Mile Implementation

4.4.1.1.1 Flexible vs Rigid Principles

This theme relates to the varying implementation style adopted by schools; either demonstrating flexibility and adaptability or following the original principles set out by TDM. School A suggested that it required flexibility from individual classes within the school and implementation reflected this;

> *"Yes, different classes do different things, so what works for one class doesn't necessarily work for another class. In Year 2, we tend to run it about two o'clock in the afternoon because we don't get an afternoon play, so we do it then and it breaks the afternoon up, which is quite nice. Other classes have been doing it first thing in the morning, other classes have done it last thing, quarter past three, different things work for different classes." (Teacher, School A, Follow-up, T12)*

This view was mirrored by school D who supported an 'anything is better than nothing' perspective;

> *"I think it is do what suits you. Don't worry about what anyone else is doing. Even if it is 5 minutes it's 5 minutes it is better than nothing. I just think just to think carefully about it is worth the infants doing it and then just finding that time slot really, try looking a bit differently at your school time table to free up a bit of time that is maybe non-productive time at the moment." (Headteacher, School D, Follow-up, T3)*

In addition, implementation that encouraged any form of movement as opposed to enforcing running was discussed positively by both teachers and pupils in relation to the importance of participation;

> *"One thing about it is that you're meant to try and do your best in it, do what you can, like run it, walk it, or jog it, doesn't really*

matter, as long as you actually do it, as long as you do it." (Pupil, School E, Follow-up, T14)

"There's a couple of, a couple of girls I'm thinking of who I think they've just skipped [laughs] about, I don't think they've done any running, they've skipped the mile every day, but at least they were doing it." (Teacher, School A, Follow-up, T12)

In comparison, school B believed maintaining a consistent implementation method based on the original Daily Mile principles was important;

"What happens with these initiatives is they get put into school and then the school change them, so then it doesn't stick really to the principles of TDM which were there in the first place it doesn't really fit with the core principles that TDM set out". (Teacher, School B, Follow-up, T10)

In order to ensure that schools do not deviate from these principles, this teacher suggested an external Daily Mile advisor for schools;

"So I think that there needs to be somebody, an advisor that schools can go to to make sure that they are sticking to their original Daily Mile plan and not turning it into something else…it just takes away from the whole point of it... there are 10 core principles set out in TDM documentation, I just think it needs to be you know, stuck to that original plan." (Teacher, School B, Follow-up, T10)

However, a consistent implementation method that maintained the original principles was associated with a lack of enthusiasm and engagement by many participants;

"If the children are doing something like that every day and it's the same thing day-in-day-out I feel they…the novelty wears off... I think it's like a lot of initiatives, you know, when we first have these initiatives the children are all up and ready and keen and love doing these things, but unless it changes or unless something is added to it, or unless they get something out of it, it's just a day-in-day-out thing." (Teacher, School A, Follow-up, T6)

A rigid implementation of TDM and lacking variety disengaged pupils. In order to maintain enthusiasm, pupils incorporated elements of play;

"I don't mind it now because I try and mix play and TDM together somehow. We do like tapping on the head while run around the yard." (Pupil, School F, Follow-up, T16)

In addition, pupils suggested a number of ways in sustaining their engagement such as utilising sports equipment and varying the location;

"I also think that they could put sports equipment in the middle because some people might want to do a different sport and not running. (Pupil, School F, Follow-up, T16)

We could change it by going like a different place, not just the same place because it's quite boring if you just go round the same place." (Pupil, School E, Follow-up, T13)

Therefore, incorporating flexibility lead to a more positive experience and increased engagement from most pupils.

4.4.1.1.2 Curriculum Time vs Playtime

There were conflicting approaches adopted by schools with regards to the time allocated for TDM. This comprised of either implementation during the taught curriculum or an additional/replacement of pupils' playtime. One of the main concerns for all headteachers and teachers was the curriculum pressure by educational inspectorates. Although schools wanted to implement TDM, finding 15 minutes within the narrow curriculum was a challenge;

"We were all sort of a bit sceptical when it first come out, sort of just timings it is in school, it's not that we didn't feel it would be a good thing to do, it's just we've got so much to do in school it was sort of timing that was our issue as a class teacher, to fit everything in and to do it not to take up their playtime." (Teacher, School B, Baseline, T9)

For some schools, this curriculum pressure forced them to find alternative opportunities in the day to deliver TDM. The headteacher from school F explained that curriculum and parental pressure influenced their decision in replacing pupils' playtime;

"There are so many pressures on schools these days with their drilling with welsh and this that and the other it is so difficult. We

have tried to get it that it doesn't eat into lesson time. I think there were some concerns with parents with regard to would this 15 minutes eat into lesson time which is why we tried to put it into playtime." (Headteacher, School F, Follow-up, T15)

For many pupils, the replacement of their playtime was a negative factor associated with their experience;

"If it wasn't taking up our play time which is one of the fun moments of the day, then I would do it, because it is during play I don't really want to do it." (Pupil, School F, Follow-up, T16)

However, this headteacher recognised pupils' frustration and utilized their pupil voice group to incorporate pupils' suggestions and maintain engagement;

"One thing that has gone well, we have got a portable speaker so we put music on for the children to run around to music, they quite like that. One suggestion…we have a 'Healthy Pupil Voice' group, is that they are going to create different playlists to try and put a bit of variety in it." (Headteacher, School F, Follow-up, T15)

In contrast, schools without an afternoon playtime coordinated TDM to be delivered as an additional playtime through a restructure of the school day;

"We thought there is no point in doing it in the morning because it is usually afternoon when they dip... So we actually changed the lunch hour, we shaved 10 minutes off the junior lunch hour, so they go back into class 10 minutes earlier, so that means they were not missing any of their lesson time. So we have actually put the 10 minutes into the afternoon break and they seem to find that this doesn't bother them at all...I think everyone enjoys the 10 minutes of fresh air and the break. They all go back a bit more replenished and bit ready for the next hour challenge." (Headteacher, School D, Follow-up, T3)

The addition of an afternoon playtime to participate in TDM was supported by all pupils;

"All the infants [younger Key Stage] get their play, they put TDM in as basically our third play, which is good." (Pupil, School D, Baseline, T1)

With curriculum pressure being highlighted by schools, some overcame this by integrating TDM within Physical Education (PE) lessons;

> *"We looked at the time tables for everybody and realised that was the only spot that we had. But what we tend to do is if the key stage 2 staff have PE on a particular day they won't do their Daily Mile at 12.50 they will do it during their PE session. So they tag it on twice at the beginning of the PE session or the end." (Teacher, School C, Follow-up, T11)*

In addition, school B used TDM in achieving the weekly recommended guidelines for PE provision;

> *"We work quite smartly here so we link, we try to link everything in as best as we can, as I said fits in with my topic…That's not the same with every class but, you know, there are opportunities to link it with curriculum, yeah, with curriculum target skills, so that's good. And it will help to count towards our overall PE time for the week as well." (Teacher, School B, Baseline, T7)*

Overall, the addition or replacement of pupils' playtime for TDM was a significant contributing factor to pupils' experience.

Delivering TDM as an extra afternoon playtime and an additional break from lessons was a positive factor influencing pupils' experience. However, replacing scheduled play caused a significant problem for pupils who enjoyed the autonomy and freedom of playtime. Although TDM was not intended to act as a replacement to PE, for some schools this was the only opportunity in the school day that did not take away from curriculum time.

4.4.1.1.3 Competitive vs Non-competitive

Conflicting messages regarding competition within TDM were conveyed by participants. Teachers discussed the challenge that existed in balancing competition. For some pupils, the competitive element fostered participation and enthusiasm whereas for others, competition completely disengaged them. This teacher felt that children thrived in competitive environments, but this was at odds with the original Daily Mile principles;

> *"I think they like the competitive element, which is not what it's meant to be. Then some of them, they're just not enthusiastic for sport and that's the negative isn't it? We've got the ones who are very enthusiastic and then the ones who really can't be*

bothered…And I know it's not meant to be competitive but that's the sort of, that's what children like. They like to do their best. They like to win. So it's difficult." (Teacher, School B, Baseline, T5)

However, finishing last was a cause of concern for some pupils who associated this with ability, suggesting that a continuous bout of 15 minutes of activity was favoured than the completion of an actual mile;

"Well some of them don't like just running in general, but some of them, and some of them are desperate not to be last, like no-one wants to be the worst runner in the class." (Pupil, School E, Follow-up, T14)

Many teachers also recognised the need for rewarding pupils to encourage their participation, stating that the wider benefits of participation were not valued by pupils;

"I know it's not meant to be a competitive thing but there needs to be some sort of reward. They need to see some sort of purpose in doing it. Yeah okay, I'm doing it to see if it affects my performance in school, but that doesn't mean anything to our children." (Teacher, School B, Baseline, T5)

To overcome this challenge, another teacher from this school suggested incorporating goal setting and enabling competition through personal targets;

"On Healthy Schools week I did for Year 6 because it's Healthy Schools week so we did record times for one week as the children were not against each other, but they were recording their own personal best and that was the week that really worked well with my class particularly, just because they were, not being competitive with anybody else, but they were setting a target for themselves, do you know what I mean?" (Teacher, School B, Follow-up, T6)

Overall, implementation that incorporated goal setting as a means of highlighting progress and personal achievement fostered engagement and motivation to participate in TDM. Findings regarding competition were mixed and depended on the individual pupil and their perception of competition, either thriving or disengaging in this environment.

4.4.1.1.4 Active Teachers vs Passive Teachers

The involvement and role of teachers during TDM was discussed by participants. Two clear themes emerged; active teacher involvement and participation or passive and disengaged teachers. Participants discussed the positive effects of teacher involvement in the implementation of TDM. For pupils, teacher encouragement and participation influenced their engagement;

> *"They [teachers] actually try and like do it, they would tell us and in encouraging and inspiring way. They're like, come on, come on, go on, you can do it, come on!" (Pupil, School D, Baseline, T2)*

Teachers were also aware of the enabling role they played in pupils' participation and supporting children that found TDM challenging. In addition, this teacher also acknowledged the benefit of participation on teachers' fitness;

> *"Staff are good, I am trying to encourage them to run it at the same time as the children. Some members of staff will run it as well; I like to join in as well. Even if it's a case of just walking around with them for those children who are struggling. I am keen that the staff don't just stand around watching them, that they try and get involved as much as possible for our own fitness levels as well...I think I would encourage other schools to take it on and try to keep it up. To try to get the staff more involved. You get the staff to encourage the children to run and obviously set a good example by them doing as well." (Teacher, School C, Follow-up, T11)*

In contrast, some pupils from other schools discussed the passive involvement of teachers and the negative effect this had on participation. For pupils, disengaged teachers resulted in disengaged pupils and rule breaking;

> *"I think that the teachers should start running it, because they're just like standing there while we're doing all the running and I feel like they should be doing it…If they joined in I would run more." (Pupil, School E, Follow-up, T14)*

> *"I think that the teacher should actually watch because everyone usually cheats, [teacher] is usually just on her phone [all laugh]." (Pupil, School E, Follow-up, T14)*

The importance of role modelling was also recognised by teachers in reference to the correlation between the lack of teacher enthusiasm and pupil engagement;

> *"I just get the feeling that they're [teachers] really not that into it so they haven't then passed on their enthusiasm to the children and I think that staff have been supervising the children but not joining in, and then it becomes something that children are being told to do instead of something children and staff are doing together." (Teacher, School B, Follow-up, T10)*

Teachers seeing value and benefit to pupils was crucial to gaining their support and enthusing pupils. However, some schools discussed the conflict that existed between the engagement of teachers from different year groups;

> *"I think some can definitely see the benefit of it, others I think feel that it is something else, another initiative, and that's probably been the difference between Foundation phase [ages 4-7] and Key Stage 2 [ages 7-11] as well is that the Foundation phase staff have been quite enthusiastic about it, Key stage 2 have been a little bit apathetic if you towards it and if it doesn't come with enthusiasm from the staff the children will pick up on that won't they?" (Headteacher, School F, Follow-up, T15)*

This view was reflected by school B who felt that TDM favoured the lower key stages in which the curriculum is delivered through play;

> *"The foundation stage staff are more engaged I think because it's easier to fit in their daily routine, because the children there are learning through play anyway. It's not a big chunk out of the curriculum when that is something that they [foundation phase] do anyway, and I definitely have better engagement from foundation stage staff, even at the idea stage than I had from Key Stage 2 staff." (Teacher, School B, Follow-up, T10)*

Teacher buy-in and active participation in TDM was important in modelling behaviour and motivating pupils. However, concerns were raised by some participants regarding the engagement of teachers from the higher key stage of primary school.

4.4.1.1.5 Supported vs Unsupported

The varying level of support from staff, parents, stakeholders and the wider community were discussed by many participants. The importance of headteacher support was identified as a critical factor in gaining the support of parents. Communication through social media facilitated this;

> *"Initially the first week we had a few grumbles on Facebook [by parents] on the social side, basically complaining that their children were feeling sick after doing the run…But our Head, was quick to reply to that message and basically said that we were out and none of them complained about feeling unwell so, we think it is the parents job to try and support the school in new initiatives and that we are doing it for their children's health and wellbeing, so stop moaning about it basically and we haven't have any problems since." (Teacher, School C, Follow-up, T11)*

In addition to parental support, engaging with sporting role models within the community acted as a way of inspiring pupils about physical activity and fitness;

> *"We've had [professional footballer] and another [football team] player came in to talk about, to run with the children, and talk about the importance of running and fitness. And we also had the, the physiotherapist, the physio from [football team], he came in as well. So they've had a lot of encouragement and from parents and from the community really." (Teacher, School A, Follow-up, T12)*

However, a lack of wider support and the difficulty in maintaining children's engagement with TDM was discussed as a barrier to sustainability by other schools;

> *"No, we've not seen anybody, I'm just chatting to my colleague, nobody's come to join in, I know it's difficult but I think we probably could have done with a bit of support, and not just a one-off, somebody turning up for a day and saying, "Come on children," because I'm just speaking, I'm the deputy head here, I'm speaking on behalf of my junior staff here, we have found it quite a challenge ourselves then really day-in-day-out to get children doing something that they don't all want to be doing." (Teacher, School B, Follow-up, T6)*

Linking to discussions of the varying engagement by teachers of different years, this school believed that external support was necessary for the older key stages, highlighting a decline in local authority support;

> *"No, and we were supposed to [have support], initially there was a lady from [local authority sport team] the, is it the [local authority initiative]? Yeah they were supposed to be involved but she dropped off after the first lot of data collection and never came back so I think that might have made a difference… I think in the upper end of the school definitely, you know in the Key Stage 2 [year 3-6] I just think that they'll need that extra support I think." (Teacher, School B, Follow-up, T10)*

Therefore, supporting schools with the implementation of TDM would encourage sustainability. This includes support from parents and the wider community and backing from local authority sport and health teams through the provision of staff members dedicated to Daily Mile implementation.

4.4.1.1.6 Summer vs Winter

Some teachers questioned the seasonal effects of TDM for pupils, speculating that pupils' enthusiasm was dependent on the weather;

> *"To be honest, with the weather I'm not sure whether it would have the same effect in the spring and autumn term, like it was the summer term which was fantastic term to do it. We could certainly give it a go, but I'm not sure it would have the same effect." (Teacher, School A, Follow-up, T12)*

However, despite summer being seen as an ideal term to implement, hot weather also created additional concerns around health and safety for a few teachers;

> *"The only problem I can really think of is when the temperature was very hot, you know, just making sure that they were hydrated and that we were, you know, they weren't too tired running in the heat and they weren't exhausted." (Teacher, School A, Follow-up, T12)*

The pressure of parental concerns regarding weather and safety were also highlighted, with parents expressing apprehension about their child engaging in physical activity in the heat;

> *"I don't know how it would, what would happen in the winter, like you know, and we had parents complain actually, "Don't let them run in the heat," so I can't imagine what would happen in the winter." (Teacher, School B, Follow-up, T6)*

Wet weather posed a problem in relation to clothing, finding alternative opportunities for physical activity (teachers) and safety concerns (pupils);

> *"When it is like drizzling, raining, a little bit, we still have to go out and sometimes the yard is really slippery and I have seen a lot of people falling over doing TDM when it has been raining because it is winter now and the terrible weather came and we are still doing it and lots of people are falling over and hurting themselves." (Pupil, School F, Follow-up, T16)*

This weather also created a practical barrier regarding clothing. Although TDM does not require specific clothing for implementation, reliance on school uniform posed a problem to schools. This included inappropriate footwear and issues related to hygiene, requiring schools to consider ways of overcoming this barrier;

> *"We have been out there on days that are drizzly but the children slip and slide on the grass and then if you do it on the yard, they, our yard tends to puddle so they're coming in with wet shoes. We have to look into really bringing in separate shoes for running." (Teacher, School A, Follow-up, T12)*

4.4.1.2 Impact on Learning, Health and Wellbeing

The majority of participants discussed the impact of TDM on pupils' learning, health and wellbeing. Conflict existed between participants' perceptions of the impact on behaviour and concentration. However, discussions on health and wellbeing were generally positive, covering the physical, psychological and social domains.

4.4.1.2.1 Behaviour and Concentration

Participants' views of the effect of TDM on the subsequent behaviour and concentration of pupils were mixed. Some teachers observed improvements in pupils' behaviour and concentration following participation in TDM.

> *"Just generally they have been much better, calmer coming into class in the afternoon because of it. They are coming in and ready to start working and that has been great, we have noticed a big difference there. In terms of concentration levels as well, they seem a bit more perkier…I do think it has a positive effect and I think it has had a positive effect on energy levels and that knocks on into class time then. We've seen an improvement in behaviour in class definitely." (Teacher, School C, Follow-up, T11)*

This finding was also reflected by some pupils who felt that participating in TDM resulted in more efficient class work;

> *"Well, I wouldn't say it affects me but like, normally, I would just be really, like just doing my work, but now that I've done TDM it gives me a bit of a boost and now I'm starting to do my work a bit quicker." (Pupil, School D, Baseline, T1)*

This was supported by a teacher from school D who discussed this in relation to the theme of curriculum time vs playtime. The introduction of an additional afternoon break to participate in TDM was a conscious decision by this school who observed the positive impact on pupils' concentration;

> *"We have noticed an improvement in fitness and concentration. Our lunch time goes into 12.50pm which starts the first lesson, so by 2.00pm the children are flagging. So to have the Daily Mile is a god send at the moment. When they come back in after their 10 – 15 minutes because the time is going less and less the more they are doing it, there are ready for their last lesson then. Whereas before it would have been so difficult to teach that last lesson." (Teacher, School D, Follow up, T4)*

However, some pupils suggested that the perceived improvements in behaviour resulted from a reduction in energy levels following participation;

> *"I think it's improving the behaviour a bit because people don't have as much energy to mess around." (Pupil, School D, Baseline, T2)*

In addition, pupils highlighted a negative association between energy levels and concentration;

> *"I think there might be one [problem] when it gets you, when it gets you so tired when you go back into class, that you lose all your concentration until you regain it." (Pupil, Baseline, School D, T2)*

In contrast, other teachers raised the challenge of settling pupils back into lessons following TDM, who felt that pupils returned to class over-excited;

> *"But we have found to do the run and come back into class has had the opposite to the desired effect, that it didn't settle them, it just made them more hyper." (Teacher, School B, Follow-up, T6)*

Overall, the effect of TDM on behaviour and concentration is largely dependent on the individual pupil. For those reporting positive improvements, longer-term sustainability is likely to be encouraged in order to foster school-wide benefits to learning. However, the conflicting statements of over-excitement and tiredness that result in a negative impact on learning are likely to discourage schools from sustaining TDM.

4.4.1.2.2 Physical Activity and Sport

Many pupils believed participating in TDM improved their attitude towards physical activity;

> *"I actually think it's had an effect on me because it actually gets me going when... Well if I'm not doing very well in school it's usually PE day so then we just go out and do PE so it like gives me positive attitude to my learning and physical activity." (Pupil, School E, Follow-up, T13)*

Teachers also discussed pupils' positive attitudes towards physical activity and elements of behaviour change;

> *"Their attitude towards fitness has improved and what we have noticed also is that most of them after Christmas have come back to school with fitbits. They are tracking their steps now, so hopefully that will have a long term effect on them you know." (Teacher, Follow-up, School D, T4)*

Pupils were positive about the additional opportunities to be physically active and the contribution towards structured sports participation;

> *"I thought it was a good thing, I don't really get to do much running at home." (Pupil, School F, Follow-up, T16)*

> *"Very much. I really like TDM because it keeps me active and it like helps me like to train in the week for my football and all that." (Pupil, School D, Baseline, T1)*

Furthermore, some pupils and teachers attributed improvements in pupils' sporting achievements to participating in TDM;

> *"It has changed the way like girls only like to do gymnastics is has changed the way of my gymnastics skills are getting better and better. But then it is not just gymnastics there is also other sports like tennis, hockey and football sometimes. All types of sports are getting easier for lots of the girls and boys because they do TDM." (Pupil, School F, Follow-up, T16)*

> *"We've been in sort of local competitions and we've brought medals home from there and, you know, the children are saying 'oh it's because we've been practising every day' and they're putting it down to practice makes perfect which is quite nice as well." (Teacher, School A, Follow-up, T12)*

4.4.1.2.3 Psychological Benefits

Many pupils acknowledged the associations between physical activity and wellbeing;

> *"So we get, even though we got active, our brains are getting healthier, so it's better for our minds as well, in the work after TDM." (Pupil, School D, Baseline, T1)*

Both pupils and teachers commented on feelings of happiness;

> *"Um, yeah, I think so because sometimes some of my friends are a little bit tired and angry in the morning and then when they do TDM they're kind of happy and stuff." (Pupil, School E, Follow-up, T13)*

> *"Well, happy children learn, so if they're happy they're going to learn, and they're certainly happy after running TDM!" (Teacher, School A, Follow-up, T12)*

In addition, feelings of improved self-esteem and school competency were reported;

> *"Um, yeah, it makes me more confident, so I do better in school." (Pupil, School E, Follow-up, T13)*

Regular participation in TDM acted as a stress relief and in alleviating the pressures of exams at this Key Stage;

> *"Um, I think it just takes your mind off things and it really just helps." (Pupil, School E, Follow-up, T13)*

> *"I actually think it's better doing it as Key Stage 2 because you get more support and so it keeps you with a positive mindset." (Pupil, School E, Follow-up, T13)*

4.4.1.2.4 Social Benefits

Many pupils reported a number of social benefits to participating in TDM. This included the opportunity to interact with peers and the positive subsequent effect during lessons;

> *"You also get to chill, at the same time talk to your friends which stops you from wanting to talk to your friends in lesson, since you've talked to them, you know what they want to say to you, they know*

what you want to say to them, so you don't really need to talk to them." (Pupil, School D, Baseline, T2)

Teachers also reported the social improvements through group participation such as team-work and cooperation;

"I'm thinking of a couple of girls in my class now because they're doing it together and I said, well go together, encourage each other, they are enjoying it a bit more now and they get out and they're all bringing their water bottles in and things like that now, so they are enjoying it more than the first sort of day when I said right, well you've got to go out, it's not just seven laps, you've got to keep moving for 15 minutes and you could see some grumbles, they're a lot more positive the more we're doing it and it's becoming routine." (Teacher, School B, Baseline, T9)

"And not only has sort of their health and fitness improved, but their social skills have improved as well, because they were doing it together, yeah, they really loved it." (Teacher, School A, Follow-up, T12)

Therefore, these positive discussions covering the physical, psychological and social domains are likely to encourage schools to continue delivering TDM in order to elicit the range of benefits observed on pupils' health and wellbeing.

4.4.2 Quantitative Results

The secondary aim of this research study was to examine the association between TDM and children's CRF and given the universal nature of TDM, compare this association between children in high and low socio-economic groups. **Table 13** presents the descriptive characteristics of those that participated in CRF tests and the total sample (including imputed data). There was a total of 336 pupils in years 5 and 6 attending the six primary schools in this study. From this sample of eligible pupils, 229 pupils (68%) participated in the 20m SRT at baseline and 235 pupils (70%) at follow up. In total, 204 pupils (61%) completed the 20m SRT at both time points. The MICE imputation method utilising shuttles, age and deprivation accounted for an additional 34 pupils at baseline and 28 pupils at follow up. There was no significant difference (p=0.33) between the mean number of baseline shuttles for those that

participated in the 20m SRT and the total sample (including imputed). Results described below will be discussed in relation to imputed data.

	Baseline		Follow-up	
	Participated in baseline 20m SRT	**Total sample baseline 20m SRT (imputed)**	**Participated in follow-up 20m SRT**	**Total sample follow-up 20m SRT (imputed)**
Age (years – at time point)	10.2 ± 1.0 (220)	10.2 ± 0.9 (254)	10.6 ± 0.6 (227)	10.6 ± 0.6 (255)
Boys	52% (117)	54% (141)	56% (130)	54% (141)
Deprived (WIMD quintiles 1, 2)	36% (79)	36% (94)	37% (86)	36% (94)
Shuttles (mean)	30.7 ± 19.3 (229)	30.9 ± 18.5 (263)	35.5 ± 20.5 (235)	35.7 ± 19.8 (263)
% fit	49% (110)	49% (128)	58% (135)	60% (157)
% fit (boy)	53% (62)	54% (76)	55% (72)	58% (82)
% fit (girl)	44% (48)	44% (52)	62% (63)	63% (75)

Table 13: *Descriptive characteristics (participated in 20m SRT, total sample)*

Mean ± SD (n); % (n)

The descriptive characteristics for shuttles and CRF at baseline and follow up (overall, deprived, non-deprived) are presented in **Table 14**. At baseline, 51% of participants were classified as fit. Overall, participants in the deprived group performed a lower number of shuttles in the 20m SRT compared to children in the non-deprived group at baseline (deprived: 23.7 ± 16.0, non-deprived: 35.2 ± 18.7) and follow-up (deprived: 28.4 ± 17.9, non-deprived: 39.8 ± 20.9). A lower proportion

of participants in the deprived group compared to the non-deprived group were classified as fit at baseline (deprived: 30%, non-deprived: 62%) and follow up (deprived: 44%, non-deprived: 70%). Both groups demonstrated equal increases in shuttles between baseline and follow-up (deprived: 4.7 ± 13.4, non-deprived: 4.8 ± 16.0). However, these results exhibit large standard deviation and wide 95% confidence intervals (deprived: 2.0 to 7.4, non-deprived: 2.3 to 7.3), demonstrating the variability that is present among this sample. A further breakdown of the descriptive characteristics for shuttles and CRF of the sample categorised by school (A-F) can be found in Appendix 13: Descriptive Characteristics of Shuttles and Cardiorespiratory Fitness by School (The Daily Mile). Using regression analysis to adjust for age and gender showed there was no significant difference in the increase in shuttles run for deprived compared to non-deprived children (**Table 15** and **Table 16**).

	Overall	Deprived (WIMD quintiles 1 & 2)	Non-deprived (WIMD quintiles 3, 4, 5)
Shuttles difference (baseline – follow-up)	5.4 ± 12.8 (204) (95% CI: 3.6 to 7.2)	4.4 ± 12.2 (72) (95% CI: 1.5 to 7.3)	5.7 ± 13.2 (127) (95% CI: 3.4 to 8.0)
Shuttles difference imputed (baseline – follow	4.9 ± 15.0 (263) (95% CI: 3.1 to 6.7)	4.7 ± 13.4 (94) (95% CI: 2.0 to 7.4)	4.8 ± 16.0 (164) (95% CI: 2.3 to 7.3)
Shuttles baseline	30.7 ± 19.3 (229)	23.8 ± 17.1 (79)	34.8 ± 19.6 (145)
Shuttles follow up	35.5 ± 20.5 (235)	28.4 ± 18.3 (86)	39.8 ± 20.9 (144)
Shuttles baseline imputed	30.9 ± 18.5 (263)	23.7 ± 16.0 (94)	35.2 ± 18.7 (164)
Shuttles follow-up imputed	35.7 ± 19.8 (263)	28.4 ± 17.9 (94)	40.0 ± 19.8 (164)
% fit (baseline)	49% (110)	32% (25)	59% (84)
% fit (follow up)	58% (135)	43% (37)	67% (94)
% fit imputed (baseline)	51% (132)	30% (28)	62% (99)
% fit imputed (follow up)	60% (157)	44% (41)	70% (112)

Table 14: *Descriptive characteristics (overall, deprived, non-deprived)*

Mean ± SD (n); 95% CI = 95% confidence interval; % (n)

	Coef.	P>|t|	95% Confidence Interval	
Decimal age	.56	0.55	-1.71	2.84
Boy	-2.62	0.16	-6.67	1.43
Deprived	-1.49	0.56	-7.64	4.66
_cons	1.38	0.16	-21.31	24.08

***Table 15**: Regression model 1 - Difference in shuttles baseline to follow-up*

Clustered by school

	Coef.	P>|t|	95% Confidence Interval	
Decimal age	.23	0.76	-1.56	2.02
Boy	-2.45	0.37	-8.85	3.95
Deprived	-0.05	0.99	-4.89	4.78
_cons	3.60	0.62	-13.95	21.15

***Table 16:** Regression model 2 - Difference in shuttles baseline to follow-up imputed*

Clustered by school

4.5 Discussion

Schools are considered a key setting in combating the rising levels of childhood physical inactivity through implementing universal running programmes aimed at increasing children's PA levels and CRF. However, their simple design and widely scalable nature with limited resources and low-cost has resulted in widespread adoption lacking evaluation of both quantitative outcomes and qualitative implementation factors that ensure success and sustainability. To date, TDM has been implemented in thousands of schools globally with the aim of

improving children's PA, CRF, health and wellbeing[223]. However, limited research exists examining the implementation and experience of TDM from a whole-school perspective[213,214]. Given its rapid expansion, this research is invaluable in providing schools with an evidence-based approach to successful implementation. Therefore, the primary aim of this study was to explore pupils', teachers' and headteachers' experiences of TDM and understand whether experience was related to implementation. Findings from this study identified a variety of implementation factors that affected participants' experience which will be discussed and summarised to provide a set of recommendations to schools.

Headteachers, teachers and pupils discussed a range of factors associated with implementation in relation to the experience and engagement with TDM. These barriers and facilitators to effective implementation identified by participants are consistent with recent research into school-based running programmes[48,214]. Implementation in this study, as captured through interviews and focus groups varied widely amongst schools and is reflected in the contrasting themes that emerged from the data. However, implementation was not directly measured and future research into TDM would benefit from examining the strength of outcomes in relation to implementation level and style. Conflict existed between schools on how TDM should be delivered, raising the issue of fidelity to the intervention. Some teachers felt following the original principles was essential. However, others and in particular the pupils advocated for flexibility, cited as a facilitator to implementation in the literature[210]. The contextual differences that schools face contribute to the challenge in the implementation of interventions following a uniform method. Previous qualitative research exploring implementation of TDM highlighted the importance of flexible implementation in facilitating teacher autonomy and engagement[213,214]. Furthermore, variation in implementation and flexibility has been documented as a facilitator in other school-based running programmes[48]. With flexibility consistently identified as a key factor to the effective implementation of interventions, it is essential for future programmes to be designed with this at the core. These findings highlight the importance of designing adaptable school-based programmes to fit within the varying contexts of schools, rather than a 'one size fits

all' model. However from a research perspective, variation in delivery and fidelity to the original intervention design poses a number of challenges for evaluating school-based interventions.

This is of particular importance as one of the most significant barriers raised by pupils was a lack of variety. After the initial excitement of a new school activity, pupils commented on feeling bored and lacking enjoyment, impacting on pupils' participation and the longer-term sustainability of TDM. Indeed, the novelty of unique PA methodologies may only elicit increases in activity in the short-term, with original behaviours returning as motivation for participation decreases. As TDM has no defined length, adherence to longer-term implementation may require additional techniques to encourage behaviour change that maintains motivation[147]. One such suggestion is to target pupils' enjoyment to facilitate involvement with interventions. One school addressed this challenge by utilising their 'pupil voice group' to suggest alternative methods for implementation. Pupils from this school proposed incorporating music and discussed the positive effect this had on engagement. This highlights the importance of pupil involvement in designing and delivering interventions, cited in the literature as a fundamental component to ensuring sustainability[210].

The most significant barrier to implementation identified by participants was that of curriculum pressure, as cited in recent research on TDM[214]. Headteachers and teachers discussed that the intense focus on academic targets and a curriculum tailored primarily to literacy and numeracy acted as a barrier to finding the time to implement TDM. In addition, academic expectations by parents exacerbated this problem, with parents questioning schools' allocation of time to physical activity over curriculum activities. Schools relied on trial and error in finding a time that fitted within the school structure and curriculum, requiring flexibility from teachers. The curriculum as a barrier to intervention implementation is well documented. Research has suggested that until schools are assessed on health and wellbeing, interventions such as TDM will not be prioritised within the curriculum[224]. However within Wales the curriculum is currently undergoing a reform, with health and wellbeing constituting one sixth of the proposed new curriculum[102]. This reform creates

potential for a shift in priority towards school-based programmes focussed on health outcomes such as TDM. It is therefore essential to provide schools with an evidence base on the effective implementation of TDM given its widespread political and media support that may pressure schools into uptake.

One method in overcoming the impact on curriculum time was suggested by teachers in this study who linked TDM with curriculum topics. Indeed, interventions that are integrated within the curriculum have been advocated for by teachers[224]. However, the suggestion that The Daily Mile could possibly be being used as a replacement to PE is concerning and has been cited in another qualitative study of TDM[214]. Arguably, aside from physical activity, the wider aims and objectives of the PE curriculum such as play, motor skill development and physical literacy are unlikely to be achieved through TDM alone. In addition, current provision of PE falls below national requirements of 120 minutes per week[211], and schools and pupils may benefit from encouraging regular quality PE provision rather than replacing with interventions. Findings from this study also highlight the importance of improving the quality of PE provision in primary schools so teachers feel confident in delivering PE as its own entity in addition to running programmes.

In this study, pupils currently not offered an afternoon playtime in school were positive about TDM providing a break from lessons. Research has highlighted the positive effect of active breaks on children's cognitive function and academic achievement[225]. The playground environment is considered a complimentary setting in promoting physical activity and play through unstructured activity and social interaction[211]. It is therefore unsurprising that pupils from another school expressed frustration about TDM replacing their afternoon playtime. However, recent research into the implementation of TDM[213] suggests that this caused less disruption to the school day and given the impact on learning time cited in this and other studies[214], headteachers may feel they have no choice. Play is an essential element of child development and the concerns over replacing playtime raised by pupils in this study demonstrate conflict between implementing TDM, curriculum pressure and the wider benefits to children's physical and social development offered throughout the school day.

There was conflict from schools regarding the competitive aspects of TDM, with a 'thrive or disengage' attitude. Some schools felt that it was important to deliver TDM as a non-competitive activity in line with the original principles. However, this conflicted with other teachers' perceptions of how to engage pupils who believed that the non-competitive element disengaged some pupils and rather, they thrived on friendly competition. In contrast, pupils were concerned about finishing last, highlighting the importance of delivering TDM as a continuous 15 minute activity, rather than the completion of a literal mile as supported by previous research[214]. Pupils setting personal goals and observing their progress encouraged participation and teachers suggested the use of rewards in increasing pupils' motivation. These methods are supported by theoretical approaches to the promotion of PA utilising Bandura's social cognitive theory which models self-monitoring, goal setting and rewards[226].

Headteachers and teachers felt that TDM was more suited to the younger ages of primary school in which the curriculum is delivered through play[133], and observed that teachers of this age group were more engaged. In addition, the notion of teachers acting as role models through modelling behaviour and verbal encouragement was discussed by pupils. However, a lack of teacher authority was highlighted by pupils as a concern in relation to pupils 'cheating' and not participating fully. Research has demonstrated the importance of involving school staff in the development of interventions to facilitate intervention ownership, autonomy and sustainability[42,211]. Teachers are agents of change in interventions, and teacher support and buy-in has been identified as a critical factor to implementation success [47,227]. Furthermore, teacher participation may elicit wider benefits such as improved teacher-pupil rapport, as identified in the literature[214]. The inclusion of teachers has also been advocated in a 'how to guide' developed by the University of Stirling, in which teacher participation and informal communication with pupils is encouraged[207].

This is further supported by findings from this study in which a whole-school approach to TDM was advocated, supported by pupils, teachers, leadership, parents and the wider community. Teachers also raised the challenge of a lack of external

support by the Local Authority Sport and Health teams, although this was not an agreed responsibility prior to implementation. A 'Daily Mile Advisor' was suggested by one school who felt over-burdened with their role as coordinator. Previous research has indicated that schools have experienced initiative overload and a lack of collaboration between school-based programmes and the wider health field[42]. In addition, although one of the benefits cited by TDM is the lack of clothing or equipment required[207], this posed a challenge to schools. Issues of hygiene were discussed and a lack of appropriate footwear prevented participation. Weather conditions were also highlighted as causing concern in relation to clothing and safety and parental concerns.

Overall, views on the effect of TDM on pupils' behaviour and concentration were mixed. Some pupils felt their ability to concentrate in lessons and attitude to learning improved following participation in TDM. These immediate effects are supported by other qualitative research exploring implementation of TDM[213,214]. Research has also demonstrated a positive association between physical activity and cognition[228]. However, the suggestion that pupils were over-excited and behaviour was disrupted on return to the classroom is a concerning finding as this contradicts the benefits publicised by TDM such as improved behaviour and fuels the barrier of impact on learning time. In addition, pupils voiced that they felt tired and lacked energy which could account for teachers' perceptions of improved concentration and learning.

Pupils and teachers discussed the positive effect of TDM on pupils' physical, mental and social health and wellbeing. Pupils noted improvements in attitudes to PA, enhanced feelings of wellbeing and reduced feelings of stress. In addition, a number of social benefits were reported including displays of team-work and cooperation. In particular, TDM offered pupils the opportunity for social interaction with peers. The literature highlights mixed findings on the effect of school-based programmes on children's wellbeing due to the complex, multi-dimensional concept of wellbeing and inconsistencies in methodologies and measurement[229]. The general consensus however, is that school-based programmes contribute positively to health and wellbeing. Teachers also noted perceived improvements in pupils' CRF.

This qualitative finding is supported by the exploratory analysis of the secondary aim conducted in this study which suggests that the CRF of children from south Wales increased between baseline and follow up following participation in TDM. An equal increase in the number of shuttles run by the deprived and non-deprived groups was observed, however, the wide confidence intervals present within this data demonstrate the variability of changes in children's CRF. Adjusting for age and gender, there was no significant difference between children of high and low socio-economic groups. These results exhibit large standard deviation and therefore, strong conclusions on the association between TDM and children's CRF cannot be made.

In this sample of children from south Wales, UK, the deprived group performed a lower number of shuttles at both time points and thus, displayed a lower proportion of children classified as fit. The social gradient of physical activity, CRF and deprivation is demonstrated in the literature, with a larger proportion of children from a higher socio-economic status classified as fit compared to those from a lower socio-economic status[230]. Reducing inequalities in health and narrowing the deprivation gap in children's CRF is a public health priority, given the wide range of health benefits of regular physical activity[95,185]. Indeed, there is widespread recognition that universal school-based programmes that engage children from a range of socio-economic backgrounds are effective in improving pupil health and wellbeing[195]. With the rapid uptake of TDM across schools in Wales and globally, it is important to examine whether its intended outcome of increasing children's PA and CRF are both valid and universal. As implementation and adherence was not directly measured, in addition to limitations with the study design, it is difficult to draw conclusions on the overall effect of TDM on children's CRF. Furthermore, the large standard deviation and wide confidence intervals within this data suggest the need for future quantitative research to include larger samples in order to further examine and understand the impact on children's CRF.

4.6 Strengths and limitations

This is the first mixed-methods study exploring the varying implementation and associated experience of TDM from a whole-school perspective and examining the association of TDM on children's CRF. Through incorporating headteachers', teachers' and pupils' views, this study provides important insights and recommendations for schools that contribute to the effective implementation of TDM in the future. With such widespread global adoption and expansion of TDM, this research is invaluable. However, a number of limitations are present in this study and it is important to consider these when attempting to draw conclusions from the findings.

School-based research poses a number of challenges in relation to the recruitment of schools. In this research study, a natural experimental approach was chosen due to the widespread adoption of TDM as a result of political and media support. However, the lack of a control group creates challenges in concluding the direct effect of TDM on children's CRF. Recruitment for this research study was conducted through convenience sampling, in which schools chose to begin implementing TDM at different time-points to coincide with school terms. This convenience sampling method could elicit selection bias as schools that volunteered to participate in the research study are likely to have a greater interest and investment in TDM with the potential to generate more positive feedback on implementation. In this research study, data collection was completed in two data collection phases due to schools choosing to implement TDM at different time-points. Research has identified the effect of seasons on PA, with lower levels of MVPA exhibited in autumn and winter[231]. Statistical analyses did not adjust for season and this should be taken into account when interpreting findings. However, the strength of this from a qualitative perspective is that experiences are captured throughout the academic year. Furthermore, schools had varying exposure to TDM and a dose-response relationship may impact on CRF. Finally, it must be considered that changes in CRF could be due to a number of other factors aside from TDM such as growth and maturation[232] and improvement in 20m SRT participation.

The implementation and fidelity of TDM was not directed measured in this study, although anecdotal differences are reported through qualitative findings. All schools were invited to participate in pupil focus groups and interviews with teachers and headteachers. However, not all schools participated in all three qualitative measures and findings represent those that chose to participate. This may impact the transferability of results. Focus group sampling was achieved through teachers selecting consented pupils fulfilling a criteria of mixed gender and physical activity abilities. Although teachers were reminded of the importance of selecting a variety of pupils with a range of abilities in order to capture a variety of experiences, there is potential that this method could cause bias in results through preferential selection. Future research would benefit from an in-depth process evaluation of a larger sample of schools. Triangulation of findings could help highlight the strengths and weaknesses of implementation factors on outcomes.

4.7 Conclusions

Findings from this study have identified a range of barriers and facilitators to implementing and sustaining TDM from a whole-school perspective. The schools in this study varied the implementation and this is reflected in the differing perspectives and experiences of participants. Ultimately, the implementation of TDM affected the pupils' enjoyment, participation, experience and potential for sustainability. For future effective implementation and longer-term sustainability of TDM the findings from this study recommend;

- Flexible, adaptable implementation incorporating pupil feedback
- Delivered during curriculum time (excluding Physical Education) or as an afternoon playtime (not replacing current play provision)
- Encouraging individual competition through personal goal setting (incorporated into curriculum work)
- Active involvement and participation of teachers and staff

- Whole-school and wider community support, engaging with parents, community stakeholders and local sporting role models

4.8 Author Contributions

Conceived and designed the study: EM. Conducted data collection: EM, CT, SB. Conducted data analysis: EM, CT. Wrote the paper: EM, CT. Provided critical input: SB, GS. Provided supervision: SB, GS.

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Chapter 5 Factors Associated with Attainment at age 10-11, Stratified by Special Educational Need. A Cohort Study using Linked Health, Educational and Survey Data

The previous chapters have highlighted how a primary school network can act as a platform to evaluate the role of both education and public health programmes within the school setting. For example, the findings from the outdoor learning study demonstrate the ability of the network to identify how an intervention can engage children in learning, improve their enjoyment of school and contribute to higher levels of wellbeing. Equally, the network is able to demonstrate that children in years 5 and 6 participating in The Daily Mile show improvements in cardiorespiratory fitness regardless of deprivation status. The network has the capability to generate evidence and synthesise this to schools through a set of recommendations. These studies demonstrate the important role of a primary school network in providing schools with evidence-informed solutions to public health and education programmes. This can support schools in fostering school environments that contribute to a child's school experience, engagement with learning and long-term health and education outcomes.

However, a wealth of other factors exist that influence children's health and education outcomes and subsequent life trajectories. Therefore, in order to truly understand the complex relationship between childhood health and education, it is necessary to delve deeper into this interaction. As discussed in Chapter 2, a unique aspect of HAPPEN is its ability to utilise data linkage through existing routinely collected electronic health and education records. This chapter will present the final analysis that constitutes this thesis in order to answer the third research objective and to use the HAPPEN network (self-assessed questionnaire and linkage to routine data) to examine early predictors of children at risk of poor outcomes (low educational attainment or poor health).

5.1 Abstract

A complex relationship between health and education exists, with evidence demonstrating the importance of childhood health and wellbeing on academic outcomes[19]. Higher educational attainment is also associated with higher adult income, occupation and health status during adulthood[233]. Therefore, further understanding the influence of sociological and epidemiological factors on children's education remains an important focus of research in order to effectively target resources. The aim of this study was to determine the strongest factors associated with educational attainment at age 10-11 of children engaged with HAPPEN, a primary school network. This was achieved through the linkage of child-collected health behaviour data (HAPPEN survey) with routinely collected, anonymous health and education data (SAIL databank). Participants were assigned a binary code for achieved or not achieved KS2 Core Subject Indicator (Level 4+) and grouped by special educational need (SEN) (no SEN, SEN). Multivariate logistic regression analyses were adjusted for potential confounders (gender and deprivation) and clustered by school. Factors associated with educational attainment for non-SEN children (n=1,744) were KS2 unauthorised attendance (OR=0.98, 95% CI: 0.96-1.00), asthma (OR=0.36, 95% CI: 0.18-0.74), vaccinations (OR=8.3, 95% CI: 2.55-26.97) and number of adults in household (OR=1.83, 95% CI: 1.21-2.78). There was a significant difference between the low deprivation (WIMD quintile 5) (OR=3.79, 95% CI: 1.04-13.9) and high deprivation group (WIMD quintiles 1, 2). For SEN children (n=455), predictive factors associated with educational attainment were being female (OR=1.82, 95% CI: 1.27-2.62), the 20m SRT (OR=1.02, 95% CI: 1.00-1.04), out of school sport clubs (OR=1.13, 95% CI: 1.02-1.25), sleep 9+ hours (OR=1.65, 95% CI: 0.99-2.73), breastfed at birth (OR=1.48, 95% CI: 0.99-2.21), free school meals at KS1 (OR=0.49, 95% CI: 0.33-0.74), any mental health diagnosis (OR=0.56, 95% CI: 0.35-0.88) and mother smokes (OR=0.68, 95% CI: 0.49-0.93). There was a statistically significant difference between the middle deprivation group (WIMD quintiles 3, 4) (OR=0.62, 95% CI: 0.43-0.91) and the high deprivation group (WIMD quintiles 1, 2). The findings from this study can be grouped into three themes; (1) social disadvantage, (2) physical and mental health

and (3) parental influence and engagement. Although distinct, these themes are also inter-related. Those from socially disadvantaged backgrounds are at risk of 'double disadvantage' and living in a cycle of poorer health and education outcomes. These findings highlight the importance of the early years and the home learning environment on child development and school readiness. The cumulative impact of these three themes can define a child's life trajectory. Therefore, the results from this study recommend that the early years must remain a public health priority. Furthermore, they suggest that HAPPEN should expand and engage with early years stakeholders.

5.2 Introduction

Good childhood health and wellbeing is instrumental in maximising achievement, employment prospects and subsequent health and wellbeing during adulthood. A mutual relationship between health and education exists, with evidence demonstrating that healthier children achieve higher levels of educational attainment. This relationship between health and education is reciprocal yet complex, with an abundance of research demonstrating the link spanning across a range of domains. The complexity of this association centres around two predominant research themes; sociological research exploring social factors and epidemiological research into lifestyle and behavioural factors. In a review of the literature, Blane *et al*. [234] identified five potential pathways that have consistent evidence linking education and health; 1) childhood socio-economic circumstances, 2) adult socio-economic circumstances, 3) childhood and adolescent health, 4) health behaviours and 5) a person's sense of control. In addition, a sixth dimension; childhood cognitive ability (intelligence) has been suggested by another author[235]. However, identifying the mediation of these factors on education outcomes remains a challenge to researchers in identifying causation and to policy makers in directing resources. Despite this challenge, it is well documented that health in early life is associated with higher educational attainment, which in turn is linked to higher adult income, occupation and health status during adulthood[233]. Therefore, it is essential to understand this complex relationship further in order to effectively target

services and resources to those at risk of low educational outcomes and ultimately poorer health and employment outcomes throughout the life course.

The most significant factor associated with educational attainment from the sociological perspective is that of socio-economic background. In a meta-analysis of 74 studies examining the relationship between socioeconomic status (SES) and educational achievement, Sirin concluded that family background has one of the strongest correlations with academic performance[236]. Demographic inequalities in education are wide ranging and limit the prospects for children to reach their academic potential, influencing future life chances and pathways. These disparities persist throughout a child's educational journey and affect their expectation of future education. Drivers in educational inequalities have been identified in the UK, including gender, parental occupation, family background and differences between schools[237]. Indeed, socio-economic background is one of the most enduring issues associated with education outcomes[238]. Published over 50 years ago, the Coleman Report[239] concluded that schools did very little to impact a child's education outcomes above what they brought from their background and home environment;

> *"'the inequalities imposed on children by their home, neighbourhood and peer environment are carried along to become the inequalities with which they confront adult life at the end of school" (p. 325).*

Research conducted since the publication of the Coleman report has also highlighted the importance of the school environment and its impact on a child's education outcomes. For example Palardy demonstrated the significance of school characteristics such as teaching quality and school resources, and the socio-economic composition of a school's cohort on academic outcomes. The author concluded that the school characteristics of low social class schools, i.e. those with a high proportion of pupils from a lower socio-economic status (SES) produced less favourable learning environments than high social class schools[240]. In addition, pupils attending low social class schools entered school with lower achievement rates. To exacerbate this achievement gap further, children attending schools with a higher group socio-economic composition (high social class school) demonstrated 30% higher mean

learning rates than those from a low social class school. This suggests that inequalities in education are associated with both individual and school-level SES, and persist throughout a child's educational journey.

Results from the Programme for International Student Assessment (PISA) show that SES is associated with significant differences in educational performance in most countries participating in the programme[241]. These disparities in education are also mirrored within health, with education acting as one of the strongest predictors of health[242]. The evidence base on socio-economic inequalities and health demonstrates that low childhood SES is associated with a range of poor health outcomes during the life course and premature all-cause mortality[243]. In fact, research has suggested that higher educational attainment can act as the single best socio-economic predictor of good health outcomes[244]. This association is likely, in part, to be connected to the epidemiological evidence demonstrating the relationship between lifestyle and behavioural factors on education. Research has shown that adults with higher levels of education are less likely to engage in risky behaviours such as smoking and drinking[245–247]. In addition, education has been associated with a lower probability of being obese[247], a higher fruit and vegetable consumption[248] and has been considered one of the most important predictors of exercise and physical activity levels[249]. However, the health factors associated with educational attainment are present long before this period, with research identifying factors such as low birth weight[250] and emergency hospital admissions during early childhood (<7 years)[251].

Another significant factor related to educational attainment is that of special educational need (SEN). A child is deemed to have a SEN if they have a learning difficulty which requires special educational provision. This is recognised as educational provision which is additional to, or different from the educational provision made for children of the same age attending local authority maintained schools[252]. SEN typically encompasses four areas that impact a child's learning; 1) communication and interaction, 2) cognition and learning, 3) behaviour, emotional and social development and 4) sensory and/or physical. The provision for children with a SEN includes three stages of intervention; 1) School Action – additional support

provided by schools themselves, 2) School Action Plus – additional support by schools with involvement of external agencies and 3) Statement – a legal entitlement to a specified package of support[253].

The prevalence of SEN varies considerably between countries due to variation in definitions and policy influences. For example within the UK, rates in England currently suggest that 15% of children attending maintained schools have a SEN[254] in comparison to 23% of children within Wales[255]. Despite this wide variance in prevalence rates, it is clear from the literature that a significant attainment gap exists, with SEN children demonstrating poorer educational attainment compared to those without a SEN[255]. Latest data for 2019 released by the Welsh Government highlight this gap in attainment for children achieving their Key Stage 2 (KS2) Core Subject Indicator (CSI), the measure used to represent the percentage of children achieving the expected Level 4+ in English/Welsh, Mathematics and Science. Current rates for children aged 10-11 in Wales demonstrate large variance between those without a SEN (98.0% achieved, n=26,709) and with a SEN (58.7%, n=9,087)[256]. Furthermore, this attainment gap persists during a child's years of schooling throughout Key Stage 3 (achieved CSI Level 5+, no SEN: 95.8% achieved, SEN: 59.3% achieved)[256] and beyond. With the relationship between education and health discussed previously, this concerning gap in achievement rates and low rates of educational attainment demonstrated by children with a SEN has significant implications for a child's future health outcomes, employment prospects and life chances.

Combining social and lifestyle factors with educational related outcomes provides a more comprehensive understanding of the relationship between health and education. Indeed, research has demonstrated that the addition of lifestyle factors within models exploring this relationship adds predictive power to the statistical explanation of health[257]. That is, lifestyle factors have been found to both mediate and moderate the assocation between education and health. Therefore, examining solely the relationship between SES and educational attainment without the inclusion of lifestyle factors (e.g. physical activity) ignores these behavioural influences that may partly explain or interact with this association. Within Wales, children have consistently underperformed in science, maths and

reading compared to the rest of the UK[241]. With evidence demonstrating that poor educational attainment is associated with depression, self-harm[258] and an increased risk of injury in adolescence[259] and a range of poor physical health outcomes[233], it is essential to understand the relationship between health and education and the mechanisms behind this. Therefore, assessing children at risk of low educational attainment and minimising this number has the ability to address the inequalities that persist in education. Furthermore, understanding the protective health factors associated with educational attainment allows the provision of public health services that have the greatest long-term impact. Examining this relationship separately for children with and without a SEN is important given the attainment gap demonstrated above. This is a significant public health issue given the wide ranging poor health outcomes associated with a lower educational status.

With this said, it is important for the public health field to prioritise efforts in reducing the rates of low educational attainment, particularly within Wales given recent PISA results and the gap in attainment demonstrated in children with and without a SEN. However, much of the focus on improving inequalities in health and education has concentrated on the role of public health and the potential of engaging with the education field has often been overlooked. With the social determinants of health and the importance of education documented[233], perhaps a shift in attention to utilising and improving the education system as a public health objective and a tool in improving outcomes may bring greater benefits to the population. Indeed, as Freudenberg and Ruglis[242] state:

> *"If medical researchers were to discover an elixir that could increase life expectancy, reduce the burden of illness, delay the consequences of aging, decrease risky health behaviour, and shrink disparities in health, we would celebrate such a remarkable discovery. Robust epidemiological evidence suggests that education is such an elixir" (pp. 1)*

Generating a greater understanding of this mutual relationship has the potential to facilitate individuals in achieving healthier futures, better employment opportunities and long-term outcomes. As Chandola *et al.* [260] state, quantifying the pathways that connect health with education could contribute to the gap in

knowledge of the role of education in reducing health inequalities. With the WHO recognising reducing health inequalities as a key strategic objective in their latest Health 2020 policy framework[17], this research is invaluable. More specifically to Wales, further understanding this complex relationship would allow targeted health promotion, tailored policy development and foster educational system change at a time of education reform and whilst the new Curriculum for Wales[102] is being devised.

The importance in intervening before children reach secondary school has been emphasised within the literature[261]. With this said, HAPPEN provides a potential solution in identifying and understanding the relationship between health and education with its unique opportunity for data linkage through the combination of survey (The HAPPEN Survey) and routine (SAIL databank) data. Indeed, the use of linking routine data with existing survey cohort studies provides an exciting opportunity in answering a range of complex research questions within the field of population health[262]. Data linkage refers to the process of combining information on the same individual from two separate record sources[263]. The field of data linkage has grown rapidly in recent years and now includes the opportunity of not just linking electronic health data but also data collected through social service and education platforms.

Linking the cross-sectional health behaviour data collected through The HAPPEN Survey with existing routinely collected health and education data facilitates our understanding of the relationship between health and education. This will help to determine whether targeting children at risk of low educational attainment attending schools that engage with a primary school network can improve the health, wellbeing and education outcomes of children and reduce inequalities within these fields. Finally, the strength of HAPPEN as a platform for this in-depth analysis allows for the rapid dissemination of findings to key stakeholders in health and education. This novel and unique contribution to the literature has exciting potential at a time of education reform within Wales and thus has important implications for policy, service delivery and curriculum design. Furthermore, HAPPEN has the ability to not only examine but also link the five factors identified by Blane *et al.* [234] and

Feinstein[235]. For example, information on childhood socio-economic circumstances, childhood health and health behaviours can be obtained through a combination of data stored within SAIL and data collected through The HAPPEN Survey.

Thus, the aim of this study is to determine the strongest factors associated with educational attainment at age 10-11 years of children with and without a SEN and engaged with HAPPEN in Wales. This will be explored through linking child-collected health behaviour data (HAPPEN survey) with anonymous, routinely collected health and education data (GP records, hospital data, key stage results) stored in the SAIL Databank.

5.3 Methods

5.3.1 Participants

This study consisted of participants aged between 9 and 11 years attending a local authority maintained primary school engaging with HAPPEN. HAPPEN is a primary school health network within Wales that aims to improve the health, wellbeing and education outcomes of children[93]. At the time of this study, data was obtained on pupils attending schools situated within the City and County of Swansea. Schools that engage with HAPPEN participate in The HAPPEN Survey for children in years 5 and 6. Data included within this study is presented on children that participated in The HAPPEN Survey between the 2014-15 and 2017-18 academic years. The full methodology for participating in The HAPPEN Survey is detailed in Chapter 2. The linkage of survey, health and education datasets provided the linked records of 2,575 children.

5.3.2 Survey Data – The HAPPEN Survey

HAPPEN is a primary school health network. Schools within Wales are invited to participate in The HAPPEN Survey, an online, self-report health and lifestyle questionnaire for children aged 9-11 years. The survey includes a range of items on

typical health behaviours including active travel, nutrition, physical activity, wellbeing and mental health. Objective assessments of children's cardiorespiratory fitness are also collected. The full protocol for The HAPPEN Survey and fitness assessments is outlined in Chapter 2. Parental consent and child assent were required for linkage with routine data.

5.3.3 Routine Data – The SAIL Databank

The SAIL databank stores anonymised records of routinely collected electronic health-related data for the Welsh population[99]. The routine datasets used within this present study were the Primary Care GP database, the National Community Child Health Database (NCCHD) and the Education Attainment database[264].

5.3.4 Data Anonymisation and Linkage

As outlined in Chapter 2, the survey data collected through HAPPEN is uploaded to the SAIL databank on an annual basis and linked with existing electronic health and education datasets outlined above and stored within the SAIL databank. The linkage of datasets follows a two-step process and is facilitated through a trusted third party, the NHS Wales Informatics Service (NWIS). Within the HAPPEN dataset (HAPPEN survey data and fitness assessments), participants are assigned a unique study ID. The first file (file 1) containing identifiable demographic information (name, postcode, date of birth) and the unique study ID are sent to NWIS for anonymisation and encryption. Each participant record is assigned an Anonymised Linkage Field (ALF) based on their names and addresses. The second file (file 2) containing the unique study ID and survey data is sent to the SAIL databank. Both files are sent to the respective parties using a secure, web-based file upload and switching service[265]. Demographic data from file 1 is removed and the ALF, week of birth, gender code and area of residence (Lower Super Output Area) remain to be recombined with the file 2 survey data within the SAIL gateway. This dataset is then ready for linkage with existing datasets stored in SAIL. All data stored within the SAIL gateway is in accordance with the Data Protection Act 1998. Data linkage was

conducted by a trained data analyst using IBM DB2 9.7 SQL. Data were imported into STATA version 16 to conduct statistical analyses by the researcher (EM).

5.3.5 Ethical Approval

The HAPPEN Survey data component of this data linkage study required child assent and parental consent to link the survey data with health and education records within SAIL. Ethical approval was obtained from the Swansea University Medical School Research Ethics Committee (reference number: 2017-0033B). The SAIL routine data component of this study uses anonymised data and therefore the need for ethical approval and participant consent was waived by the approving Information Governance Review Panel (IGRP) board. The IGRP board provides independent guidance and advice on SAIL procedures and consists of representatives from organisations such as the Welsh Government, Public Health Wales, the National Research Ethics Service and the public. The panel review all proposals to ensure the project and analysis requested is appropriate and in the public interest[265]. IGRP approval for HAPPEN was received in April 2016 (approval number: 0485).

5.3.6 Statistical Analysis

The aim of this study was to examine epidemiological factors associated with KS2 educational attainment in children (aged 10-11) using linked survey and routine data. Participants were grouped by SEN (SEN, no SEN) and assigned a binary code for achieved (1) or not achieved (0) the expected Level 4+ CSI in KS2. Within Wales, the CSI is the measure used to represent the percentage of children achieving the expected Level 4+ in English/Welsh, Mathematics and Science. Given the sample sizes within the linked datasets, SEN was assigned as a group variable based on a combined SEN provision code (School Action, School Action Plus, Statement). Deprivation was assigned as an area-based socio-economic measure using the Welsh Index of Multiple Deprivation (WIMD)[266]. Weighted scores for eight domains of deprivation are calculated as a WIMD score for each LSOA. WIMD scores are ranked from most to least deprived and grouped into quintiles (1=most deprived, 5=least deprived). For the purpose of this study, three WIMD groups were assigned by sample size; high

deprivation (WIMD quintiles 1&2), middle deprivation (WIMD quintiles 3&4) and low deprivation (WIMD quintile 5). Statistical analyses were conducted using STATA version 16.

Multivariate logistic regression analyses was conducted to examine the health predictors of KS2 educational attainment. Given the variation in achievement rates reported in recent Welsh Government statistics and within this sample, children were stratified by SEN (non-SEN, SEN) and analysed in separate regression models. Analyses were adjusted for potential confounders (gender and deprivation) and clustered by school.

Achievement at KS1 was not adjusted for within analyses as this variable is on the pathway to KS2 educational attainment and takes into account the school-level factors that may explain educational attainment (e.g. a curriculum or learning intervention targeted at a non-achieving individual). Therefore, excluding KS1 educational attainment generates an understanding into the wider epidemiological factors that are associated with educational attainment at KS2. Prior to analyses, all data were cleaned and screened for potential outliers.

Backward-stepwise regression selection was employed manually to build the final regression models for children with and without a SEN. This process was selected given the large possibilities of predictor variables within the survey and routine data, and its ability to screen out variables that are not important to the outcome variable. The process of backward-stepwise regression analyses involves the inclusion of all variables within the initial model, followed by the individual removal of the least significant variables. This procedure is repeated until no nonsignificant variables remain within the final model. This was repeated for children with and without a SEN to produce two final models of statistical contribution displaying the major determinants of educational attainment at KS2. Given the addition and removal of HAPPEN survey questions throughout its development, and the 18 month delay in upload of routine educational attainment data to SAIL, a number of questions were unable to be included within analyses due to the small sample sizes present. Variables at risk of collinearity were manually screened and one representative variable

selected. Baseline characteristics were summarised by group (non-SEN, SEN) using proportions and means (95% confidence intervals).

5.4 Results

Table 17 presents the demographics for non-SEN and SEN children by achievement status (achieved KS2: A, did not achieve KS2: DNA). The total sample of children without a SEN was n=1,845 and those with a SEN n=730. Children from HAPPEN without a SEN displayed KS2 achievement rates of 98.3% (n=1,813), non-achievement 1.7%, compared to those with a SEN, 71.2% (n=520), non-achievement 28.8%.

5.4.1 Survey Data - The HAPPEN Survey

A difference in the categorisation of fitness (using the 20m SRT) between achievement status was observed within this population. Without a SEN who achieved, 50% were classified as fit compared to 40% that did not achieve. This difference was more marked for SEN children; achieved 45% fit, did not achieve 32% fit.

Variations in active travel behaviours before and after school were observed between non-SEN and SEN children. For non-SEN children, a lower proportion that achieved KS2 (40.2%) travelled actively to school compared to did not achieve (51.7%). A smaller but similar relationship was displayed for children with a SEN for those that achieved (42.3%) and did not achieve (47%). Active travel from school showed the same relationship for SEN children (A: 47.4%, DNA: 54%) but the opposite relationship for non-SEN children (A: 44.8%, DNA: 41.4%).

42.9% of SEN children that reported to be physically active (>60 minutes) at least 5 times a week were in the did not achieve group compared to the achieve group (50.7%). No difference was observed for this variable for non-SEN children. There was a larger variation for non-SEN children in the reporting of other physical activity

behaviours; attending weekly out of school clubs (A: 2.59, DNA: 1.68), reporting to be able to ride a bike (A: 93%, DNA: 86.2%) and to swim (A: 84.9%, DNA: 72.1%).

A higher proportion of SEN children that did not achieve KS2 reported to be sedentary 5+ days (A: 46.9%, DNA: 53%). For both groups, a higher proportion of those that did not achieve reported to be tired 5+ days (non-SEN: 39.1%, SEN: 39.1%) than those that achieved (non-SEN: 25.7%, SEN: 30.8%). A difference in non-SEN children by achievement group reported to be able to concentrate for 5+ days (A: 52.9%, DNA: 44%) and have sugary snacks 5+ days (A: 33%, DNA: 26.1%). There were higher proportions of children reporting to eat 3+ takeaways for non-SEN (A: 4.6%, DNA: 35%) and SEN children (A: 8.3%, DNA: 15.9%).

There was no difference between achievement groups for non-SEN and SEN children's reported wellbeing in the domains of health, school, family or friends. However, SEN children that did not achieve their KS2 reported a lower wellbeing life (8.44/10) than those that achieved (8.82/10). Higher levels of school competence were reported by non-SEN children that did not achieve their KS2 (A: 90.2%, DNA: 96.6%).

Differences in sleep behaviour were observed between SEN groups. For SEN children, a higher proportion of those that achieved their KS2 reported to sleep for 9+ hours (A: 85%, DNA: 81.9%). The opposite relationship is displayed in non-SEN children (A: 88.2%, DNA: 92.6%). More children without a SEN that achieved reported to have an afternoon school breaktime (A: 72.6%, DNA: 50%).

5.4.2 Routine Data – The SAIL Databank

In both groups, higher proportions of children that achieved their KS2 were breastfed (non-SEN: 45%, SEN: 32.7%) compared to those that did not achieve (non-SEN: 18%, SEN: 24.6%). The provision of free school meals (FSM) differed by achievement group for both groups. For non-SEN children, a higher proportion that did not achieve received FSM in KS1/Foundation Phase (A: 17.7%, DNA: 35%) and KS2 (A: 15.5%, DNA: 34.4%). The same relationship was observed in SEN children in KS1/Foundation Phase (A: 31.7%, DNA: 48.%) and KS2 (A: 26.9%, 42.9%). Children

without a SEN demonstrated larger variation in school attendance by achievement status. During KS1/Foundation Phase, this included overall session absences (A: 22.5 days, DNA: 26.7 days), authorised absence (A: 20.6 days, DNA: 23.7 days) and unauthorised absences (A: 1.9 days, DNA: 3.1 days). A larger variation in this group was observed during KS2 for overall session absence (A: 16.5 days, DNA: 23.8 days), authorised absence (A: 13.1 days, DNA: 18.3 days) and unauthorised absence (A: 3.5 days, DNA: 5.5 days).

Children with a SEN that did not achieve had a higher proportion of mental health diagnoses; 19.5% compared to those that achieved; 14.8%. In addition, having asthma demonstrated a difference by achievement group for non-SEN children, with 11.7% of those that achieved having asthma compared to 25% of those that did not achieve. Children without a SEN also displayed variations for vaccinations, with 98.5% of those that achieved receiving routine vaccinations during childhood compared to a lower proportion of 87.5% of those that did not achieve. Children with a SEN experienced more house moves, of those that achieved 21.4% experienced three or more house moves compared to 31.4% of those that did not achieve their KS2. Parental characteristics also differed between KS2 achievement group. Children that did not achieve their KS2 had a higher proportion of mother's depression diagnosis (non-SEN: 40.6%, SEN: 51.9%) in comparison to those that achieved (non-SEN: 36.2%, 45.2%). The same trend was observed for mothers that smoked, with 31.3% of non-SEN and 43.3% of SEN achieving children having a smoking mother compared to their non-achieving counterparts (non-SEN: 21.2%, SEN: 31.9%).

	No SEN		SEN	
	Achieved KS2	**Did not achieve KS2**	**Achieved KS2**	**Did not achieve KS2**
N	98.3% (1813) 95% CI: 97.5% -98.8%	1.7% (32) 95% CI: 1.2% - 2.4%	71.2% (520) 95% CI: 67.8% - 74.4%	28.8% (210) 95% CI: 25.6% - 32.2%
Boys	45.5% (825) 43.2% - 47.8%	56.3% (18) 39% - 72.1%	56.2% (292) 51.8% - 60.4%	60.5% (127) 53.7% - 66.9%
Deprived (WIMD 2014 Q1, 2)	38.2% (692) 95% CI: 36% - 40.4%	62.5% (20) 95% CI: 44.9% - 77.3%	39.6% (197) 95% CI: 35.4% - 44%	45.4% (89) 95% CI: 38.6% - 52.4%
HAPPEN data				
Shuttles (20m SRT)	31.69 (1622) 95% CI: 30.85 – 32.54	29.37 (30) 95% CI: 21.60 – 37.13	29.46 (451) 95% CI: 27.92 – 31.01	25.06 (200) 95% CI: 22.94 – 27.18

Fit	50% (810) 95% CI: 47.6% - 52.4%	40% (12) 95% CI: 24.3% - 58.1%	45% (203) 95% CI: 40.5% - 49.6%	32% (64) 95% CI: 25.9% - 38.8%
Breakfast	93.1% (1633) 95% CI: 91.8% - 94.2%	93.1% (27) 95% CI: 76.2% - 98.3%	92.2% (458) 95% CI: 89.4% - 94.2%	94% (187) 95% CI: 89.7% - 96.5%
Active travel to school	40.2% (704) 95% CI: 38% - 42.5%	51.7% (15) 95% CI: 34.1% - 69%	42.3% (209) 95% CI: 38% - 46.7%	47% (94) 95% CI: 40.2% - 53.9%
Active travel from **School**	44.8% (786) 95% CI: 42.3% - 47.2%	41.4% (12) 95% CI: 25.2% - 59.7%	47.4% (235) 95% CI: 43% - 51.8%	54% (107) 95% CI: 47.1% - 60.1%
5+ Fruit and veg	28.1% (493) 95% CI: 26.1% - 30.3%	24.1% (7) 95% CI: 12% - 42.7%	28.4% (141) 95% CI: 24.6% - 32.5%	28.6% (57) 95% CI: 22.8% - 35.3%
Active 5+ days	50.5% (854) 95% CI: 48.1% - 52.8%	51.5% (16) 95% CI: 42.1% - 77.9%	50.7% (231) 95% CI: 46.1% - 55.2%	42.9% (73) 95% CI: 35.7% - 50.5%

Sedentary 5+ days	48.5% (793) 95% CI: 46.1% - 51%	48.3% (14) 95% CI: 31% - 65.9%	46.9% (215) 95% CI: 42.4% - 51.5%	53% (97) 95% CI: 45.7% - 60.1%
Tired 5+ days	25.7% (345) 95% CI: 23.4% - 28.1%	39.1% (9) 95% CI: 21.8% - 59.8%	30.8% (109) 95% CI: 26.2% - 35.8%	39.1% (59) 95% CI: 31.6% - 47.1%
Concentrate 5+ days	52.9% (858) 95% CI: 50.5% - 55.4%	44% (11) 95% CI: 26.3% - 63.3%	42.8% (185) 95% CI: 38.2% - 47.6%	42.6% (72) 95% CI: 35.4% - 50.2%
Sugary snack 5+ days	33% (547) 95% CI: 30.8% - 35.3%	26.1% (6) 95% CI: 12.2% - 47.3%	36.5% (160) 95% CI: 32.1% - 41.1%	32% (59) 95% CI: 26.5% - 40.2%
Takeaway 5+ days	4.6% (43) 95% CI: 3.4% - 6.2%	35% (7) 95% CI: 17.7% - 57.5%	8.3% (25) 95% CI: 5.7% - 12%	15.9% (21) 95% CI: 10.6% - 23.2%
Out of school clubs	2.59 (1521) 95% CI: 2.47 – 2.71	1.68 (25) 95% CI: - 0.88 – 2.48	2.43 (432) 95% CI: 2.16 – 2.69	1.79 (170) 95% CI: 1.47 – 2.10

Ride a bike	93% (1617) 95% CI: 91.7% - 94.1%	86.2% (25) 95% CI: 68.5% - 94.7%	89% (436) 95% CI: 85.9% - 91.5%	87.8% (173) 95% CI: 82.5% - 91.7%
Swim	84.9% (1479) 95% CI: 83.1% - 86.5%	72.1% (21) 95% CI: 53.7% - 85.6%	70.4% (347) 95% CI: 66.2% - 74.3%	68.7% (136) 95% CI: 61.9% - 74.8%
Wellbeing Health	8.74 (1738) 95% CI: 8.67 – 8.8	9 (29) 95% CI: 8.44 – 9.56	8.70 (495) 95% CI: 8.57 – 9.02	8.79 (199) 95% CI: 8.56 – 9.02
Wellbeing School	8.79 (1738) 95% CI: 8.72 – 8.88	8.9 (29) 95% CI: 8.28 – 9.53	8.7 (495) 95% CI: 8.55 – 8.85	8.73 (199) 95% CI: 8.48 – 8.99
Wellbeing Family	9.53 (1738) 95% CI: 9.48 – 9.58)	9.41 (29) 95% CI: 8.88 – 9.94	9.53 (495) 95% CI: 9.43 – 9.63	9.52 (199) 95% CI: 9.36 – 9.68
Wellbeing Friends	9.33 (1738) 95% CI: 9.27 – 9.39	9.41 (29) 95% CI: 8.96 – 9.86	9.32 (495) 95% CI: 9.21 – 9.43	9.34 (199) 95% CI: 9.16 – 9.52

Wellbeing Life	9.02 (472) 95% CI: 8.87 – 9.12	9.17 (6) 95% CI: 7.02 – 11.3	8.82 (119) 95% CI: 8.48 – 9.17	8.44 (45) 95% CI: 7.66 – 9.23
High School Competence	90.2% (1570) 95% CI: 88.7% - 91.5%	96.6% (28) 95% CI: 79.2% - 99.5%	85.6% (423) 95% CI: 82.2% - 88.5%	88.8% (174) 95% CI: 83.5% - 92.5%
High Autonomy	89.7% (1561) 95% CI: 88.1% - 91%	86.2% (25) 95% CI: 68.5% - 94.7%	85.8% (424) 95% CI: 82.5% - 88.6%	90.3% (177) 95% CI: 85.3% - 93.7%
High General Competence	90.1% (1568) 95% CI: 88.6% - 91.4%	89.7% (26) 95% CI: 72.4% - 96.6%	89.1% (440) 95% CI: 86% - 91.5%	87.7% (171) 95% CI: 82.3% - 91.6%
Sleep hours	9.79 (1721) 95% CI: 9.73 – 9.85	9.96 (27) 95% CI: 9.44 – 10.48	9.73 (481) 95% CI: 9.6 – 9.87	9.71 (199) 95% CI: 9.49 – 9.94
Sleep 9 hours	88.2% (1518) 95% CI: 86.6% - 89.6%	92.6% (25) 95% CI: 74.7% - 98.1%	85% (409) 95% CI: 81.5% - 88%	81.9% (163) 95% CI: 75.9% - 86.7%

Afternoon break	72.6% (344) 95% CI: 68.4% - 76.4%	50% (<10%) 95% CI: 16.7% - 83.3%	65.6% (78) 95% CI: 56.5% - 73.6%	64.4% (29) 95% CI: 49.5% - 77%
Emotional difficulty	5.35 (473) 95% CI: 5.03 – 5.67	4 (6) 95% CI: 1.61 – 6.39	6.22 (119) 95% CI: 5.53 – 6.9	5.91 (44) 95% CI: 4.62 – 7.19
Behavioural difficulty	2.21 (473) 95% CI: 2.01 – 2.42	1.83 (6) 95% CI: -1.38 – 5.05	3.39 (119) 95% CI: 2.94 – 3.84	3.25 (44) 95% CI: 2.45 – 4.05
SAIL data				
Birth weight	3.40 (1742) 95% CI: 3.37 – 3.43	3.22 (19) 95 CI: 2.89 – 3.56	3.33 (503) 95% CI: 3.28 – 3.38	3.22 (202) 95% CI: 3.14 – 3.31
Low birth weight	5.4% (94) 95% CI: 4.4% - 6.6%	16% (<10%) 95% CI: 5.2% - 39.1%	6.6% (33) 95% CI: 4.7% - 9.1%	9.9% (20) 95% CI: 6.5% - 14.9%

Breastfed	45% (729) 95% CI: 42.6% - 47.4%	18% (<10%) 95% CI: 5.8% - 42.7%	32.7% (154) 95% CI: 28.6% - 37.1%	24.6% (47) 95% CI: 19% - 31.2%
FSM Foundation Phase/KS1	17.7% (308) 95% CI: 16% - 19.6%	35% (7) 95% CI: 17.7% - 57.5%	31.7% (158) 95% CI: 27.8% - 36%	48% (98) 95% CI: 41.3% - 54.9%
FSM KS2	15.5% (281) 95% CI: 13.9% - 17.2%	34.4% (11) 95% CI: 20.2% - 52.1%	26.9% (140) 95% CI: 23.3% - 30.9%	42.9% (90) 95% CI: 36.3% - 49.7%
Achieve KS1/Foundation Phase	90.9% (1648) 95% CI: 89.5% - 92.1%	34.4% (11) 95% CI: 20.2% - 52.1%	68.9% (358) 95% CI: 64.7% - 72.7%	18.6% (39) 95% CI: 13.9% - 24.4%
Achieve KS1/Foundation Phase missing data (9999)	4.2% (76) 95% CI: 3.4% - 5.2%	37.5% (12) 95% CI: 22.7% - 55.1%	4.3% (22) 95% CI: 2.8% - 6.3%	2.86% (6) 95% CI: 1.3% - 6.2%

Session Absence KS1/Foundation Phase	22.53 (1737) 95% CI: 21.68 – 23.37	26.7 (20) 95% CI: 16.03 – 37.37	29.36 (498) 95% CI: 27.13 – 31.56	31.64 (204) 95% CI: 28.03 – 35.24
Session Absence Authorised KS1/Foundation Phase	20.61 (1736) 95% CI: 19.83 – 21.39	23.65 (20) 95% CI: 15.1 – 32.2	25.36 (498) 95% CI: 23.41 – 27.3	27.84 (204) 95% CI: 24.66 – 31.02
Session Absence Unauthorised KS1/Foundation Phase	1.93 (1736) 95% CI: 1.63 – 2.24	3.05 (20) 95% CI: -0.2 – 6.3	4.0 (498) 95% CI: 3.05 – 4.95	3.8 (204) 95% CI: 2.61 - 5
Session Absence KS2	16.54 (1813) 95% CI: 15.85 – 17.22	23.78 (32) 95% CI: 19.11 – 28.45	21.06 (520) 95% CI: 19.19 – 22.92	22.11 (210) 95% CI: 19.42 – 24.81
Session Absence Authorised KS2	13.05 (1813) 95% CI: 12.46 – 13.64	18.3 (32) 95% CI: 14.46 – 22.16	16.54 (520) 95% CI: 14.88 – 18.2	17.32 (210) 95% CI: 15.17 – 19.46
Session Absence Unauthorised KS2	3.49 (1813) 95% CI: 3.16 – 3.82	5.47 (32) 95% CI: 2.84 – 8.1	4.52 (520) 95% CI: 3.71 – 5.32	4.8 (210) 95% CI: 3.47 – 6.13

Any Mental Health	6.23% (113) 95% CI: 5.2% - 7.4%	6% (<10%) 95% CI: 1.6% - 21.8%	14.81% (77) 95% CI: 12% - 18.1%	19.52% (41) 95% CI: 14.7% - 25.5%
Asthma flag	11.69% (212) 95% CI: 10.3% - 13.3%	25% (8) 95% CI: 13% - 42.6%	15.96% (83) 95% CI: 13.1% - 19.4%	12.86% (27) 95% CI: 9% - 18.1%
Have siblings	48.76% (884) 95% CI: 46.5% - 51.1%	50% (16) 95% CI: 33.3% - 66.7%	53.85% (280) 95% CI: 49.5% - 58.1%	55.24% (116) 95% CI: 48.4% - 61.8%
Did not attend GP	40.54% (735) 95% CI: 38.3% - 42.8%	50% (16) 95% CI: 33.3% - 66.7%	54.81% (285) 95% CI: 50.5% - 59%	57.62% (121) 95% CI: 50.8% - 64.1%
Child vaccination	98.46% (1785) 95% CI: 97.8% - 98.9%	87.5% (28) 95% CI: 71% - 95.2%	99.23% (516) 95% CI: 98% - 99.7%	98.57% (207) 95% CI: 95.7% - 99.5%
House moves 3+	17.1% (310) 95% CI: 15.4% - 18.9%	18.75% (6) 95% CI: 8.7% - 35.9%	21.35% (111) 95% CI: 18% - 25.1%	31.43% (66) 95% CI: 25.5% - 38%

Number of Adults in House	1.9 (1813) 95% CI: 1.83 – 1.9	1.4 (32) 95% CI: 1.07 – 1.68	1.7 (520) 95% CI: 1.62 – 1.77	1.65 (210) 95% CI: 1.53 – 1.76
Mum depression	36.18% (656) 95% CI: 34% - 38.4%	40.63% (13) 95% CI: 25.2% - 58.1%	45.19% (235) 95% CI: 41% - 49.5%	51.9% (109) 95% CI: 45.1% - 58.6%
Mum smoke	21.24% (385) 95% CI: 19.4% - 23.2%	31.25% (10) 95% CI: 17.7% - 49%	31.92% (166) 95% CI: 28% - 36.1%	43.33% (91) 95% CI: 36.8% - 50.1%
Mum age birth	28.81 (1813) 95% CI: 28.54 – 29.08	25.53 (32) 95% CI: 23.45 – 27.61	26.69 (519) 95% CI: 26.17 – 27.21	26.59 (209) 95% CI: 25.7 – 27.47

Table 17: *Demographic characteristics (HAPPEN data and SAIL data) for children without a SEN and with a SEN.*

Binary and categorical data: % (n), 95% confidence intervals. Continuous data: mean (n), 95% confidence intervals

The cohort flow diagram presented below depicts the steps of data inclusion and exclusion prior to analysis. From the initial datasets consisting of HAPPEN collected data and routine data (Primary Care GP, NCCHD, education attainment) (n=6190), 484 participants were excluded due to missing ALF. This is likely a result of missing demographic records provided by the school (e.g. date of birth). The next step involved the exclusion of participants with multiple survey responses, for example completion in both years 5 and 6, or participants from school-based intervention evaluations with baseline and follow-up measures (e.g. The Daily Mile). In the case of multiple participant entries, participants' initial baseline responses were included, and additional responses (e.g. second, third or fourth response) excluded. This process generated a linked dataset of 4492 unique participants. From this dataset, a total of 1917 participants were excluded due to missing data. Of these 1917 instances of missing data, 1605 participants completed The HAPPEN Survey in the 2017-18 and 2018-19 academic years and thus were excluded with no current educational attainment data (i.e. their educational attainment data was not currently stored within SAIL but will be uploaded in future updates). The remaining exclusion (n=312) was due to missing routine data records, for example representing children that have moved to Wales and are not registered with a GP. Following these exclusion processes, the final linked datasets of unique participants with full routine data and HAPPEN survey responses for data analysis consisted of 2575 participants (no SEN: n=1774, SEN: n=455). The variables with missing data within the final analyses models are presented in the diagram below, accounting for n=71 excluded non-SEN data and n=275 SEN data. For non-SEN participants, the majority of missing data was due to incomplete demographic data (e.g. postcode – WIMD, gender) provided by schools. For SEN participants, in addition to this missing demographic information, excluded data included missing objective fitness assessments (20m MSRT, e.g. schools only participating in The HAPPEN Survey or non-participation by pupil), and missing responses within The HAPPEN Survey (sleep, out of school clubs, likely due to coding inconsistencies or non-completion of survey). Missing routine records (e.g. breastfeeding, FSM) also accounted for instances of excluded data. Thus, final analyses models consisted of n=1774 non-SEN and n=455 SEN participants.

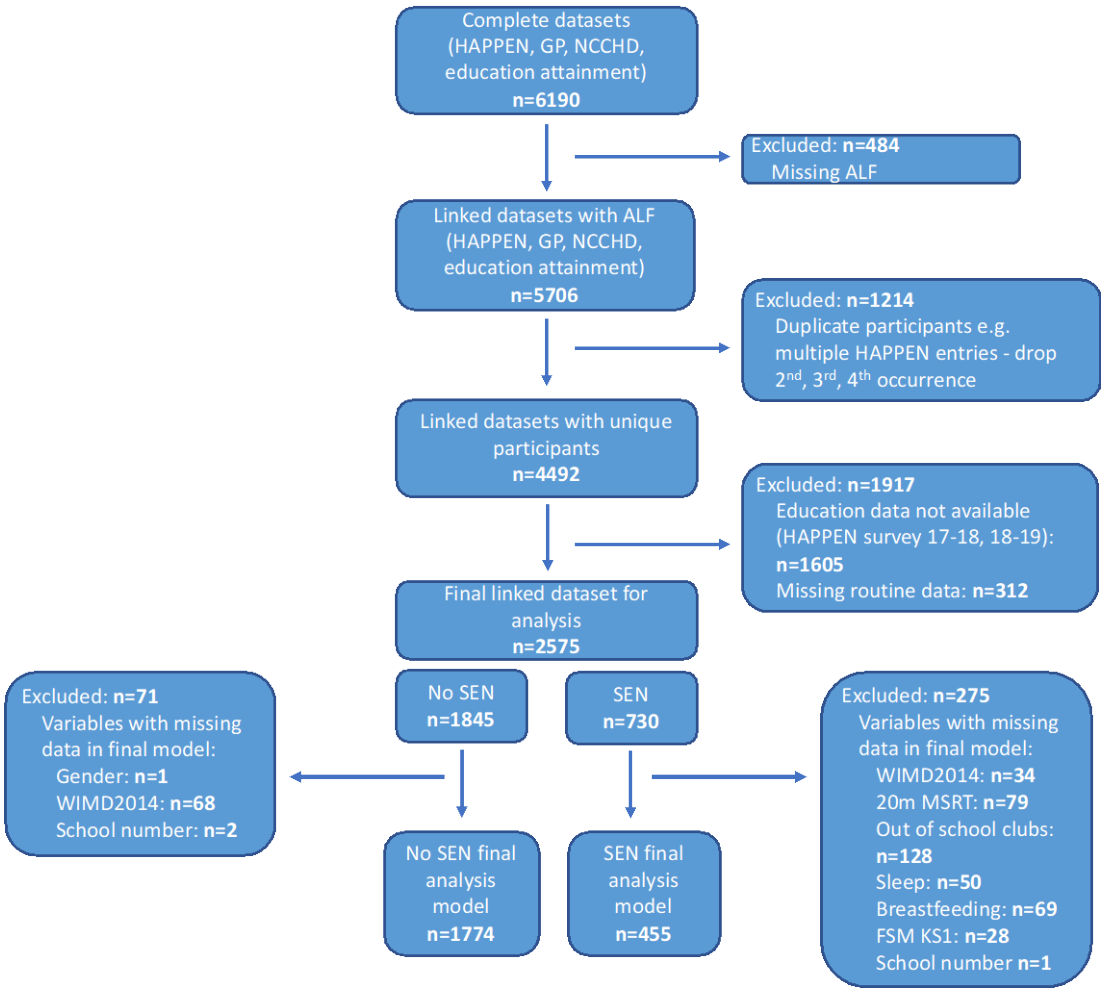

***Figure 6**: Cohort flow diagram of the process prior to data analysis*

The stepwise regression technique applied to statistical analyses for non-SEN and SEN children produced final predictor models of educational attainment at KS2. **Table 18** presents the predictive factors of a non-SEN child achieving their KS2 CSI at age 10-11 years. Factors associated with a non-SEN child achieving at KS2 were KS2 unauthorised absence (odds ratio, OR=0.98, 95% CI: 0.96-1.00), asthma diagnosis (OR=0.36, 95% CI: 0.18-0.74), vaccinations (OR=8.3, 95% CI: 2.55-26.97) and number of adults living in the house (OR=1.83, 95% CI: 1.21-2.78). There was a significant difference between the educational attainment of the least deprived group (WIMD quintile 5) (OR=3.79, 95% CI: 1.04-13.9) and the most deprived group (WIMD quintile 1, 2), but no difference for the middle deprivation group (WIMD quintile 3, 4) (OR=1.37, 95% CI: 0.53-3.53). There was no significant difference by gender (OR=1.4, 95% CI: 0.56-3.72). This model included n=1774 HAPPEN participants and the variables within the model accounted for 10.5% (R^2)of the variance in the outcome.

N=1,774 **R^2=0.1050**			
Non-SEN achieved KS2 CSI	**Odds ratio**	**p.**	**95% confidence intervals**
Female	1.4	0.446	0.56-3.72
WIMD middle deprivation (quintiles 3, 4)	1.37	0.511	0.53-3.53
*WIMD low deprivation (quintile 5)**	3.79	0.044	1.04-13.9
KS2 unauthorised absence	0.98	0.053	0.96-1.00
*Asthma**	0.36	0.005	0.18-0.74
*Vaccinations**	8.3	0.000	2.55-26.97
*Number of adults in house**	1.83	0.004	1.21-2.78

Table 18: *Predictive factors (HAPPEN data and routine data) of a non-SEN child achieving their KS2 CSI. WIMD reference group – high deprivation (quintiles 1, 2).*

The factors associated with KS2 educational attainment for SEN children are presented in **Table 19**. These factors were being female (OR=1.82, 95% CI: 1.27-2.62), the 20m SRT (OR=1.02, 95% CI: 1.00-1.04), out of school sport clubs (OR=1.13, 95% CI: 1.02-1.25), sleep 9+ hours (OR=1.65, 95% CI: 0.99-2.73), breastfed at birth (OR=1.48, 95% CI: 0.99-2.21), free school meals at KS1 (OR=0.49 95% CI: 0.33-0.74), any mental health diagnosis (OR=0.56, 95% CI: 0.35-0.88) and mother smokes (OR=0.68, 95% CI: 0.49-0.93). There was a statistically significant difference between the middle deprivation group (WIMD quintiles 3, 4) (OR=0.62, 95% CI: 0.43-0.91) and the high deprivation group (WIMD quintiles 1, 2), but no difference with the low

deprivation group (WIMD quintile 5). Accounting for n=455 HAPPEN participants with a SEN, this model displayed an R^2 value of 9.1%.

N=455 **R^2=0.0906**			
SEN achieved KS2 CSI	**Odds ratio**	**p.**	**95% confidence intervals**
*Female**	1.82	0.001	1.27-2.62
*WIMD middle deprivation (quintiles 3, 4)**	0.62	0.013	0.43-0.91
WIMD low deprivation (quintile 5)	0.82	0.628	0.37-1.81
*20m SRT**	1.02	0.031	1.00-1.04
*Out of school clubs**	1.13	0.017	1.02-1.25
Sleep 9+ hours	1.65	0.053	0.99-2.73
Breastfed	1.48	0.056	0.99-2.21
*FSM KS1**	0.49	0.001	0.33-0.74
*Mental health**	0.56	0.012	0.35-0.88
*Mother smokes**	0.68	0.017	0.49-0.93

Table 19: *Predictive factors (HAPPEN data and SAIL data) of a SEN child achieving their KS2 CSI. WIMD reference group – high deprivation (quintiles 1, 2).*

5.5 Discussion

This study aimed to examine the most important predictive factors associated with achieving the expected level 4+ CSI (achieving English/Welsh, Mathematics and Science) in children aged 10-11 attending a HAPPEN primary school. Results from this study have identified these determinants of educational attainment for children with and without a SEN, given the wide variation in achievement by these groups in recent Government statistics. Therefore, these groups will be discussed in separate subsections to reflect the differences between these subgroups. The achievement gap between children with and without a SEN stated above was also demonstrated in this study. Within this HAPPEN sample, 98.8% of children without a SEN achieved their KS2 CSI, in comparison to 71.2% of children with a SEN. Narrowing inequalities in health and education, both demographically and in educational provision is a public health priority. Therefore, this section aims to discuss the factors associated with achieving KS2 and offer considerations and conclusions for the public health and education fields.

5.5.1 Children Without a SEN

5.5.1.1 Deprivation

At the 5% significance level, findings from this research study present a significant difference in the KS2 achievement levels of HAPPEN children without a SEN by deprivation group. Within this study, deprivation was classified as an area-based socio-economic measure using the Welsh Index of Multiple Deprivation (WIMD) and classified into three groups of high deprivation, middle deprivation and low deprivation. Results from this study show that HAPPEN children in the lowest deprivation group were more likely to achieve their KS2 educational attainment than those in the highest deprivation group. Thus, what is often referred to in the literature as the attainment gap is in reality a gradient; that is the most advantaged pupils perform the highest test scores and the most disadvantaged pupils the lowest[267].

Socio-economic background is one of the key drivers in educational attainment. Inequalities in education have persisted for decades as highlighted in the Coleman report published in 1966[239]. On a global level, the WHO's Health 2020 report highlights the importance of education as a fundamental component of reducing inequalities and supporting human development[18]. The report also recognises the synergy between sectors and proposes that investing in education is an investment in health and wellbeing. Indeed, as the WHO state in this report, education plays a vital role in securing children with positive life chances. Educational qualifications are a strong determinant of future prospects through increased employment opportunities, better living conditions and better health and wellbeing outcomes. Therefore, reducing inequalities in education is a public health priority and plays a crucial role in improving patterns of social mobility[268]. However, despite the efforts by all sectors to reduce inequalities, the findings in this study suggest that a deprivation gap, or gradient, in education still persists.

These findings are in no way novel but provide a stark reminder that things are still not improving for non-SEN children in Wales. Indeed, a recent report by UNICEF; 'An Unfair Start', presented a life course perspective to educational inequalities and highlighted that inequalities originate from birth[237]. This has been demonstrated within the academic field, with deprivation-related parental habits such as smoking during pregnancy and not breastfeeding following birth impacting on a child's development[269,270]. This impact on children's healthy development has also been observed in the field of neuroscience, with research demonstrating the impact of poverty on the development of children's brains, with the most deprived children exhibiting the largest differences in brain structure[271].

Parental engagement and involvement through the home learning environment has also been demonstrated, for example through learning activities that stimulate language development and literacy and numeracy competence. This has been cited as an important component in children's skill development[272]. Results from the Millennium Cohort Study (MCS) found that markers of home learning are socially patterned, with the most favourable profiles of home learning observed in the highest income groups[273]. Factors such as these all have strong

implications for children's cognitive development during the early years and ultimately their school readiness; a measure of how cognitively, socially and emotionally prepared a child is to succeed in school[274]. Indeed, a gap in school readiness exists between children from deprived and non-deprived backgrounds. Recent findings from the MCS have demonstrated that socio-economic conditions such as social class, maternal education and family income are the strongest predictors of school readiness at age 3[275].

As highlighted in this study, children without a SEN in the least deprived group performed significantly better at KS2 than those in the most deprived group, and although not statistically significant, better than the middle deprivation group. Indeed, early life has a profound impact on children's school readiness and primary school achievement. However, there is also an abundance of evidence on the impact of socio-economic determinants of education that suggests these inequalities persist and worsen throughout a child's academic journey. For example, analysis by the Education Policy Institute showed that disadvantaged pupils in England (eligible for Pupil Premium) start the early years phase 4.3 months behind their non-disadvantaged peers, they are then 9.4 months behind in primary school (KS2) and this gap increases further to 13.4 months behind in secondary schools[267]. This is supported by evidence from the Scottish leavers cohort study that applies the linkage of education and health records of pupils who leave school in Scotland having reached the minimum school leaving age (16 years). Findings from this population prospective study using the older Scottish Credit and Qualifications Framework (SCQF) (prior to curriculum reform) found the number of school leavers failing to achieve any passes at SCQF level 3 (lowest level at which an external examination is taken) was significantly higher for those on FSM. Furthermore, there was a significant negative association between deprivation at birth, using the Scottish Index of Multiple Deprivation, and the highest SCQF attained at age 16[276].

Following secondary education, there is also an association between SES and the likelihood of spending time not in employment, education or training (NEET) which has a subsequent impact on physical and mental health[277]. Thus, the gradient in educational inequalities endures throughout a child's educational journey

and beyond. With the relationship between education and health well documented, findings in this study and further afield suggest the health, wellbeing and employment outcomes of some children within HAPPEN are at risk.

Thus, with these inequalities in education highlighted, it is now important to consider the role that schools can play in reducing the gradient. There has been a longstanding debate regarding the function of schools and the inquiry into whether they exacerbate or ameliorate academic disparities. Indeed, answering this question has important implications for both policy and practice. This was attempted in a recent article by Dumont and Ready using nationally representative data from America. However, the authors failed to come to a conclusion, citing differences in research questions and analytical approaches[278].

Within Wales, tackling the impact of deprivation on educational attainment remains a priority[279]. With the new Curriculum for Wales currently being pioneered, perhaps this shift in education perspective provides this opportunity, through increased autonomy for schools and shaping curriculum delivery based on local and community needs. A recent Welsh Government education action plan on the new curriculum suggests that the sector must be knowledgeable about educational inequalities. This requires cross-sectoral and multi-agency collaboration by the regional consortia, and supporting those in greatest need[280]. This timely document highlights the important role that HAPPEN can play in providing a universally accessible health and education network for primary schools in Wales, collaborating with schools, regional education consortia and the wider public health and education field. For example, the HAPPEN school report allows the identification and prioritisation of the health and wellbeing needs of pupils. Furthermore, research by HAPPEN has concluded the positive impact of The Daily Mile on children's fitness from both deprived and non-deprived areas, highlighting the potential of The Daily Mile in tackling inequalities in children's health and fitness[81]. These findings have been shared throughout Wales, the UK and internationally. Although technically distinct from educational inequalities, given the cyclical relationship between health and education these findings, along with HAPPEN's network function provide a potential piece in the complex jigsaw of decreasing the inequality gradient.

5.5.1.2 Unauthorised Absence

Attendance during KS2 was a significant factor associated with educational attainment in the form of unauthorised absence. The recording of school attendance within Wales is typically categorised under three predominant groups; present, authorised absence and unauthorised absence[281]. Instances that are coded as authorised absences are approved by the school and include medical appointments, illnesses and agreed family holidays. In comparison, unauthorised absence refers to truancy and family holidays not approved by the school (or >10 days duration). Indeed, two large scale studies involving administrative data demonstrated the negative impact of both authorised and unauthorised absences on the test performance of primary school-aged children[282,283]. These results are unsurprising given that children that are absent from school subsequently receive fewer days of teaching. However, an interesting finding was that this association was more apparent for children with higher levels of unauthorised absence. Within both the political and research agendas, much of the rhetoric and focus on school absence has centred on those that are unauthorised[284]. Both studies highlight the importance of distinguishing between authorised and unauthorised absences within analyses in order to understand their individual relationship with academic outcomes. This is demonstrated within the analyses from this study in which initial analysis models included both authorised and unauthorised absences. However, final results indicate only *unauthorised* absence during KS2 was associated with educational attainment for children within HAPPEN.

This negative impact of unauthorised absence has longer term consequences as the trajectories of non-attendance can be tracked throughout a child's educational journey[284]. As demonstrated in **Table 17**, children's non-attendance shows a growing trend from KS1 to KS2 with the mean difference in non-attendance days between children that did and did not achieve widening during this period. This increase is observed in both authorised and unauthorised absences. Research has demonstrated the association between higher levels of school absence and the increased likelihood of early school dropout[285]. In fact, this impact is not limited to academic outcomes, with evidence highlighting that association between school

absence and engagement in future risky health behaviours such as alcohol, smoking and drinking[286].

Therefore, school non-attendance as early as primary school has significant implications for education and health outcomes, contributing to a cycle of widening inequalities. To further exacerbate the problem of widening inequalities, research has demonstrated that socio-economic indicators at both the school[287] (free school meal provision) and home[288] (poverty) level are related to higher levels of absence. In addition, the effect of school absence on achievement is greater for low income and disadvantaged primary school children[283,289,290]. Although SES was controlled for within this study, the direct relationship between SES and attendance was not examined. However, efforts to increase levels of attendance within school may benefit from focussing on children from disadvantaged backgrounds.

However, identifying the mechanisms behind school absence and in particular, unauthorised absence have been a challenge to the education and research sector as non-attendees do not appear to fit into one group and account for a variety of reasons[291]. Understanding these mechanisms is essential for schools to direct resources according to need and for policymakers in designing and implementing policies and interventions[292]. With this said, reasons for non-attendance generally fit within three categories; individual, home and school factors[293]. On the individual level, a variety of factors have been identified that contribute towards children's non-attendance at school. These include a lack of self-esteem and academic ability, low confidence and social skills, poor peer relationships and bullying[294,295]. However as McIntyre-Bhatty states, problems with attendance on an individual level often requires individualised solutions[291]. This is likely to involve an intensive process from the school in collaboration with families to uncover the reasons for the child's disaffection with school. If this is ignored, or efforts to increase attendance are targeted universally as opposed to individually, it is likely the causes of non-attendance remain undiscovered and these behaviours will continue.

Furthermore, home and family environments also play an important role in the school attendance of children. For example unauthorised absences, as identified as an important predictor of educational attainment in this study, have been associated with factors relating more so to parental involvement and home environments. Grolnick and Slowiaczek conceptualised parental involvement into three domains; (1) behaviour (participating in school activities and work at home), (2) cognitive (exposing the child to intellectually stimulating activities) and (3) personal (staying informed about the child's school)[296]. Indeed, a large synthesis by Henderson *et al.* of over 50 studies examining the impact of parental involvement on children's academic achievement concluded that a positive and convincing relationship exists between family involvement and a child's academic achievement and attendance[297]. The benefits included within the review also included improved home and school behaviour and better social skills. However, Henderson *et al.* emphasised that parental involvement will not solely improve the academic outcomes of children. Rather, they highlighted the importance of complementary school environments that support children. Therefore, although personal and family factors hold an influence upon a child's attendance, factors from a school perspective must be considered. Those associated with non-attendance have been identified including a negative attitude to or a poor relationship with teachers and low enjoyment of school[284]. In addition, teaching quality has been identified as a school-level factor associated with attendance[298].

Thus, schools can play an important role in encouraging attendance through targeting precursors to school absence such as a pupil's relationship with their teacher and influencing their enjoyment of school. This can be achieved through the provision of curricular and extra-curricular activities. Given the findings in this study of the relationship between KS2 unauthorised attendance and educational attainment and the likelihood of non-attendance behaviour patterns persisting throughout the later stages of education, focussing efforts on children at risk of school absence during the primary years is a priority for public health and education. This is emphasised by Hancock *et al.* who conclude that efforts to improve attendance need to start early[283]. Therefore, introducing school-based

programmes that have been shown to increase a child's engagement with school show potential in addressing this challenge. Previous research from HAPPEN presented in Chapters 3 and 4 have demonstrated the potential in curriculum-based education and health programmes. For example, findings from the qualitative analysis of outdoor learning concluded that children's enjoyment of school and engagement in learning improved[80]. In addition, the mixed-methods study on The Daily Mile recommended the active involvement of teachers within the running programme and suggested the wider benefits this can elicit such as improved teacher-pupil rapport[81]. Furthermore, these findings suggested students improved their social skills.

Based on the findings in this study, the suggestion that curriculum-based outdoor learning and The Daily Mile could provide schools with an avenue in improving attendance and children's enjoyment of school is backed up by research. This is supported in an analytical review of school absenteeism by Reid who suggested that improving school attendance requires schools to change, develop their curriculum, teaching styles and school ethos[299]. Both outdoor learning and The Daily Mile require a large culture change throughout schools. These programmes require headteachers to reflect on their priorities and the overall school ethos, teaching staff to adapt their teaching styles and reassess the time they dedicate to curriculum activities and be flexible in their approaches, all of which contributes to improving school wellbeing. Both school-based programmes discussed within this thesis incorporate all of these elements highlighted by Reid. However as discussed in this section, influencing the school environment does not provide the only solution to improving attendance rates. This requires a coordinated effort involving engagement with parents and families in order to target the individual and sociofamilial factors. This raises the question of the future direction of HAPPEN and the consideration of incorporating elements of parental engagement, perhaps through the dissemination of findings to parents, families and the wider community.

5.5.1.3 Asthma Diagnosis

Results from this study also identified a predictive association between children without a SEN achieving their KS2 educational attainment and a lower likelihood of having an asthma diagnosis. Asthma is a long-term lung condition that causes inflammation of the breathing airways[300]. Globally, asthma is the most common noncommunicable disease amongst children[301]. It has been reported that the prevalence of asthma within Wales is one of the highest in the world, with over 314,000 people having asthma of which 59,000 are children (1 in 10 children)[302]. The prevalence of asthma is increasing due to the urbanisation of developed countries, causing changes in lifestyle and environment[303]. In addition, evidence demonstrates the social gradient that exists, with children of parents from a lower SES at an increased risk of asthma diagnosis[304]. Indeed, the impact of asthma on children's education has been the subject of research for many decades. Given the finding in this study, this will be discussed in relation to the literature on children's attendance, educational attainment and future implications.

As discussed previously, school non-attendance has significant implications for children such as a lower educational attainment and a higher likelihood of school dropout. With this said, research suggests that asthma is the leading cause of school absence[305]. Furthermore, the level of school absence has been found to correlate with the severity of a child's asthma condition[306,307]. Hsu *et al.* noted that asthmatic children that missed school were more likely to have uncontrolled asthma and report suffering from asthma episodes or attacks[308]. With this increased likelihood of school interruption for asthmatic children, it is important to understand the factors behind school absence in order to reduce inequalities in education provision. Children with asthma may be required to miss school for medical appointments[309]. It is also important to consider the seasonal effects of children's absence from school in which increased levels of air pollution or allergens may contribute towards lower school attendance[310].

An interesting finding from Stridsman *et al*. highlighted how the school environment exacerbates the symptoms of asthma in adolescents. Within this study,

the participants aged 14-15 identified a range of triggers within the school environment including poor air quality, a poorly cleaned environment, building construction, allergens, strong fragrances, stress and physical education[311]. Triggers such as these could encourage children and adolescents to miss school in order to avoid aggravating their condition which subsequently can have an impact on their education. These findings highlight the importance of schools and school staff understanding and considering the potential triggers within the school environment, and modify any factors that could impact a child's condition.

However, research with teachers suggests that teacher knowledge of asthma is low[312] and they do not feel adequately prepared to support children with the management of their asthma due to concerns over medical emergencies, administering medication and issues of liability[313]. This could be improved through the inclusion of chronic disease management within initial teacher training or current teaching professional courses. Indeed, HAPPEN provides a platform in which information on chronic disease management of pupils could be shared with teachers. Evidence suggests that the levels of school absenteeism observed within the asthmatic population decreases with age, that is, as a child gets older they miss fewer days of school[314]. One explanation for this is that the management of asthma improves as a child gets older. Furthermore, children of a younger age are more likely to have uncontrolled asthma than children of an older age[315] which could contribute to school absence. These findings highlight the importance of focussing efforts on primary school children, particularly those with chronic conditions such as asthma, and providing them and their teachers with support in managing their condition.

Therefore, given the importance of school non-attendance and the implications this has for children's education and employment outcomes, the increased levels of school absence observed in the asthmatic population could explain one mechanism through which children achieving their KS2 educational attainment within HAPPEN are less likely to have an asthma diagnosis.

Surprisingly, the literature examining the impact of an asthma diagnosis on children's educational attainment has produced conflicting results. A review by Taras and Potts-Datema concluded that of the 66 reviewed studies of school-aged children (5-18), approximately two thirds demonstrated no difference in the levels of academic achievement of asthmatic pupils. The studies showing a difference in achievement levels were limited to children with severe symptoms or to other contributing social factors (e.g. SES), and the authors concluded that there is no clear evidence that the presence of asthma affects academic achievement[316]. Furthermore, a population cohort study undertaken using routinely linked data in Scotland examined the impact of asthma on educational attainment data for over 125,000 school children. Their initial findings showed that adjusting for SES, asthmatic children (SEN and no SEN) had lower attainment than their non-asthmatic peers. However, this association weakened when children with a SEN were excluded, and disappeared when adjusting for school absence. The authors therefore suggested that there was not a direct effect of asthma on educational attainment but rather, an indirect effect through school absence. With this said, this study was completed with children of secondary school level and thus, the findings presented from HAPPEN provide an important contribution to the literature of primary school aged children. It is possible that during primary school, the findings found in this study are due to children having poorly controlled or managed asthma as discussed previously. School non-attendance could be higher as a result and thus, this explains the association between KS2 educational attainment and asthma diagnosis in this study. Therefore, further research is warranted and it would be useful to follow up children included within this study at secondary school age to examine if the impact of asthma on their education is reduced as they get older, they learn to manage their condition better and increase school attendance.

The mixed findings found within the field of educational attainment and asthma could be due to the varying definitions and severity of asthma, such as defining asthma based on respiratory symptoms or a clinical diagnosis[316]. Differences in the reporting of asthma diagnosis must also be considered as published studies include a range of reporting methods. For example, in a study examining the

relationship between asthma, school absence and academic performance, the inclusion of asthma-diagnosed pupils was obtained through the school nurse via either parent/guardian report, the supply of asthma medication to the school nurse, or asthma action plans obtained through a doctor[317]. Within this present study, the definition and diagnosis of asthma was based on the GP recorded Quality and Outcomes Framework (QOF)[318] and obtained through routinely collected medical records.

Given the high prevalence of asthma within Wales and the potential impact the condition can have on children, these findings are of great public health and education concern. The findings in this study and evidence from the literature suggests that the most important mechanism to prioritise in improving the educational attainment of asthmatic children is that of school attendance. Firstly, this could be achieved through interventions that provide extra support to asthmatic children whose condition-related absence impacts their education. This would ensure these children do not fall behind from missed school which contributes to widening the inequalities that persist in education. Secondly, interventions could focus on reducing the levels of absence observed in asthmatic children through teacher training of condition management, removing school triggers that have been suggested above and working directly with asthmatic children to identify the individual factors that contribute towards their non-attendance.

Indeed, the school as a key setting for delivering health interventions has been the primary focus of this thesis in its entirety. In the case of asthma, there are a plethora of examples of school-based interventions incorporating educational and behavioural change elements that target asthmatic children. For example, there is evidence demonstrating the range of benefits of school-based interventions that have effectively improved school policies, pupil and teacher asthma knowledge, pupils' self-management skills, asthma control, quality of life and parental management[319–322]. However, it is important to remind those that deliver such interventions within schools the impact of stigma as a result of targeted interventions, and the unintended consequences this may bring. A study by McCann *et al*. examined a whole-school asthma intervention and demonstrated a decrease in

girls' self-esteem as a result of participating and advocated for future interventions to provide appropriate support[323].

5.5.1.4 Vaccinations

Another interesting finding was the predictive association between childhood vaccinations and KS2 educational attainment. However, it is important to draw attention to the wide 95% confidence intervals within this sample. Indeed, childhood vaccinations are a public health priority given their preventative mechanisms in offering protection to a number of infectious diseases. There is widespread recognition that vaccinations provide a safe, cost-effective solution to the promotion of good health. Globally, universal childhood vaccination programmes are considered to be one of the most successful public health interventions[324]. The WHO predict that vaccinations save an estimated 2-3 million deaths per year[325]. Within the UK, vaccination programmes have been incorporated into policy and are regularly updated and amended following scientific advice[326,327]. These programmes are based on the 'herd immunity' approach which requires high coverage rates of 95%. In response to recent declines in childhood vaccinations[328], governments have advocated for the compulsory vaccinations of school children[329]. However, this is not currently planned within Wales given the relatively stable rates observed[330]. Despite this, recent statistics on the Measles, Mumps and Rubella (MMR) vaccine suggest that the rate of two year olds receiving the first dose is below the 95% threshold[331]. From 2015, Public Health Wales identified the early years as a priority area in response to the growing body of evidence highlighting the importance of this stage in children's long-term health[332]. Within this strategic plan, maintaining or improving the uptake of childhood vaccinations was recognised as an essential component in decreasing the likelihood of disease outbreaks and both protecting and improving the health outcomes of children. Within this study disparities in vaccination uptake are observed, with 98.5% of non-SEN achieving children receiving their routine vaccination as opposed to 87.5% of non-SEN that did not achieve their KS2.

Thus, given the relationship between health and education described previously, vaccinations could provide one mechanism in improving educational outcomes for children as highlighted in this study. This is also supported by the evidence demonstrating the positive impact of vaccinations on children's cognitive and physical development, school enrolment and educational attainment[333–336]. Furthermore, a recent longitudinal study conducted in Ethiopa, India and Vietnam demonstrated the impact of 2,000 children receiving the measles vaccine aged 6-18 months. These findings concluded that compared to children who had not received the measles vaccination, measles-vaccinated children showed better anthropometric measurements (BMI, height and weight), performed better in standardized cognition tests (vocabulary, mathematics, reading and writing assessments) and displayed higher schooling grade attainment at ages 7-8 and 11-12[337]. Therefore, this research demonstrates the wide range of benefits of vaccinations to child development, due to their protection of infections and diseases that can occur during early childhood. However, much of the evidence examining the impact of vaccinations on outcomes such as these has been developed in low- to middle-income countries. These countries have considerably lower vaccination rates (<80%) and are where the burden of vaccine-preventable diseases is far greater than in higher income countries such as the UK. Nonetheless, two authors of a recent paper suggest that when combined with adequate nutrition and nurturing environments, vaccinations as a health intervention have the potential to reduce the burden of infectious disease, contributing to tackling inequalities in health, cycles of poverty and low income[338]. It is clear that much of the evidence points towards the great potential of public health investment on childhood vaccinations for children's longer term education, health and subsequent employment and economic productivity[338].

In comparison, the majority of research into childhood vaccinations in high income countries has focussed on identifying the factors related to uptake in order to increase vaccination coverage across the population. Therefore, the findings in this study presenting the association between childhood vaccinations and educational attainment at age 10-11 using routine data provide a novel contribution to the

literature and supports the public health priority of increasing uptake from a wider education perspective.

However, it is possible to speculate that this association is unlikely to be a direct causal link but rather, suggestive of wider parental engagement with their child's health and life, and their access to and utilisation of health services. This mirrors the finding of the association between educational attainment and unauthorised absence in KS2 and the importance of parental involvement in a child's educational journey. As discussed previously, parental involvement is strongly associated with children's academic achievement[297]. It has been suggested that this association could also be linked to health outcomes, for example, unhealthy parents may be less able to support their child with educational activities[339]. However, the mechanisms behind the association of parental involvement in their child's health is more complex. In many countries including the UK, parents have a legal right to make decisions regarding their child's healthcare[340]. This model follows a route of information sharing by healthcare professionals, allowing parents the choice for informed decision making on their child[341].

The mechanisms behind parental decision making are dependent on a number of factors. A review by Aarthun and Akerjordet identified a range of these factors including demographic characteristics such as parental age, income and level of education. In addition, other influences included life circumstances, their interaction with a healthcare professional and previous health service experiences[342]. Thus, this wide range of factors represents a complex picture in understanding parental decision making regarding their children's health. However in the case of vaccinations, one of the most consistent factors that influences childhood vaccination uptake within the literature is that of parental knowledge, beliefs and attitudes. As parents are the proxy decision makers in their child's provision of vaccinations, they play a fundamental role in determining the likelihood of a child receiving vaccinations. In particular, concerns around vaccine safety, distrust in the healthcare system, parental hesitancy and religious or cultural reasons have been associated with a decreased likelihood of a child receiving vaccinations[343–345]. A survey delivered in England to examine parental attitudes

to childhood vaccinations demonstrated that over 25% of parents had doubts about giving their child a vaccination[346]. This in part could be due to the large controversy that surrounded the MMR vaccination and its proposed association with autism during the 1990s and 2000s[347].

However, the likelihood of vaccination uptake goes beyond the individual factors and is also associated with the socio-ecological perspective of the determinants of health[348]. Within Wales there remain significant inequalities in the uptake of vaccinations, with a 9% difference in uptake between the most deprived and least deprived areas[332]. The public health profession, both at a government level and individual GP practice level play an important role in informing and communicating information to parents regarding vaccination. Indeed, initiatives such as Flying Start include vaccination interventions as part of their core work, and play an important role in working with families, particularly those at greatest need[349]. However, perhaps schools and more specifically, HAPPEN can contribute through increased parental engagement and dissemination of health messages to parents, families and the wider community. It is therefore without question that increasing parental confidence in childhood vaccination programmes is essential in increasing uptake, with a particular focus given to health literacy. Utilising pre-existing platforms such as HAPPEN provide an opportunity to communicate research findings such as this, and wider public health messages to children, families, schools and communities. On a wider scale, the findings between the association of childhood vaccinations and KS2 educational attainment also raise the question of intervening before primary school age. This suggests that future HAPPEN direction could also benefit not only from increasing focus on parental engagement, but also from incorporating early years stakeholders such as Flying Start programmes. In addition, a shift towards collecting health behaviour information on the younger ages of primary school could provide a benefit to both schools, families and public health professionals.

5.5.1.5 Number of Adults in Household

Within this HAPPEN sample, the number of adults in the household was associated with educational attainment at KS2. It could be speculated from the demographics table within this study that those that achieved their KS2 were more likely to come from two-parent households, whereas those that did not achieve were more likely to live in single-parent households. Within this discussion, the term 'parent' refers to the adult care giver and guardian responsible for that child. This may not explicitly be a mother or father, but perhaps also a grandparent, carer or other relative. Indeed, family structures have changed considerably over recent decades. This has included an increase in single-parent families and the diversification of family compositions observed such as non-marital children, cohabiting adults and step-parents[350]. For example within the UK, the number of cohabiting couple families is growing at a faster rate than married couples and single-parent families[351]. Furthermore, in an international comparative study using PISA results from 21 countries, the UK had the second highest proportion of children of single mothers (15%)[352].

Indeed, a wealth of research exists examining the impact of varying family structures on a range of child development and academic outcomes. The majority of this literature has examined this impact on adolescent outcomes and has primarily been conducted in the United States of America. For example, Manning and Lamb examined the impact of single-parent, cohabiting parents and married parents on adolescents' outcomes. Their findings suggest that adolescents from married, biological parent families had better academic and behavioural outcomes than their counterparts from single mother, cohabiting stepfather and married stepfather families[353]. The study of 21 countries participating in the PISA programme found that children from a single mother family performed significantly lower in maths test scores. In addition, the UK displayed some of the largest negative effects compared to other countries[352]. The negative outcomes for children from single-parent families are reported to be larger when measured at adolescence than at a younger age (e.g. primary school). In a report to the US Department of Health and Human Services, it is suggested that this is because the consequences cited in previous

research (e.g. behavioural problems, school dropout, low grades) are larger during the adolescent period[354]. For example, behavioural problems may cause classroom disruption during primary school but could result in more severe consequences such as school dropout during secondary school. However, this also highlights the findings within this study that the number of adults in the household is associated with children's educational attainment in KS2 could lead to even larger negative consequences for these children when they reach secondary school.

With this said, these poorer outcomes for children residing in single-parent families are demonstrated consistently within the literature. One of the largest longitudinal studies exploring the impact of family structure on a wide range of outcomes is that of the 'Fragile Families and Child Wellbeing Study' from the United States of America[355]. Their findings demonstrated the negative impact of family structure transition, that is, the father exiting the family structure during the child's first nine years on children's anti-social behaviour[356]. In another study, a parent moving out of a family home was associated with reduced cognitive development measures (vocabulary tests) and externalizing behaviours (aggression and rule-breaking)[357]. Overall, these findings suggest that a disruption to a child's parenting circumstances and a parent moving out of the family home can impact their socio-emotional development and externalizing behaviour, both are which are likely to contribute to the differences in academic outcomes observed.

However, the importance of the quality of parental relationships must not be overlooked. Research has examined how the relationship quality of parents is linked to both parenting behaviours and children's development. It is well acknowledged that positive parenting (e.g. engagement with child) is beneficial for children's healthy development, whereas negative parenting (e.g. hostility) is detrimental[358,359]. Indeed, research has demonstrated that parental relationship quality (married and unmarried parents) is also positively linked with the parental engagement of pre-school age children[360]. However, this advantage of living with two married or cohabiting parents is not always received by all. A study by Musick and Meier highlighted that children from high conflict married-parent families experienced higher rates of school dropout, lower academic grades and engaged in

riskier behaviours (smoking and drinking) compared to children from low conflict married-parent families[361]. Despite this, a similar trend of poorer schooling outcomes and substance use was observed for children in stepfather and single mother families when compared to low conflict married parent families. The authors suggested that single mother families have higher levels of financial insecurity through the reliance on one income. Indeed, an important household level factor that supports children's overall development is parental access to social and material resources.

As Bird states, the household composition has an impact on this access to and availability of resources for a child[362]. For example, a single-parent household may rely on just one source of income to support their child. Furthermore, data from the PISA study of 21 countries highlighted that there is a pattern between maternal education and single motherhood[352]. Indeed, trends in single motherhood also suggest a widening of inequalities, with data showing that the numbers of single mothers are increasing at a faster rate amongst mothers of the lowest education level[363]. This data shows that compared to other countries such as America, Canada and Germany, the UK has the widest inequality gap between single mothers in the lowest (43%) and highest (14%) maternal education group. Furthermore, more single mothers (34%) are situated below the poverty line (earning less than 50% of the median income) compared to two parent families (10%). As McLanahan suggests, this disparity in the growth of single motherhood amongst the lowest education group is leading to greater disparities in children's resources such as parental time and money[363].

It has been suggested that half of the negative outcomes of children from single parenthood are a consequence of economic disadvantage[354]. If low income is the most important factor accounting for these negative outcomes it is important that the wider societal and policy implications reflect this. Within Wales for example, the Flying Start programme recognises low income and lone-parenthood as risk factors for adverse outcomes[364]. Furthermore, single-parent families are classified as vulnerable to developing parenting difficulties or being unable to adequately care for their children. As such, the programme offers parenting support to work with

parents to reduce these risks, given the large body of evidence regarding positive parenting and successful outcomes for children. Perhaps there is scope for HAPPEN to engage with stakeholders such as Flying Start in order to share evidence and inform targeted service provision based on need.

McLanahan and Sandefur suggest that the remaining explanation for these negative consequences is partly due to lower parental involvement[365]. As discussed already, the importance of parental involvement has been highlighted in the literature and has been found to be strongly associated with children's academic achievement[297]. As suggested within the demographic characteristics of this HAPPEN sample, it is possible that non-SEN children that achieved their KS2 were more likely to come from two-parent households. It could therefore be suggested that single parents are likely to have to balance a number of household responsibilities in addition to their employment, and thus have less time to commit to engaging their child in stimulating activities. Indeed, research by Kohl *et al.* found that single-parent status was negatively associated with parental involvement at school, the quality of the parent-teacher relationship and the teacher's perception of the parent's value of education[366]. The authors state that the fewer resources available to single parents, such as child care and time may contribute to having less capacity able to be involved with their child's education. Thus, teachers may perceive this as parents being less involved without acknowledgement of the wider barriers these single parents may face.

Given the rising levels of single mothers within the lowest education group, it could be possible that these mothers do not feel they have the required skills to engage and support their child with cognitive development activities. Indeed, socio-economic differences also play a part in parental involvement and engaging their children in stimulating tasks. For example, research has suggested that mothers with higher education are more likely to enrol their children in pro-academic experiences such as preschool groups and extracurricular programmes[352]. Thus, where single parents may lack the time to invest directly with their child in home learning activities, those of a higher educational background could offset this by their desire to provide indirect opportunities for cognitive stimulation.

It is clear that the literature paints a negative outlook of children growing up in single parent households. However, it is important not to tarnish all in these circumstances as being exposed to or at a high risk of poor outcomes throughout their life. Within modern society, there is no such thing as a 'normal', traditional family. Instead, for the majority of children growing up in single-parent households this is their normal, and they will continue to follow a healthy child development trajectory of academic, social and psychological adjustment[367]. However, the findings in this study and the wider literature suggests there may still be a need to provide children with support both within school and in the wider community. Furthermore, these findings may point towards the wider socio-demographic influences of a parent's ability to be engaged and involved with their child's education. This highlights the need for schools to view parental involvement in relation to the broader socio-ecological influences and ensure children are provided with the necessary support to succeed and achieve.

5.5.2 Children with a SEN

5.5.2.1 Gender

Findings from this study demonstrated that there was a significant difference of SEN children's educational attainment at KS2 by gender. For HAPPEN children with a SEN, girls were more likely to achieve their KS2 CSI than boys. Indeed, recent statistics on educational attainment at KS2 for Wales demonstrate that a higher proportion of girls achieved their CSI compared to boys[368]. However, this data is not further separated by SEN or no SEN and thus the findings from this study cannot be compared on a national level. The gender gap in educational attainment appears to persist throughout a child's educational journey. A report by the National Foundation for Educational Research demonstrated that the gender gap in GCSE attainment in Wales is consistent across all ten area deprivation deciles[369]. A gender gap also exists within SEN provision, with SEN prevalence higher amongst males who are more likely to be identified as having a SEN than girls[254,370]. This gender gap in SEN identification is complex and it is unclear whether this is due to differences in incidence or differences in identification. However in a review of the

literature, Peacey and Lundt suggested that the higher prevalence of SEN provision identified for boys is in part due to teacher bias in referral. Despite this, girls with and without a SEN outperform males throughout their education. This gender gap is also present across schools, suggesting that between-school differences accounts for little in the wider picture of persisting gender disparities[371].

Indeed, these gender differences are present from a young age. Evidence has shown that girls exhibit higher levels of cognitive function and general intelligence from as young as two[372,373]. Research has also demonstrated the gap in children's literacy and language development independent of socio-economic factors at age five[374]. It is therefore unsurprising that gender differences in children's school readiness have been observed, with girls having an advantage in their social, physical and intellectual preparedness at school entry compared to boys[375–377]. This suggests that the differences in children's school readiness is associated with earlier child development and has significant implications for children's developmental and academic trajectories and outcomes throughout the lifespan[378]. This gender gap at school entry has been attributed to behavioural differences between boys and girls. For example, research by Isaacs demonstrated that girls score higher than boys in learning related behaviours such as paying attention[375]. Girls have also exhibited significantly higher scores of specific behaviours such as persistence, engagement and cooperativeness, all of which are key components for effective learning within the classroom environment[379]. Thus, this evidence by Fantuzzo and colleagues suggests girls are at an advantage not only at the start of school in terms of cognitive development, but also in terms of the behaviours they display that are conducive to the classroom and foster learning. This research study highlighted the potential in the teacher rating instruments employed within the study to measure children's classroom functioning. These valid measures were developed with teachers, are classroom context specific and provide an assessment of pre-school children's social, emotional and behaviour competencies[379]. This allows the quantification of school readiness and the early identification of those at risk of poor academic performance.

Other theories proposed to explain the gender differences observed in children's educational attainment include learning styles and attitudes to learning.

For example, girls respond more positively to school work, complete more homework and find it easier to succeed in the school setting[380,381]. Furthermore, parental aspirations and attitudes to children's learning are also likely to have an impact. The Families and Children Survey demonstrated that a larger proportion of parents of girls wanted them to stay at school compared to parents of boys[380]. However, a study by Childs and McKay identified a bias that may exist within the teaching profession[382]. Their research highlighted that boys from a low SES initially displayed higher levels of distractibility such as difficulties sitting still and a lack of self-regulation, although this difference was negligible at the two year follow-up. Indeed, this behaviour can be disruptive to the classroom in the short-term. However the authors demonstrated the longer-term perceptions of teachers and the vulnerability of socially disadvantaged boys who were stigmatised by teachers as being problematic. Conversely, these teachers displayed more positive judgements of middle class girls, suggesting an underlying bias against boys and those that are socially disadvantaged exists. There is a risk that these negative perceptions may persist throughout a child's schooling experience, influencing teaching style, judgements and expectations of children's academic ability. Indeed, more must be done both during initial teacher training and within the classroom setting to ensure a more efficient management of problematic behaviour and to avoid stereotyping and blame that can have long lasting implications for children.

With evidence suggesting that the onset of the gender gap in educational attainment was the introduction of GCSE examinations in 1998, the question of how assessment arrangements influence this must be considered[383]. Within Wales, the new curriculum is currently being devised and in turn, a change in assessment procedures is due to be published. Thus, this is an opportune time for Wales to consider how the curriculum, teaching and assessments can be shaped and delivered to ensure the successful learning and progression of pupils regardless of gender or socio-economic background. In addition, fundamental changes are required from initial teaching training in order to reflect this new curriculum, providing the opportunity for new teachers to consider inclusive strategies that enable all children to reach their academic potential. Finally, the importance of the early years must not

be forgotten. With this, early intervention is required to provide pre-school children with the prospect of developing the necessary skills that prepare them for the start of school. In relation to HAPPEN, these findings highlight the importance of expanding the engagement with stakeholders to include those in the early years, pre-school and the Foundation Phase in primary school, considering the longitudinal and life course approach to children's health, wellbeing and education.

5.5.2.2 Deprivation

A range of factors were identified that were associated with educational attainment for children with a SEN. An interesting finding on area-level deprivation was the association between the three deprivation groups (high, medium, low deprivation) and educational attainment at KS2. For children with a SEN, the middle deprivation group (WIMD quintiles 3, 4) were less likely to achieve their KS2 CSI compared to the highest deprivation group (WIMD quintiles 1, 2). This finding conflicts with the results of non-SEN children in this study in which the expected inequality gradient was displayed, that is, the least deprived group were more likely to achieve their KS2 than the most deprived. However, a report on SEN statistics in England and Scotland highlighted the disproportions that are present in SEN identification and support provision[370]. Although SEN was more than twice as likely to be identified in pupils living in the most deprived areas, statutory support plans were more than twice as likely to be opened for SEN children living in the least deprived areas. Thus, disparities in SEN identification, provision and support across deprivation levels may impact children's learning experiences and academic outcomes.

This is a novel finding given that the majority of Government reports and published work uses a dichotomous measure of high or low deprivation based on SES[369,384]. This raises the question of how deprivation should be classified within the education field, and that assigning children a binary deprived or non-deprived classification measure could result in unintended consequences of missing those that group in the middle and thus, poorer outcomes. Indeed, this finding is new and is rarely supported in the literature in which the traditional deprivation gradient is

observed. However, limited studies have demonstrated a similar deprivation trend within the health field. For example, children in the middle deprivation group that participated in the objective fitness assessments within the Swan-Linx study (discussed in Chapter 2) displayed significantly higher standardised body mass index (BMI) scores than their least deprived counterparts[385].

This unexpected finding highlights the possible impact of resource allocation, that is, that resources are usually targeted according to need, for example the Pupil Deprivation Grant. In the case of deprivation, it is common within public health and education to provide support for children from deprived areas. An example of this is the FSM eligibility for pupils within Wales. This allows children that meet certain criteria, such as a parent on income support, to be eligible to receive FSM[386]. However, another finding within this study was that a SEN child that received FSM during Foundation Phase was less likely to achieve their KS2 educational attainment compared to a child not receiving FSM at this education stage. Indeed, the report by the National Foundation for Educational Research highlighted that pupils with SEN in mainstream schools in Wales are disproportionally eligible for FSM[369]. This eligibility for FSM increases with SEN provision, that is, the more support required the more likely the SEN child is to be eligible for FSM. For example, statemented pupils are more than twice as likely to be eligible for FSM than non-SEN children. Furthermore, the gap in attainment by FSM tracks throughout the school stages, and eligibility widens from Foundation Phase to KS2. This may explain why FSM eligibility during this earlier school phase is associated with KS2 educational attainment.

A report published by the Social Mobility Commission explored the academic progress of secondary school pupils from low income families. The authors demonstrated that of those receiving FSM, the greatest progress was made by pupils attending schools that comprised of either high or low proportions of pupils eligible for FSM[387]. That is, pupils receiving FSM perform better in schools in which either the majority or minority of pupils are from low-income families. Within schools of a high FSM intake, the gap between low-income pupils and their peers was smaller. This finding echoes that of results in the present study in which SEN children from middle deprivation families perform poorer than those of either high or low

deprivation. One such explanation offered is that children attending schools with higher proportions of disadvantaged pupils are likely to have more children just below the threshold for FSM eligibility and thus, there is less of a gap. However, this means a child whose FSM eligibility is just below the borderline will receive less in-school support than their peers who meet the criteria, despite there being little difference between the two. In addition, these schools of a higher deprivation cohort are likely to receive additional school funding from the Pupil Deprivation Grant which can be invested into educational support. In comparison, schools with a low proportion of pupils eligible for FSM have a smaller group to provide support to and it is possible these pupils benefit from peer group effects[387]. Furthermore, this report concluded that differences in educational progress were attributed to pupil level factors as opposed to differences between schools, highlighting the importance of family influences such as parental engagement, home learning environments and health behaviours, all of which strongly feature within this chapter.

This finding also has implications on a wider societal level and for the families of children within HAPPEN. Reports on variations in adult income through the labour market have highlighted the growing disparities in earnings over recent decades. The highest group, mainly constituting those with graduate degrees are earning increasingly higher wages than low and middle earning groups (lower and intermediate qualifications)[388]. This may cause considerable financial pressures to the middle income group, particularly for those whose children have SEN and require additional support that may necessitate parents to take time off work. Furthermore, the pay growth for middle wage earners has been reducing in reaction to the declining employment opportunities for middle-skilled jobs[389]. Couple this with growing employment in the low and high skilled jobs, and inequalities begin to persist for those in the middle.

This may explain some of the inequalities observed in this present study of children living in the middle deprivation group and the implications of SEN children residing in middle socio-economic areas that may be at the ‘sub-threshold’ of support. Thus, the results highlighted in the present study reinforce the importance of schools in providing universal support for children with a SEN, regardless of social

background. Indeed, there is still a value in targeting those from deprived backgrounds given the fewer resources available to these families and children. This is supported by the finding that SEN children receiving FSM during Foundation Phase were less likely to achieve their KS2. However, these results highlight the risk in solely targeting to deprivation and the unintended consequence of poorer outcomes for those that are just below the threshold for additional support such as FSM, such as the results that the middle deprivation group performed worse than the most deprived group.

5.5.2.3 20m Multi-stage Shuttle Run Test

For children with a SEN, there was a positive association between educational attainment at KS2 and performance in the 20m SRT. Indeed, it is well acknowledged that regular physical activity (PA) during childhood is associated with a range of health benefits. These include reduced body fat, more favourable cardiovascular and metabolic disease risk profiles, enhanced bone health and reduced symptoms of anxiety and depression[95]. These healthy habits such as PA have been shown to track into adulthood[184]. The benefits of regular PA during adulthood include a reduced risk of heart disease, stroke, diabetes, breast cancer, colon cancer and 20-30% lower risk of all-cause mortality[95]. As discussed in Chapter 4, PA is the principle, modifiable determinant of CRF[186], which reflects the cardiovascular and respiratory system's capacity to supply oxygen during long-term PA[187]. The 20m SRT is a maximal running fitness test and thus, reflects the HAPPEN participant's aerobic fitness. Given the association between PA and fitness, it could be assumed that participants within this study that display higher levels of fitness within the 20m SRT engage in higher levels of PA. However, global physical inactivity is a major public health concern. Within Wales, survey level data from the latest Active Healthy Kids Report Card suggests that just 34% of children aged 3-17 are meeting the current guidelines of 60 minutes of MVPA per day[188,191]. Therefore, efforts to increase levels of childhood PA and decrease sedentary time have been observed, with examples such as The Daily Mile having a positive impact on children's fitness as demonstrated in Chapter 4[81].

The results from this study demonstrate a positive association between children's performance in the 20m SRT and their educational attainment at KS2. Research within this field has demonstrated the relationship between aerobic fitness and cognitive function. For example, a study on 9 and 10 year old children using objective assessments of aerobic fitness showed that children classified as aerobically fit outperformed their lower-fit counterparts in cognitive function tasks[390]. Similar findings were reported in studies of a similar age in which aerobic fitness was positively related to cognition including executive function and self-regulation[391,392]. Furthermore, two large meta-analyses concluded that PA and aerobic fitness both have a consistent positive association with cognition[228,393]. Interestingly, the authors stated that any type of PA will ultimately benefit cognitive performance and that children of the age range of the HAPPEN sample receive the greatest cognitive benefits from PA.

Two such mechanism categories have been proposed that explain this association[228]. Firstly, physiological mechanisms such as alterations in brain structure and function have been researched. For example, the improved cognitive performance observed in children with higher aerobic fitness levels has been attributed to larger brain volumes. Specifically, it has been suggested that this is within areas of the brain responsible for cognitive control such as the basal ganglia[394]. Secondly, the learning/developmental mechanism explains that regular PA provides experiences that may be necessary for full cognitive development. It is argued that movement such as PA provides a different sensory input for learning and is essential for children to acquire knowledge through a number of domains (e.g. kinaesthetic)[395]. Thus, aside from the cognitive benefits of PA, it also plays an important role in the healthy development of children and facilitates optimal health.

Given the evidence base explaining the association between PA and cognition, and the importance of cognitive function on academic performance[396], it is unsurprising that research has demonstrated the relationship between PA and academic outcomes such as that in this study. Thus, the findings within this study are consistent with previous research examining this association. Indeed, this finding is well documented within the literature of children of this age group[397]. For

example, evidence has demonstrated the positive association between cardiovascular fitness, as measured by a progressive aerobic endurance run like this study, and children's academic achievement and attendance[398,399]. Specifically, a key finding from one study was the positive association of aerobic fitness and performance in both reading and maths[398]. Furthermore, the correlation between fitness and academic achievement in the study by Welk *et al.* was similar for girls and boys, and after controlling for school-level differences, SES and school size[399]. Indeed, the authors suggest that the association with attendance could impact upon children's achievement, supported by the findings in this study.

Other research using a one-mile run/walk test demonstrated an association between aerobic fitness and enhanced performance in achievement rates within a sample of ethnically and socio-economically diverse primary and secondary school pupils[400]. Similar results have also been found in a sample of sedentary, overweight children aged 7-11 who participated in a regular aerobic exercise programme as part of a randomized controlled trial[401].

However, it is important to note that the measurement of CRF varies widely between studies, as demonstrated above. Furthermore, many studies do not stratify their sample by educational needs, as displayed in this study. Some examples of benefits to children with a SEN were demonstrated in a review by Trudeau and Shepherd[402]. For example, the benefits of physical education to children with emotional and behavioural difficulties has included improvements to their concentration and behaviour[403]. Children with reading difficulties (dyslexia and dyspraxia) participating in a home-based exercise programme demonstrated improvements in SATS literacy results[404], in addition to longer-term improvements in verbal skills and memory[405]. The authors of the review concluded that the impact of PA on children with educational needs remains an open field to be researched. Thus, findings from this study provide an important, understudied contribution to the literature.

With this said, the literature remains consistent in demonstrating a positive association and thus, it is important to continue promoting regular PA during

childhood and within the school setting. Fitness has also been associated with positive behaviour in the classroom and at home, reported by both teachers and parents[391]. This thesis has demonstrated the importance of the school setting in promoting such behaviours and has presented findings from an evaluation of The Daily Mile[81]. Indeed, another significant finding within the literature is that even when PA replaces classroom time, it does not impair the academic achievement of children[406]. The findings from this study, in addition to the wider literature demonstrating the positive association between PA, fitness and academic achievement provide a strong argument for increasing overall PA opportunities within the school environment. Despite this finding, evidence suggests that teachers still perceive the curriculum to be a barrier to prioritising health and wellbeing[42]. Additional barriers also exist in relation to children with a SEN who may have varying levels of learning, social and developmental needs. Research examining teachers' perceptions of the inclusion of children with a SEN within mainstream PE highlight a number of barriers[407]. For example, teachers expressed concern over their ability and adequacy in providing inclusive PE to children with different needs, suggesting a lack of confidence exists in adapting lessons. Furthermore, modifying activities for children with a SEN required different equipment, additional support or previous experience. This highlights the importance of integrating inclusive provision opportunities within initial teacher training.

5.5.2.4 Out of School Sport Clubs

Another finding within this HAPPEN sample in relation to PA was that of the positive association between participating in out of school sport clubs and KS2 educational attainment. This association will be discussed through two primary mechanisms that may explain this relationship. Firstly, it is possible to presume that children who participate in out of school sport clubs are more likely to engage in higher levels of PA, demonstrate increased physical fitness and thus, this may impact on their educational attainment as outlined previously. Secondly, it is also possible that participation in out of school clubs acts as a proxy measure of parental involvement, a domain that has featured heavily throughout these discussions.

By its nature, sport involves varying intensities of PA, including moderate-to-vigorous, the intensity that features heavily in research and policy. Although sport encompasses the broader components of PA, it is important to recognise the distinctions between PA, exercise, fitness and sport. The definition of PA is "any bodily movement produced by skeletal muscles that results in energy expenditure"[408]. Exercise is a subset of PA and comprises planned, structured and repetitive activities with the objective of improving fitness[408]. Fitness, as discussed previously is a set of health and skill-related attributes[408]. Sport covers all of these distinctions and can be undertaken individually or as part of a team, with a common set of rules or expectations with a defined goal[409]. Indeed, sport contributes to overall health and wellbeing through the functions of PA, exercise and fitness. Research has shown that children who participate in sport display higher levels of PA and CRF[410].

The benefits of sport in the literature centre on sport's important contribution to children's development through the physical, lifestyle, social and cognitive domains[411–413]. Indeed, aside from the wider benefits of the PA component of sport to children's health, the organised and structured design of sport appears to facilitate positive developmental trajectories. This is achieved through the various skills and values associated with sport, including responsibility, leadership and social cohesion[414]. Furthermore, epidemiological studies suggest the longer-term benefits of sports participation, with participants of sport having half the mortality rate of non-participants of sport[415].

In relation to the findings in this study, research conducted in Germany on children aged 3-10 demonstrated the positive impact of out of school sport club participation during childhood on children's health, education and behaviour[413]. Their results showed a consistent message, that children participating in sports clubs outperform children not participating in sports clubs across all domains measured. From the health domain, children that attended sports clubs displayed significantly better health outcomes, including lower skinfold measurements and a reduced resting heart rate. These children also showed a reduction in peer and emotional problems, and an improvement in behaviour and overall school performance. In

adolescents, evidence has shown that those engaged in out of school sport had the highest levels of psychosocial skills such as prosocial behaviour, social and personal responsibility and self-efficacy than those less engaged. Thus, the authors conclude that the development of these skills has important societal implications in shaping their adult profiles[416]. Evidence from the MCS, conducted on 19,000 children born in 2000-01 has also demonstrated similar findings. Their study found that children attending organised sport clubs between the ages of 5 and 11 was associated with positive academic outcomes at KS2, supporting the findings of HAPPEN children within this study[417].

It is also important to consider the gender differences that may be present in out of school sports club participation. In the most recent 2018 School Sport Survey, Sport Wales reported that a gender difference remains in out of school club participation levels, with more boys attending a club three or more times a week than girls[418]. Gender differences have also been reported consistently in the literature, with boys engaging in higher levels of activity, displaying higher levels of CRF and participating in more sports clubs that girls[418–422]. This suggests that there may be less opportunities for girls to engage in sport clubs outside school and within the community. These gender differences have not only been demonstrated across the childhood and adolescent age groups but also into adulthood, with data from England suggesting 61% of men compared to 46% of women take part in sport[423]. Furthermore, a decline in participation rates is observed from childhood into adolescence, mirroring that seen within time spent being physically active[424]. In fact, data suggests attrition rates of between 70% and 80% in sport participation by the time children are 15 years old[425]. Socio-economic disadvantage has been demonstrated to be a key predictor of sport dropout[426]. In addition, children's transport for a sporting event was also associated with sport dropout, suggesting the strong parental influence through the provision of transport and financial support. Research by Telford *et al.* on 8-12 year old children highlighted the central role that extra-curricular sport club opportunities play and the positive contribution these had on the PA levels of both girls and boys[427]. Thus, the school setting is not only key

in influencing levels of PA, but also provides an opportunity for inclusive sporting provision that removes barriers such as this.

However, evidence suggests that an inequality gradient exists in sport club participation. Data from the 2018 Sport Wales School Sport Survey demonstrates this disparity in extra-curricular and community sport participation. When using FSM as a proxy for SES and grouping schools into FSM quartiles, 55% of children attending schools within the least deprived group participate in extra-curricular or community sport at least three times a week, compared to 42% within the most deprived group[418]. In addition, findings from the MCS study have demonstrated that disadvantaged children were less likely to participate in sports activities outside of school (61%) compared to more affluent children (78%).

With regards to children with a SEN that are represented in findings from this study, the MCS highlighted the barrier of the limited availability and provision of after school clubs for children with a SEN[428]. They also demonstrated disparities in after school club participation between SEN and non-SEN children. It could be presumed that this barrier also remains in out of school clubs for SEN children. With the findings in the present study that out of school club participation is associated with educational attainment in KS2, it is essential for sport clubs to consider their provision of activities and ensure inclusive opportunities for all.

The second mechanism through which the association between out of school club participation and educational attainment found in this study could be explained is that of parental involvement. Indeed it is possible to assume that a child's out of school club participation acts as a proxy measure of parental involvement, in addition to that of family resources. Children's first experiences of sport typically start within the school setting through opportunities of PE and extra-curricular clubs[429]. Although these experiences are crucial in engaging children in lifelong PA habits, it is also essential to consider the important role of parental influence. Indeed, research has demonstrated the influence of parents is stronger than that of teachers for adolescents' engagement in PA, regardless of age, gender and physical condition[430]. This influence has been found to be important both in children's

immediate participation and the lasting, longer-term engagement in activity during adulthood[431].

The parental influence of a child's activity and sport participation functions through many domains as identified within a systematic review including parental encouragement, beliefs and attitudes[432]. Furthermore, parental role modelling and reinforcing, their involvement in their child's life as discussed previously, in addition to facilitating behaviours such as providing transport and financial support all impact upon a child's participation[432]. This systematic review concludes the importance of parents being involved in their child's activity habits if their child is to lead a lifetime of physically active behaviours. In addition, children's perception of their parents involvement in their sporting activities has been researched. A study by Anderson *et al.* [433] identified that children's enjoyment and anxiety during sport participation is related to their perceived parental support and pressure. Thus, parents not only play an important role in their child participating in sport clubs, but also in their child's affective response and experience to such activities. The authors suggested that parental encouragement coupled with child autonomy contributed positively to a child's enjoyment.

However, the results found in the present study also suggest the consideration of the wider demographic influences. Findings from the MCS found that taking part in organised sport such as swimming or football is strongly linked to a child's mother's education level[434]. This could highlight an economic influence that is present, affecting parents' ability to pay for their child to attend sports clubs. This is supported by their findings on after school clubs, with parents identifying cost as a barrier. However, schools overcame this by offering a reduced or waived fee for disadvantaged pupils[428]. Perhaps this could be considered by out of school clubs to encourage participation on a wider level.

As demonstrated in findings from the MCS study, enabling factors that allowed participation in out of school clubs were those that were free or low cost[435]. Furthermore, the logistics of travel and time acted as a barrier to families in providing their children with out of school opportunities in the community. Indeed,

in a review by Somerset and Hoare on the barriers to sports participation, lack of time and cost of clubs were the most common barriers identified[436]. These challenges may be particularly pronounced for families from disadvantaged backgrounds that rely on the use of public transport and lack the resources that more affluent families possess. Furthermore, children from single-parent families may also be more affected by these barriers, suggesting a widening of already present inequalities. However, their findings revealed the potential of out of school clubs in reducing the attainment gap between disadvantaged and more affluent children[417]. Children from disadvantaged backgrounds that attended out of school clubs two days a week displayed statistically significant higher KS2 educational progress than those that did not attend clubs.

Therefore, given the results in this study and the wider literature, these findings show great potential in the offerings that schools provide for their pupils. Aside from community-based sports clubs, schools can play a highly influential role in reducing disparities in sports club participation both between children from different socio-economic backgrounds, and also between children with and without a SEN. Furthermore, this has the potential to reduce inequalities in children's educational attainment that is observed between these groups. This can be achieved through the provision of free and inclusive sporting activities before and after school that offer children enriching opportunities that provide important contributions to their overall development. As after school clubs are covered by the curriculum, there is a need for policy to consider the wider benefits of school sport and activity provision in not only providing sporting opportunities but also contributing towards wider child development and reducing inequalities in health and education.

5.5.2.5 Sleep

Sleep was another factor identified as having an association with the KS2 educational attainment of SEN children in HAPPEN. Indeed, sleep plays a crucial role in children's physical, social and behavioural health and has been considered a fundamental requirement for their healthy growth and development[437]. Advice shared by the NHS recommends children of this age group need approximately 9½ to

10 hours sleep per night[438]. However, sleep disruption has a profound negative impact on both short- and long-term outcomes[439].

Sleep issues are broadly categorised into biological disorders such as obstructive sleep apnea and behavioural based disorders such as bedtime resistance[440]. During childhood, the most common of such issues relates to behavioural sleep problems such as difficulty or refusal to sleep[441]. Although disturbances with sleep decrease with age, they are still experienced by children of primary school age, with approximately 25% of children experiencing sleep problems during childhood[442,443]. It is plausible that some children within this present study, both with and without a SEN have experienced forms of sleep problems during their primary school years. Furthermore, the evidence appears to point towards a relationship between sleeping behaviours and SEN. A population-based study by Bonuck *et al*. identified an association between respiratory (e.g. sleep apnea) and behavioural sleep problems (e.g. inadequate and fragmented sleep) during early childhood and an increased likelihood of having a SEN at age 8[444]. Research has demonstrated that children with certain SEN such as Attention Deficit Hyperactivity Disorder (ADHD) experience more sleep problems, particularly those that are behavioural, compared to children without an ADHD diagnosis[445]. In addition, a higher prevalence of sleep problems has also been observed with other SEN types including autism[446] and between children attending a special school compared to a mainstream primary school[447].

These sleep disorders and disrupted sleep have been found to impact brain development during the critical period of early childhood[448]. For example, children experiencing sleep difficulties are likely to lack the necessary brain stimulation for optimal neuronal development[448]. Thus, problems with sleep during early childhood have a negative impact on cognitive development. Executive functions such as memory and cognitive flexibility develop during early childhood, but continue to be strengthened and improved during older childhood, adolescence and adulthood[396]. Indeed, sleep problems have been found to lead to difficulties with the executive functioning of pre-school age children[449] and the cognitive performance of children at school-entry[450]. Both objective and subjective

measures of sleep have been associated with children's school readiness[451]. As discussed previously in relation to school readiness, there is a possibility that sleep disruption is further exacerbating inequalities in children's education, with those starting school at a lower cognitive state than their counterparts and then continuing to struggle to reduce the cognitive gap.

Experiencing problems with sleeping is likely to have a significant impact on a child's life, including their ability to concentrate, focus and learn within the school setting. Given this negative impact on cognitive functioning as a result of sleep disruption, it is therefore unsurprising that sleep was associated with educational attainment of SEN children within this HAPPEN sample. This is further demonstrated within the literature in which sleep has been related to measures of school achievement. For example, a recent longitudinal child-cohort study in Norway demonstrated a relationship between parent-reported sleep problems and impaired academic performance reported by teachers of children of a similar age to this study[452]. A meta-analysis by Dewald *et al.* found associations between sleep quality, sleepiness and insufficient sleep with the school performance of both children and adolescence[453]. Their findings suggested that the strongest effects were that of sleepiness, highlighting the potential of educating children about the importance of sleep and positive sleep practices.

An association also exists between sleep disturbances and a range of emotional and behavioural problems in children and adolescence[454]. For example, a longitudinal study by Gregory and O'Conner demonstrated that sleep problems at age 4 predicted an increase in depression, anxiety, attention problems and aggression in mid-adolescence (age 15)[455]. All of these are likely to cause significant disruption and impact upon a child's ability to learn. Thus, these factors may also mediate the relationship observed between sleep and academic performance.

Many studies exploring the impact of sleep use self-report methods or proxy measures through parents. Within this present study, sleep was self-reported by children within The HAPPEN Survey. However, it is important to note that research

has supported the external validity of child-reported sleep and authors of this study confirmed the value in utilising child self-report measures of sleep in school-aged children[456].

These studies highlight the importance of preventative sleep interventions targeting primary school-aged children. However, early sleep behaviours are established through parental influences. A common practice recommended to parenting is to develop a bed time routine and maintain a consistent sleep pattern of bed time and waking time for children, with research demonstrating the positive impact this has on children's sleep duration[457]. However, a growing concern within current society is the impact of screen time, particularly immediately before a child's bed time. In a study of 20,000 primary school-aged children, the presence of media (e.g. TV) within a child's room was associated with a shorter sleep duration as a result of later bed times and wake times[458]. Indeed, the increase in mobile phone use within the younger population is also exacerbating this problem. Children who use a mobile phone at bed time have reported to sleep approximately one hour less, feel tired in the morning and are less likely to eat breakfast than those that did not use a mobile phone[459]. Previously, this section has highlighted parenting programmes within Wales such as Flying Start. Through Flying Start, health visitors deliver a range of preventative programmes to families. This includes providing information on sleep patterns and routines as outlined above.

As discussed throughout this thesis, schools are a key setting in targeting health promotion and education programmes. As with many interventions, the primary school age is a critical period to target in which health behaviours are developed and established. Research has demonstrated the positive impact of universal school-based sleep education programmes on increasing the sleep duration of children aged 7-11 years in Canada[460]. This programme titled 'Sleep for Success' involved components encompassing a HPS framework. This included sleep knowledge and education for pupils and family involvement through the encouragement of parent-child conversations on healthy lifestyles in the context of sleep. It also used sleep promotion with school staff and a wider school environment strand through school policies and the curriculum. However, less-intensive

curriculum programmes have demonstrated conflicting results in the primary school setting[461]. Despite increases in children's sleep knowledge, there was no significant increase in sleep behaviours such as sleep duration. Other studies have shown similar findings[462] and highlight that education alone is unlikely to elicit changes in behaviour without wider school policy change and parental involvement. This is supported by the socio-ecological theory to health as discussed in Chapter 1, whereby an individual's health behaviour is influenced by a variety of factors across a number of levels.

Through HAPPEN acting as a platform for evaluating school-based interventions, there is scope for future programmes to be incorporated into school functioning through the new Curriculum for Wales. Subsequently, it would be possible to evaluate these programmes through the primary school network to measure effectiveness and impact, and to disseminate the findings throughout stakeholders in health and education.

5.5.2.6 Mental Health Diagnosis

Children with a SEN in this HAPPEN sample were less likely to achieve their KS2 educational attainment if they had been diagnosed with a mental health problem. Mental health problems in the paediatric population cover a broad range of emotional and behavioural problems characterised by internalizing and externalizing behaviours[463]. Common childhood mental health conditions include depression, anxiety and conduct disorder[464]. The prevalence of mental health problems in children suggest that one in eight children aged between five and 19 have a mental health disorder[465]. It has been shown that half of all lifetime mental health problems begin by the age of 14[466]. Within Wales, improving the mental health and wellbeing outcomes of the population is a public health priority, with particular attention given to children and young people. The 'Together for Mental Health' delivery plan highlights the importance of a 'whole-school approach' to mental health and wellbeing and will be in part delivered through the new curriculum[467].

The prevalence of mental health conditions amongst children displays variance between different demographic groups of society. For example, children from single parent families, those whose parents have a lower education level and those that live within 'unhealthy functioning' families (e.g. poor family communication) are more likely to have a mental health disorder[468]. Indeed, these factors are interconnected with other factors identified as important predictors of children's educational attainment, and demonstrate the wider influences of children's life trajectories. More specifically, a relationship between mental health diagnosis and SEN appears to exist. A report by the Office for National Statistics (ONS) published in 2005 showed that children with an emotional mental health disorder were twice as likely to have a SEN[469]. In addition, half of children with conduct disorders had a SEN. As Evensen states, it is still unclear why mental health problems disproportionally affect children with low school achievement (i.e. some SEN children) and limited academic skills[470]. In addition, challenges are often present with identifying mental health problems amongst SEN children given the overlap between mental health symptoms and the characteristics of complex needs[471].

However, evidence consistently points towards disparities in mental health prevalence amongst children with a SEN. For example, research has demonstrated that children with ADHD or Autism Spectrum Disorder (ASD) display higher rates of co-occurring mental health conditions such as depression than would be expected in the general paediatric population[472–474]. For children with ASD, depressive symptoms measured at age 10 remained elevated and show an upward trajectory until the age of 18[474]. Findings by Blackman *et al.* highlighted that although depressed ADHD children did not display more severe ADHD than those without depression, they did present impaired social and academic functioning[472]. For children with ASD, those scoring higher on measures of autistic traits have shown to have a higher prevalence of depressive symptoms at both age 10 and 18 years[474]. Furthermore, this research found evidence that bullying contributed to the higher risk of depression observed in children with ASD. Indeed, the psychosocial harm of bullying to children includes the negative consequence of poor mental health outcomes[475]. It is possible to suggest that this risk is raised in children with a SEN

who are already alienated from classmates due to their additional learning needs. Children with a SEN have been identified as a high risk group for being the victims of bullying[476]. Research from two longitudinal studies in the UK (MCS and Next Steps) suggest that children with a SEN are twice as likely to be bullied[477]. Indeed, the act of labelling a child with a SEN contributes to this risk and must be considered by schools in order to provide appropriate support[478]. All of these factors outlined above including the existence of comorbidities and the greater likelihood of being bullied impact a child's ability to learn and achieve within the school setting, causing significant demand for both teachers and families[479].

Gender differences within childhood mental health conditions also occur. The report by the ONS showed that boys are more likely to experience externalizing problems such as conduct disorder and girls more likely to experience internalizing conditions such as anxiety[469]. However, this onset of mental health disorders varies by age. For example, emotional problems have been found to be more dominant in boys during the pre-pubertal period. After the age of 12 however, the opposite is observed whereby the incidence of such disorders is greater in girls[480]. As the authors of this study state, boys are particularly vulnerable to emotional disorders before puberty at a time when girls appear to be somewhat resilient. Identifying the factors facilitating these resilient traits would provide a milestone step in designing effective interventions targeted at the primary school age. In addition, this gender variation must be accounted for in providing tailored intervention and support.

It is also important to draw attention to the research with contrasting findings. The research on externalizing mental health problems appears to be consistent, that it has an adverse impact on educational outcomes. However, the impact of internalizing mental health behaviours is more mixed. For example, internalizing mental health problems such as anxiety have been positively associated with educational achievement[470,481]. This could be due to the characteristics of anxiety that may result in over-preparing due to concerns about exam failure. Such traits may actually be conducive to educational systems that operate through strict testing measures such as those employed within Wales.

With this said, it is well established that the presence of mental health conditions has significant implications for children's learning. This is highlighted by findings in this present study showing the negative impact of poor mental health on children's educational attainment at KS2. McLeod and Fettes propose three potential mechanisms for the trajectories of educational attainment observed in children with a mental health condition[482]. These are academic deficits, disruptive behaviours and the manner in which parents and teachers respond. These will be discussed in relation to the literature in identifying possible pathways explaining the lower academic outcomes of children experiencing mental health problems.

A recent meta-analytic review identified that psychiatric conditions such as depression and internalizing behaviours (e.g. suicidal thoughts, panic disorder) are risk factors with a moderate to large effect size for school absenteeism[483]. As discussed previously, school non-attendance would be regarded as an academic deficit. This can have a profound impact on children's education and could act as a contributing factor for the poorer educational outcomes observed in this population. Indeed, children displaying non-attendance behaviours do not fit into one category and understanding the aetiology of school absence is a challenge[291]. Thus, supporting children experiencing poor mental health could provide one intervention in reducing levels of school absence. In addition, research has demonstrated that children with a mental health disorder are significantly more likely to drop out of secondary and tertiary education early[484]. Given that early termination of education is associated with a range of poorer outcomes throughout the life course such as higher rates of unemployment, poverty and poorer health outcomes[485,486], it is essential for education systems to focus attention on pupils experiencing poor mental health that may impact their non-attendance. Indeed, chronic non-attendance behaviour acts as a risk factor for future early school dropout[487].

Children with a mental health condition are also more likely to be excluded from school[488]. Recent data from Wales has shown that the highest rates of school exclusion are observed within the SEN population[489]. Indeed, children with behavioural mental health problems may struggle to function within a traditional

classroom setting that requires long periods of sedentary activities and focussing attention on one task. These externalizing behaviours exhibited by such pupils are likely to disrupt the traditional learning environment, causing teachers to turn to punishment[482]. Persistent disruption and behavioural problems can potentially contribute towards exclusion. Exclusion from school is likely to cause a significant setback for children and widen the gap in their learning and education between both SEN children with and without mental health conditions, and between SEN and non-SEN children.

There are multiple pathways between mental health and its impact on education that may explain some of this association. Indeed, symptoms that accompany poor mental health such as sleeping problems could impact children's cognitive development, function or capacity, as discussed previously. This impact has been observed at school entry, demonstrating the impact of mental health on children's school readiness. For example, research using administrative data in Germany has shown the adverse impact of mental health conditions on children's development. The study by Salm and Schunk identified mental health conditions to have a large and statistically significant effect on the cognitive and verbal ability of children before school entry[490]. Furthermore, childhood mental health appears to have differential impacts on children's cognitive and verbal ability between socio-economic groups, as measured by parental education. In line with other findings in this present study, the detriment of childhood mental health on cognitive and verbal ability had a stronger effect for children whose parents were of the lowest education group, suggesting another contributor to the inequalities in health and education. Impaired cognitive function is thus likely to inhibit a child's ability to learn effectively within the classroom. During the primary school years, inefficient learning will limit children's capability of developing the necessary skills required for more complex academic skills. Thus, for a SEN child with a mental health problem who may already have impaired cognitive function, this may impose additional pressures on their learning, their relationships with peers, teachers and their families and their overall ability to reach their academic potential.

Evensen highlights the important role that schools play in supporting children experiencing mental health difficulties and facilitating their educational trajectory[470]. However, qualitative research by Rose and colleagues identified teachers' concerns of the prevalence of mental health problems within SEN children, including feeling inadequately prepared or supported and a lack of resources[471]. In addition, parents of SEN children have expressed feeling that this lack of teacher training and support for SEN children contributes towards an increased vulnerability of exclusion due to judgement or discrimination[491]. Teachers have also noted that specialist mental health staff often lacked the appropriate knowledge or understanding of the needs of SEN pupils. Indeed, this paper published in 2009 highlighted that teachers felt services such as Child and Adolescent Mental Health Services (CAMHS) are over-stretched and unable to provide the level of support required for children with these complex needs. Over 10 years later, this challenge remains with evidence suggesting that CAMHS services in Wales are over capacity[492]. However, recent investment by the Welsh Government has committed over £7 million to improve the mental health of children and young people[493]. This money will support improving CAMHS in addition to the whole-school approach to mental health stated previously.

Through The HAPPEN Survey, information on children's emotional and behavioural mental health difficulties are shared with schools through the school report. This facilitates schools in utilising universal mental health and wellbeing interventions within the school setting based on school-level data to improve pupil outcomes. However as Veldman *et al*. point out, the early detection of child mental health conditions is of no use without the support of early intervention and improved teacher and school staff training[463]. Indeed, the additional toll that mental health is likely to place upon children with a SEN must also be considered. In a recent guidance document published by the Department for Education, the importance of creating a whole-school culture towards mental health and wellbeing is essential[494]. This is to be achieved through the school culture, ethos and environment, in addition to curriculum activities and forming partnerships with

families and the wider community. Thus, this echoes the framework supported by the HPS movement discussed in Chapter 1.

5.5.2.7 Breastfeeding

Results from this study have shown an association with a SEN child being breastfed at birth and their educational attainment in KS2. This monitoring of breastfeeding in Wales is used as part of the Welsh Government's 'Strategic Vision for Maternity Services in Wales' and 'Early Years and Childcare Plan' in which a priority is optimising nutrition from birth[495,496]. The NHS suggest than the benefits of breastfeeding to a child include the protection from infection and provision of vitamins and minerals, in addition to longer-term health benefits such as a reduced risk of becoming overweight[497]. However, the UK displays some of the lowest rates of breastfeeding globally, with Wales showing even lower rates than other parts of the UK[498]. Indeed, initiatives such as Flying Start promote breastfeeding and provide advice and information to mothers through UNICEF's 'Baby Friendly Initiative'[498], however, these rates suggest more needs to be done[349].

The wider academic literature on the impact of breastfeeding suggests a positive association exists with children's cognitive development and academic performance, controlled for confounding variables such as SES[270]. Furthermore, this series of systematic reviews suggested longer term benefits of being breastfed at birth exist such as lower blood pressure and cholesterol and a lower prevalence of overweight/obesity and type-2 diabetes. However, the authors acknowledged that the effect of breastfeeding on these longer term benefits were similar or smaller than those derived from other public health interventions such as dietary advice and the promotion of regular physical activity. There also appears to be a strong body of evidence suggesting an association between breastfeeding and a higher performance in intelligence tests using the measure of intelligence quotient (IQ) in both children and adolescents[499,500]. This is supported by a study in Brazil that included a 30 year follow-up of participants that demonstrated that 72% of the effect of

breastfeeding on school attainment and adult earnings was explained by an increase in IQ[501].

With this said, the biological and behavioural debate between the two potential mechanisms behind these benefits has been raised; that is nutrients and nurture[502]. On one hand, part of this association has been explained through the nutrients within breast milk, namely the polyunsaturated fatty acids[503]. These nutrients have been linked with the visual and neural development of children, both of which contribute to their cognitive development[503,504]. In comparison, researchers have argued the nurturing hypothesis; that breastfeeding acts as a proxy measure for the wider socio-economic characteristics and parenting behaviours[505]. Huang *et al.* suggest that breastfeeding is one of a number of positive parenting behaviours that all contribute towards the healthy development of children[505]. For example, the cognitive benefits attributed to breastfeeding could allow for the hypothesis that breastfeeding at birth has a positive effect on children's school readiness. However, a study by Gibbs and Forste demonstrated that the positive correlation between breastfeeding and school readiness observed at age 4 was removed after controlling for mothers' education and other parenting behaviours (e.g. emotional support and cognitive stimulation)[502]. This study concluded that mothers with a higher level of education are more likely to engage in breastfeeding and other positive parenting behaviours, which as a result improves children's cognitive development. Huang *et al*. set out to examine this association in the context of socio-economic characteristics and parenting behaviours but failed to explain the mechanisms. However, the authors still found a positive association between breastfeeding and children's academic ability in their longitudinal study, after adjusting for socio-economic characteristics and parenting behaviours. Therefore, it appears that the impact of breastfeeding on children's cognitive development and subsequent academic outcomes are likely to be caused by a variety of both nutrient and nurture mechanisms.

The findings in this study of the positive association between HAPPEN children with a SEN that were breastfed and achieving their KS2 educational attainment, in addition to the literature supporting this association warrants the current public

health priority of increasing breastfeeding rates. The disparities in breastfeeding rates across Wales adds to the picture of inequalities that has been discussed in relation to both health and education. Interestingly, there appears to be a lack of official statistics of breastfeeding rates for children with a SEN. Although local authority reports state that post-natal factors such as breastfeeding influences the prevalence of SEN, this is not supported by any published evidence[506]. Indeed, it is likely the association found in this study forms part of the wider social determinants of health that influences children's trajectories. The academic literature in most cases fails to distinguish between children with and without a SEN in relation to breastfeeding. Thus, the findings in this present study provide a novel contribution to the literature and start the debate of why breastfeeding is an important parental behaviour for SEN children's subsequent educational attainment. Furthermore, these findings add to the body of evidence promoting the importance of positive parenting behaviours identified both within this study and in the wider literature. These results strengthen the need for HAPPEN to engage with early years stakeholders and increase parental engagement, allowing the promotion of positive health messages to be shared.

5.5.2.8 Mother Smokes

Another factor to be discussed in the present study is the association between maternal smoking behaviours and children's educational attainment at KS2. Within this HAPPEN sample, SEN children were less likely to achieve their CSI at age 10-11 if their mother reported to smoke. Although rates of smoking have declined in Wales over the last decade, the latest data from the National Survey for Wales shows that 17% of adults currently smoke. Children are 70% more likely to start smoking if one of their parent smokes[507]. Smoking is one of the leading causes of illness and death in the UK and reducing smoking rates is a public health priority[508]. Smoking remains one of the most significant contributors to inequalities in health, with adults in the most deprived areas being twice as likely to smoke than those in the least deprived area[509]. This gap in smoking behaviours amongst the opposite socio-economic groups has remained the same in some places, and widened in others[510].

However, the picture is far more complex than this, with smoking acting in combination with a wide range of other determinants of health and education. Indeed, smoking is more prevalent amongst people from a lower SES and acts as a determinant in health inequalities[511]. Although much of the research has focussed on single health behaviours, there is an increasing recognition that health behaviours such as smoking, physical activity and fruit and vegetable intake tend to cluster amongst individuals[512]. For example, people that report being current smokers are more likely to engage in low levels of physical activity[513]. Smoking has also been identified as having the strongest and most consistent correlation with other unhealthy behaviours[514]. The association between sub-optimal health behaviours such as smoking and physical inactivity on longer-term morbidity and mortality risk has been a large topic of research[511].

Maternal smoking is unlikely to directly impact children's academic outcomes. Rather, the results within this present study highlighting the association of maternal smoking behaviours on children's educational attainment is likely to function through the mechanism of wider socio-economic inequalities. Indeed, parental health behaviours hold a strong influence over the health behaviours displayed by children[432,515]. It is therefore plausible that the results in this study operate through the mechanism of maternal health behaviour influences on child health and thus, children's subsequent educational attainment. There are multiple pathways that are responsible for this across the socio-ecological spectrum from individual, household, community and systemic influences[516]. However, one of the largest determinants of maternal health is that of SES. Those within the most deprived groups within society are more likely to engage in risky health behaviours such as smoking[511]. From a children's perspective, early childhood disadvantage is also associated with engagement in risk behaviours during adolescence. These health behaviours have been associated with lower levels of educational attainment, increased behavioural problems and poorer long-term outcomes[517]. Furthermore, social disadvantage is associated with lower cognitive ability, subsequent educational attainment and poorer health outcomes[268]. Research has identified three pathways that mediate this link between childhood socio-economic disadvantage

and subsequent smoking behaviours. These were lower IQ scores and lower educational attainment, increased rates of conduct and behavioural disorders and exposure to peer and parental smoking[518,519].

The majority of research has focussed on the impact of maternal smoking during pregnancy. Numerous studies have reported the adverse effect of maternal smoking during pregnancy on child outcomes including an increased risk of pre-term birth, low birth weight, later childhood conduct problems and ADHD and an increased risk of childhood obesity[520–523]. In relation to findings from this SEN sample within HAPPEN, data from the Avon Longitudinal Study of Parents and Children showed that mothers of children with a SEN were more likely to smoke during pregnancy[444]. Thus, a complex pathway of maternal behaviours, subsequent child development and risk of having a SEN may be at play. However, research into the effects of smoking exposure after birth must also be addressed. For example, evidence has demonstrated the adverse impact of second hand smoke on children's respiratory health, including an increased risk of wheezing, cough, breathlessness and asthma[524]. In addition, the risks identified in this study were higher for maternal smoking than paternal smoking, highlighting the important of targeting mothers in smoking prevention programmes.

Reducing the smoking rates of parents also has significant socio-economic implications. Behavioural change can be achieved through two methods, either individual prevention or wider environmental and structural changes[525]. Research has shown that individual behaviour change programmes that encourage smoking cessation are less effective amongst lower socio-economic groups[526]. This study examining the smoke quitting rates of the UK's Stop Smoking Services found that affluent smokers were more likely to quit smoking than disadvantaged smokers. In addition, whilst smoking rates in Wales have declined over recent decades, data demonstrates that the inequality gap in smoking rates has remained constant in some areas, and widened in others. Thus, this suggests that policies such as tobacco packaging and advertising have been successful, but primarily amongst the least deprived and possibly more educated groups of society. Evidence from Wales examining the impact of the smoke-free legislation suggests that whilst increasing

numbers of children report living in smoke-free homes, there is still a large proportion of children that report their parent still smokes in the household[527]. Within this study, there was no significant reductions in inequalities of exposure to second hand smoke. As Kalita states, it is essential to broaden the focus of effective interventions on changing maternal health behaviours to take into account these socio-ecological influences that shape individual behaviour change[516]. Furthermore, the limited success for disadvantaged groups of both individual behaviour change programmes and broader policy implementation implies that the inequalities in smoking form part of a wider societal imbalance on health outcomes.

The findings in this present study that SEN children of mothers who smoke are less likely to achieve their KS2 educational attainment raise questions for HAPPEN's contribution to improving outcomes for children. Indeed, this association is part of a wider socio-economic picture of health inequalities and the accumulation of various family health behaviours and the consequences this has for children. These results highlight the importance of HAPPEN disseminating findings to wider stakeholders, in addition to those involved in policy design. Designing policies that influence behaviour change at a family level also require the acknowledgement of the social context in which people operate and live, and the strong influence this has on behaviour[528]. Indeed, focussing on maternal health behaviours such as smoking is important, but the broader improvements in children's outcomes necessitates a multi-dimensional approach accounting for the socio-ecological influences on individual behaviour and collective family behaviours.

5.6 Conclusion

HAPPEN allows the social, lifestyle and epidemiological factors associated with children's educational attainment to be examined through linking survey data with routinely collected data. It is essential to understand this complex relationship further in order to effectively target resources and services based on need and at those at risk of low education outcomes. In addition, these findings allow evidence-informed programme delivery, public health practice and policy design. This study

provides a comprehensive understanding of the complex relationship between health and education that encourages targeted health promotion and tailored policy development. This is a particularly invaluable contribution at a time of education reform and during the development of the Curriculum for Wales. In comparison to the rest of the UK, children in Wales have consistently underperformed in science, maths and reading[241]. Therefore, efforts to improve the health and education outcomes for children are fundamental in reducing inequalities and improving the life chances of children.

There are three clear themes that arise from the findings in this study: social disadvantage, physical and mental health and parental influence and engagement. This concluding section will discuss the findings from this study in relation to these three themes. Although distinct, these themes are also inter-related and must be considered as part of the wider socio-ecological influences on children's health through the complex connections that exist between these themes. Finally, the importance of the early years on child development has emerged from the findings in this study, particularly in relation to the home learning environment, cognitive development and children's school readiness.

5.6.1 Social Disadvantage

Socio-economic background has been an enduring issue associated with educational outcomes over the last 50 years[239]. It is one of the strongest correlates of academic performance[236] and health outcomes[243] and reducing inequalities in education remain a public health priority. The findings in this study highlight the complex relationship between socio-economic status and the attainment gap. For non-SEN children, the expected inequality gradient is observed for educational attainment, that is, the least deprived are more likely to achieve than the most deprived. Although this is unsurprising, it suggests that despite a public health focus on reducing inequalities, the deprivation gap in education still persists within society.

The topic of deprivation for non-SEN children must also be considered in relation to the finding of the negative association between unauthorised absence and

educational attainment. School non-attendance has large implications for children's academic outcomes given that those absent from school receive fewer days of teaching. Higher levels of school absence have been correlated with socio-economic indicators of deprivation at the school[287] and area level[288]. In addition, the negative impact of school absence on children's education outcomes is greater for children from low income families and disadvantaged backgrounds[283,289,290]. This double disadvantage contributes to a widening of inequalities between the different ends of the social disadvantage spectrum. Targeting non-attending behaviour requires schools to adopt individualised approaches with pupils. However, the application of universal school-based programmes that influence children's enjoyment of school could also be considered. Results presented within this thesis on outdoor learning and The Daily Mile have demonstrated their ability to increase school engagement, wellbeing and enjoyment of learning, in addition to addressing inequalities in health. With research suggesting that improving school attendance requires changes in curriculum development, teaching style and the school ethos, perhaps school-based programmes such as these can be considered as a potential tool in improving pupils' attendance[299].

On the other hand, an unexpected finding for SEN children was that the middle deprivation group were the least likely to achieve their KS2 educational attainment. This is a novel finding and an important contribution to the literature, particularly in relation to the debate of resource allocation targeted to need. The provision of FSM is an example of this and SEN children in this study that received FSM during Foundation Phase had poorer educational outcomes compared to their non-FSM counterparts. Evidence has shown that the greatest progress made by children receiving FSM is observed within schools of either high or low proportions of pupils eligible for FSM[387]. This could explain some of the variation in achievement by area-level deprivation presented in this study. For example, perhaps SEN children who received FSM during Foundation Phase reside in middle socio-economic areas or attend schools with overall cohorts of medium proportions of FSM provision. Therefore, they are demographically at risk due to being sub-threshold for receiving additional support. In conclusion, although it is still paramount for public

health and education to continue assisting those who are socially disadvantaged, findings in this study for both non-SEN and SEN children support the provision of universal interventions and programmes. Furthermore, these findings highlight the importance of broadening how deprivation is classified within both research and practice. Perhaps this requires a move beyond a dichotomous measure that could result in unintended consequences for those that are borderline and at risk of being missed.

Although social inequalities are part of a wider socio-ecological web of influences, it is also important to consider the impact that schools can have on reducing inequalities and the role that HAPPEN can play in improving outcomes. Within Wales, the new curriculum provides an exciting opportunity for schools to shape the content of their curriculum based on their learners' needs. Indeed, HAPPEN can fill a gap in providing schools with information on the health and wellbeing of their pupils. Since expanding across Wales, this universal coverage is not bound by geographical restriction and thus, every school in Wales can benefit from the support of HAPPEN equally. This also allows the delivery of an evidence-informed curriculum and the provision of interventions based on school-level need.

5.6.2 Physical and Mental Health

Another theme that can be derived from the findings in this study is that of physical and mental health. For non-SEN children this theme was primarily connected to chronic conditions, with the presence of asthma being negatively associated with educational attainment. Although the wider literature on asthma and educational attainment has produced conflicting results, asthma has been identified as the leading cause of school absence[305] which could account for the results in this study. Given that the severity of asthma symptoms correlate with school non-attendance[306,307], and research has demonstrated how the school environment can exacerbate symptoms[311], it is essential for schools to consider identifying and modifying triggers to prevent asthma-related school absence. Furthermore, providing teacher training of condition management in addition to support for

asthmatic children could prevent medical-related absence, whilst being mindful of avoiding stigmatisation.

For SEN children, the theme of physical and mental health is represented through the influences of PA and fitness, sport club participation, sleep behaviours and the presence of a mental health disorder. The importance of physically active behaviours emerge given the positive association between both shuttle running performance and out of school clubs with educational attainment. Regular PA is an essential component of children's development and contributes towards achieving higher levels of fitness and optimal thresholds of physical and mental health. With research demonstrating the association between aerobic fitness and cognitive development and function[228,390,393] this has important implications for children's learning. These findings emphasise the need for schools to provide more physically active opportunities within the school day. For example, this could be achieved through incorporating movement and PA into classroom lessons, taking PA breaks such as The Daily Mile and increasing PE and extra-curricular club provision. However, previous research has highlighted the barriers that schools face and the lack of teacher confidence in adapting lessons for SEN children who display additional learning, social and developmental needs[407]. Therefore, it is paramount that teachers are provided with appropriate training and support so that they feel confident in providing an inclusive PE experience for all children.

Considerations of sleep behaviours are important, with results in this study demonstrating the association of sleep with educational attainment for SEN children. Sleep is one of the fundamental requirements for children's healthy growth and development[437]. Approximately 25% of primary school children experience sleep disturbances[442,443] and a higher prevalence of sleep problems have been observed within SEN children[445,446]. In addition to experiencing sleep problems during the early years and the subsequent impact on brain development[448] and school readiness[451], it is possible to suggest that a proportion of SEN children within this sample currently experience sleep disruption. This is likely to impact their cognitive development, their ability to concentrate and learn within the classroom and ultimately their educational outcomes, as demonstrated in this study. Moving

forward, perhaps the new Curriculum for Wales provides an opportunity to incorporate healthy sleeping habits into learning, although education alone is unlikely to elicit long-term changes in behaviour. However, HAPPEN offers the ability to evaluate school-based sleep education or behaviour programmes to examine their feasibility and effectiveness.

The final factor within this theme was the presence of a mental health condition which was found to be negatively associated with SEN children's educational attainment. Children with a SEN are disproportionally affected by mental health conditions, with a higher prevalence observed amongst this population. Furthermore, the stigmatisation of SEN labelling coupled with the increased risk of bullying victimisation is likely to contribute to negative psychosocial outcomes including low wellbeing and mental health problems. This co-occurrence of mental health conditions and SEN can impair children's cognitive, social and academic functioning[472,490], influence school non-attendance[483] and increase the risk of school exclusion[488] and early school dropout[484]. Thus, given the already challenging learning needs that SEN children exhibit in addition to experiencing adverse mental health outcomes, this is likely to also have a significant impact on a child's ability to learn and function within the classroom setting and ultimately their academic outcomes. This finding highlights the importance of schools providing appropriate support to SEN children experiencing mental health conditions, but also on a wider level to those at risk of low wellbeing or poor mental health. However, research has demonstrated teachers' concerns including feeling inadequately prepared in supporting SEN children with mental health problems, and a lack of knowledge of SEN pupils' needs displayed by specialist mental health workers[471]. Therefore, despite the positive progress being made in Wales including large investments by the Welsh Government, it is essential that this is also met with increased training opportunities for staff, appropriate support and targeted services for SEN children who often have other complex needs. Furthermore, this must be matched by the school ethos and practice regarding the emotional health of its pupils in order to ensure the development of mentally healthy children and a whole-school approach to mental health and wellbeing.

5.6.3 Parental Engagement and Influence

Within this present study, one of the most significant themes to emerge from the findings is the importance and influence of parents during early childhood and throughout the primary school years. This theme can be recognised in relation to parental engagement, involvement and influence. Throughout the results of this study, the importance of parents has presented itself through direct factors such as the number of adults in the household, and indirect factors such as out of school club participation. Indirectly, it is possible to suggest that the influence of parental behaviours and practices is likely to impact the health and wellbeing of children and thus, account for some of the findings of the impact of health and wellbeing on children's educational attainment. For example, children's short- and longer-term participation in physically active behaviours is influenced by parental support and role modelling[431]. Parents are also required to support their child financially and through transport for their child's participation in out of school clubs. Furthermore, the role of social disadvantage and demographic status of the parent is also likely to play a part, given that high cost has been identified as a barrier to club participation[436]. In addition, although sleep was also identified as a predictive factor of educational attainment, the mechanisms behind children's sleep behaviours may partly be influenced by parenting practices, such as bedtime routines and household rules regarding screen time before bed.

Parental health behaviours were identified within this study as having an impact on SEN children's educational attainment including maternal smoking. Indeed, exposure to parental smoking can have a direct adverse impact on a child's health and wellbeing[524]. However, the finding of the association of maternal smoking within this study is likely to function within a wider picture of social disadvantage and poverty. Smoking rates in Wales are twice as high in the most deprived communities compared to the least deprived[509]. Those that smoke are also likely to engage in other sub-optimal health behaviours such as physical inactivity[514] and children are 70% more likely to start smoking if one parent smokes[507]. Thus, the findings in this study suggest that the influence of social

deprivation and the cumulative impact of parental health behaviours impact a child's health and likelihood of engaging in risky behaviours including, but not limited to smoking. Those that engage in risky behaviours are at an increased risk of conduct and behavioural disorders[517], lower levels of educational attainment and longer-term morbidity and mortality[511], representing a cycle of disadvantage. Worryingly, efforts to decrease smoking rates in recent years appear to have disproportionally benefitted the least deprived, widening health inequalities between the most disadvantaged. Thus, a disconnect appears to exist between the intended outcomes of policy and public health campaigns and the reality of those it benefits. On a school-level, the incorporation of preventative smoking education within the primary school curriculum and offering smoking cessation programmes during secondary school may have a small positive impact. However, this is unlikely to truly break the cycle of disadvantage that exists given the much larger and wider family and social influences on behaviours. Future policies must consider how to engage with the hardest to reach groups who are likely to receive the greatest benefits. Furthermore, efforts must recognise and respect the vast socio-ecological influences of multiple health behaviours, and the cumulative impact of family behaviours and practices on the present and future outcomes of children.

Thus, a number of factors identified as having an association with educational attainment within this study are likely to act as proxy measures of parental engagement. In addition to harmful parental health behaviours such as maternal smoking, this also included positive practices such as breastfeeding (SEN children) and vaccination uptake (non-SEN children). This is an important finding given the low breastfeeding rates[498] and MMR vaccination uptake rates that are sub-threshold (95%) for herd immunity observed within Wales. Therefore, the results in this study support the current public health priorities that focus on the early years and advocate for optimising nutrition from birth[280] and maintaining or improving the uptake of childhood vaccinations[332]. Indeed, the evidence suggests that parental behaviours such as these have a positive impact on children's health and development such as cognitive function[270][283]. However, it is possible to speculate that these parenting behaviours mirror a wider representation of parenting practices including

engaging in other healthy behaviours and displaying higher levels of parental engagement.

The topic of parental engagement is heavily featured throughout the results of this study. With research suggesting that it is strongly associated with children's academic achievement[297], it is conceivable that higher levels of parental engagement and involvement result in improved home learning environments during the early years and throughout the primary school period. The early years are a critical period in which activities that stimulate language development and literacy and numeracy competence are required for healthy development[272]. In addition, home learning environments during the primary school period are important in supporting a child throughout their educational journey. Research suggests that markers of home learning are socially patterned[273] and unhealthy parents are less likely to be able to support their child with educational activities[339]. This could be explained demographically, for example perhaps parents that engage in multiple risk behaviours, including smoking identified in this study, are more likely to be from socially disadvantaged backgrounds and lack the educational capacity and necessary skills to support their child academically. This hypothesis is supported by research demonstrating an association between low parental education and lower levels of parental involvement in school-related domains[366]. Worryingly, this inequality gap in parental educational capacity to support their child could be exacerbated by the fact that mothers of a higher educational background are more likely to register their child in external pro-academic experiences[352].

The finding of the negative association of unauthorised absence on non-SEN children's educational attainment could also be considered in relation to the topic of parental engagement, with research suggesting a positive relationship between parental involvement and children's academic achievement and attendance[297]. Regarding SEN children, results in this study indicate the importance of the number of adults in the household. Furthermore, the demographics table suggests that SEN children that did not achieve are more likely to reside in single parent families compared to SEN children that achieved their KS2. Household composition and access to social and material resources is an important indicator of childhood

outcomes[362]. Single parents are bound by restrictions, given their requirement of ensuring financial security to their family, relying on one source of income to provide resources and needing to balance employment commitments with household tasks. Therefore, is it possible that they have less time or capacity to commit to engaging in stimulating home learning activities. Furthermore, the trend in single motherhood in the UK suggests that the number of single mothers of the lowest education background is increasing and more single mothers are situated below the poverty line when compared to two parent families[363]. Thus, the finding in this study also has important demographic implications and suggests the widespread economic disadvantage of single parent families in terms of access to resources, in addition to the limited time available to engage with their child, for example, through home learning environments and cognitive enhancing activities.

5.6.4 The Pathway between Health and Education

From the results in this study, it could be derived that those from deprived backgrounds are more likely to have parents that engage in unhealthy risk behaviours such as smoking. In comparison, early parental behaviours such as breastfeeding and vaccinations appear to be protective in children's longer term outcomes. These behaviours contribute directly to the child in terms of cognitive development, but also act as proxy measures of parental engagement and are suggestive of wider pro-parenting practises. Parents from disadvantaged backgrounds or single parent families may lack the necessary education, skills or time to provide a stable home learning environment that contributes to children's cognitive development. The social patterning of home learning environments also suggests that less deprived families, and perhaps those with more adults in the household or two parent families have more access to resources and time to engage their child in stimulating activities. For children with a SEN however, these parents may struggle to provide them with the complex support they require due to their additional learning needs. These children from disadvantaged backgrounds or with a SEN are likely to display lower measures of school readiness and begin school behind their peers socially, emotionally and cognitively. Throughout their school experience this gap in

development will widen. They may have higher school absence and subsequently receive fewer teaching days than their counterparts, further amplifying the gap in academic skills and ability. This unauthorised absence will place these children at risk of early school dropout and achieve fewer qualifications will which impact their employment opportunities as adults. For children with a chronic condition such as asthma, their symptoms may be triggered by the school environment and teachers may lack the necessary skills to facilitate condition management. These symptoms may also necessitate school absence. Furthermore, for SEN children that are neither from high or low deprivation areas, the nature of their borderline demographic background puts them at a greater risk of poorer education outcomes, especially if they attend schools with a medium proportion of FSM intake.

However, girls with a SEN are likely to progress in school more than boys. This partly is due to differences in early childhood development, in addition to differences in learning styles and the possession of certain behaviours that are conducive to learning such as engagement and persistence. In relation to learning, it is probable that sleep disturbances will have a negative impact on a child's ability to concentrate, focus and learn. It is expected that children with a SEN experience more problems with sleeping which will affect their cognitive development and cause further disruption to their learning in addition to their already complex learning needs. Furthermore, the presence of a mental health condition will have significant implications for children's learning through academic deficits, disruptive behaviours and school absence. Again, it appears that SEN children are disproportionally affected by mental health conditions but identifying these can be a challenge due to the overlap of characteristics associated with a SEN. The labelling of a SEN may also cause stigmatisation and bullying within school and poor mental health outcomes. Schools also lack the necessary training or resources to feel confident in identifying and supporting SEN children's poor mental health.

During their time in school, children of more engaged parents are more likely to attend out of school clubs and display higher levels of aerobic fitness. Directly, higher levels of PA and fitness are associated with more favourable health profiles and indirectly, higher sports club participation provides a wider range of social skill

development that translates to being advantageous within the school environment. Those children that engage in more PA tend to have more active parents who model this healthy behaviour to their children. With the clustering of health behaviours, perhaps these parents are less likely to engage in other unhealthy behaviours such as smoking. Inter-generational effects suggest that their children are also less likely to smoke during adolescence and adulthood. For deprived families, the cost of sport clubs and transport requirements is likely to act as a barrier and further widen the gap in children's opportunities.

5.6.5 Summary

In conclusion, the results in this study emphasise the importance of the early years, parental influence and engagement and the home learning environment. The influence of parents also accounts for some of the findings in relation to physical and mental health, given the association between parental and child health behaviours. These have important implications for children's cognitive and overall healthy development, the impact this has on their school readiness, engagement in healthy behaviours and subsequent academic outcomes and life trajectories. However, the theme of deprivation runs prominently throughout and is interconnected to all of the findings. It appears that those from socially disadvantaged backgrounds are at risk of 'double disadvantage' and living in a cycle of poorer health and education outcomes. Understanding these results utilising a life course perspective provides a long-term lens to identify influential factors that are guiding children's trajectories.

Therefore, the cumulative impact of social disadvantage, physical and mental health and the influence of parental engagement and behaviours will define the trajectory of a child's life. From pre-birth to the early years, school entry and throughout the primary school period, the combination of these themes interplay either in a protective or a preventative manner in determining the educational attainment of children. These education outcomes have significant implications for children's future academic and employment pathways and health and wellbeing profiles. These economic, health and education inequalities that are demonstrated in this study are persisting and defining the life chances of children born today.

Reducing inequalities in health and education remains a public health priority and in improving the patterns of social mobility.

Although many of the factors identified within this study are part of a wider socio-ecological influence on children's health and education outcomes, there is still an important role that schools can fill in teaching, supporting and developing children. Indeed, children spend a large proportion of their waking hours in school and thus, schools provide a platform aside from formal teaching to influence, encourage and inspire children to lead healthy lives and reach their academic potential. Within the school environment, schools can provide access to both targeted services in supporting children at risk of poor health and education outcomes, in addition to universal programmes that offer a level playing field for all pupils to benefit. For example, programmes such as the outdoor learning study presented in Chapter 3 demonstrate their ability to engage children in learning, improve their enjoyment of school and benefit pupils of all learning styles. Results from The Daily Mile study propose its ability in addressing inequalities in children's aerobic fitness. Aside from these curriculum programmes, schools can develop a whole-school approach to health and wellbeing through the themes presented in Chapter 1 such as the overall school ethos, policies and practices.

As mentioned throughout this thesis, the current curriculum reform within Wales provides an exciting opportunity for schools to further prioritise and embed health and wellbeing through its distinct Area of Learning and Experience. Furthermore, through the support of HAPPEN, schools can develop, design and deliver their curricular and whole-school approach to health and wellbeing based on their learners' needs. Finally, the findings in this study suggest a need to expand the reach of HAPPEN and engage more with early years stakeholders. Perhaps also, the development of The HAPPEN Survey could benefit from capturing information on the younger years of primary school in providing more of a life course approach in understanding the health behaviour of children. All of the above can begin to untangle the complex relationship between health and wellbeing, aim to break the cycle of double disadvantage and strive to allow all children to live long, healthy and happy lives.

5.7 Strengths and Limitations

This study provides a rare insight into the complex relationship between health and education through the combination of health, education and survey data. The results in this study demonstrate the potential of a primary school network in collecting in-depth data on children's health and wellbeing and linking this with existing routinely collected datasets. In addition, the findings in this study offer an important contribution of this understanding to the literature and facilitate the tailored provision of health services, programmes and education focus. This study has important implications in both the public health and education fields.

There are a number of limitations to consider when interpreting the results from this study. The classification of KS2 educational attainment is assessed by teachers and is therefore subject to inherent bias from the teacher. The proportion of non-SEN children not achieving their KS2 educational attainment is low and therefore the small sample size within this group must be considered. The label of SEN and FSM are interchangeable and children can move between groups. The eligibility for FSM can change each year dependent on parental employment status and changes in eligibility criteria. In addition, children with/without a SEN can move in and out of eligibility dependent on reason for difficulty. There is the potential for misreporting through for example the miscoding of data by general practitioners. The limitations of missing data must also be considered.

The HAPPEN Survey collects self-reported health behaviour data and therefore the limitations of self-reporting and subjectivity must be considered. For example, children may report responses to questions that they feel are favoured by their teachers or parents. In addition, the time when the survey was completed varies, with some children completing the survey in year 5 and others in year 6. Given the delay of approximately 18 months in the upload of educational attainment data to the SAIL databank, it was not possible to include HAPPEN survey data collected in 2018-19 or 2019-20 academic years.

5.8 Future Directions

With the national expansion of HAPPEN currently underway, the numbers of children participating in The HAPPEN Survey has significantly increased during the academic year of 2019-20. At the time of writing, over 9,000 children have completed the survey during this academic year. This number is expected to increase during the remainder of the year. Therefore, the future linkage of these HAPPEN survey data with educational attainment data and health records will compose of a much larger sample. Updated educational attainment data will also allow for the linkage with more recent questions within The HAPPEN Survey, such as those on children's emotional and behaviour mental health difficulties and physical competence. Furthermore, this data will include children from a larger geographical area and the majority of local authorities in Wales. Future analyses therefore aims to provide a more nationally representative dataset and will generate useful insights into the relationship between the health and education of children.

The analyses included in this study will form one of the components of a larger data linkage academic paper. This paper will link the health and education records of all children in Wales and present these results alongside analyses included within this study. Thus, the paper will share national data linkage results alongside deeper sub-analyses consisting of health behaviour information collected through HAPPEN. The findings from this paper intends to provide a comprehensive understanding of the impact of social, epidemiological and behavioural outcomes on educational attainment.

The findings in this study will be disseminated amongst HAPPEN stakeholders and the wider public health and education field. This will allow the tailored provision of public health services, school-based programmes and curriculum delivery to follow an evidence-based approach. Furthermore, the results presented in this study emphasise the importance of HAPPEN engaging with early years stakeholders to ensure that services delivered during this critical period are supported by the evidence.

Chapter 6 HAPPEN Expansion and Reflections

The historical context of health promotion in schools and the recent developments and challenges within this field were outlined and discussed in Chapter 1. This initial chapter identified a gap in the provision of school-based health promotion and practice and concluded with a set of recommendations for improving the health and wellbeing of pupils;

- There is a significant gap in collaboration between and integration of research, school health promotion and the health sector.
- There is a need to target the primary school age as a method of prevention.
- There is a need for a platform that provides school-level health behaviour information on an individual primary school level, allowing the identification of school health priorities.
- This platform would involve the rapid dissemination of school health information and research findings to a local, regional and national level and engage with the health sector to target and implement school-based programmes tailored to pupils' needs.
- This platform would involve a cycle of evaluation of school-based programmes that is shared between schools (for school-level impact i.e. adapting programmes based on process evaluations) and the public health sector (where to target resources that produce the greatest benefit).
- The importance of a low-cost, sustainable infrastructure that is incorporated into the curriculum.
- The integration of school health behaviour data in addition to epidemiology and academic outcomes.
- The essential components must be that it employs a bottom-up approach, enables teacher autonomy, involvement and collaboration; it is not an add-on but rather complements the curriculum.

This thesis demonstrates a potential solution that addresses these recommendations through the development and expansion of HAPPEN, a primary school network in Wales.

Furthermore, this thesis presents three research objectives and demonstrates how these were achieved through the use of a combination of action research methods and qualitative and quantitative investigation. The overarching aim was to develop HAPPEN through an action research model. HAPPEN is a primary school network combining multidisciplinary expertise through a unified system of education (schools), health (practitioners) and research (academics). Discussed in Chapter 1 and 2, the qualitative pilot work conducted prior to this PhD formed the basis of HAPPEN, from concept to initial development. At this time, HAPPEN was a localised pilot project serving the Swansea local authority. Thus, aside from the studies presented in Chapters 3, 4 and 5 demonstrating HAPPEN's ability to generate academic research, this PhD also set out to develop HAPPEN, its data collection tools, infrastructure and network resources. Finally, it is important to examine the feasibility of expanding the network across Wales. Following an annual process of observation, reflection, planning and implementation, HAPPEN has developed into a national network. This iterative process following O'Leary's cycles of research is displayed in Chapter 2 and concluded with a final, revised model of HAPPEN which will be discussed further below. This process has provided the first primary school health network in Wales. However, questions still remain regarding the scalability and sustainability of HAPPEN and implications for practice, all of which will be explored within this chapter.

The second objective of this thesis examines if HAPPEN can act as a platform to evaluate interventions in the school setting and disseminate evidence-based learning. This objective has been achieved through the publication and dissemination of the studies presented in Chapters 3 and 4 in peer reviewed journals; a qualitative analysis of outdoor learning and a mixed-methods study on The Daily Mile[80,81]. The full backgrounds, methodologies, results, discussions and conclusions are presented within their respective chapters and thus will not be discussed in detail in this chapter. However, the publication of these studies demonstrate HAPPEN's ability

to perform the function of knowledge exchange through the dissemination of peer-reviewed research on both education and health programmes to schools. Findings from both studies have provided schools with a clear evidence base on whole-school experiences, implementation factors and implications for sustainability. The dissemination of these findings to schools has not been limited to stakeholders within HAPPEN, but has also received widespread global media coverage. This has allowed the findings to be shared to an international audience, facilitated through their respective publications in The Conversation[105,112]. For example, findings from the outdoor learning study were shared by the World Economic Forum in the form of a video summary[107]. To date, this video has been viewed over one million times across the different platforms. In addition, ITV Wales filmed a news piece on the findings from The Daily Mile. The findings from this study were also presented to The Daily Mile's Research Advisory Group and are currently being developed in collaboration with The Daily Mile Foundation and London Marathon Events into a Daily Mile branded infographic to be shared with all schools participating internationally. Further details of the dissemination of these research studies can be found in Appendix 5: Impact and Public Engagement.

Thirdly, this thesis aimed to examine if HAPPEN can be used for observational epidemiology by identifying the factors associated with educational attainment. Presented in Chapter 5 are the results on the social, lifestyle and epidemiological factors associated with educational attainment at KS2 for children with and without a SEN. This study demonstrates HAPPEN's ability to perform deeper sub-analyses of child-collected data (HAPPEN survey and fitness assessments) with routinely collected data through the form of data linkage. The findings from this study identify a range of health factors associated with educational attainment at KS2 for children with and without a SEN and provide an important contribution to the literature in further understanding the complex relationship between health and education. The component of data linkage is not only a novel aspect of HAPPEN, but a unique concept of any primary school network. Furthermore, it addresses concerns raised in Chapter 1 regarding the lack of collaboration between health and education and the need to incorporate academic measures within analyses.

Therefore, this concluding chapter aims to provide a reflective account of the development of HAPPEN and its ability to perform the function of knowledge exchange to improve the health and wellbeing outcomes of primary school children. This will be discussed in relation to the developments demonstrated in Chapter 2. The findings presented in Chapters 3, 4 and 5 will also be briefly outlined in relation to the principles embedded within the HPS framework. Furthermore, the refined HAPPEN model will be presented and discussed with regards to the implications for practice, its sustainability and future directions. The overarching debate that structures this chapter is whether developing, implementing and expanding a primary school network is feasible with consideration of both the challenges to its development and the strengths of the network. Ultimately, this chapter aims to provide a definitive answer as to the value of, and need for a national HAPPEN primary school network in Wales.

6.1 HAPPEN within the HPS framework

Prior to providing a reflective account of the development of HAPPEN, it is necessary to interpret the findings from this thesis in relation to the HPS framework. Although HAPPEN is not formerly a HPS project, it is grounded within the settings-based approach to health promotion and aims to function through the principles outlined within the HPS model. These are; (1) the formal curriculum, (2) the school environment and ethos, and (3) the school's links with the wider community. HAPPEN also provides a platform for schools to prioritise and embed health and wellbeing within these principles and therefore accelerates the growth of both health promotion within schools and the HPS movement across Wales. As stated in Chapter 1, a HPS is "one that constantly strengthens its capacity as a healthy setting for living, learning and working"[20]. Considering this definition, the overarching function of HAPPEN through the distribution of individualised pupil health and wellbeing school reports, action plans and resources supports schools in ensuring that health and wellbeing is considered across all aspects of school life. This will now be discussed more specifically in relation to the three principles of the HPS framework and provide

insight into how the findings generated through HAPPEN are relevant to the HPS approach.

6.1.1 The formal curriculum

Mirroring the shift by HAPPEN from a public health tool to a curriculum tool, the primary purpose of the school report is to act as a needs analysis for schools to design their new curriculum based on pupils' needs. Therefore, the school report supports schools in delivering the formal curriculum by incorporating priorities identified within the school report that are specific to the health and wellbeing needs of their pupils. Schools are also increasingly incorporating school-based health programmes (e.g. outdoor learning and The Daily Mile) within their dedicated curriculum time. Qualitative findings from these studies presented in Chapters 3 and 4 provide an insight into the barriers and facilitators to effective programme implementation and are shared with schools within their school reports.

Thus, disseminating these research findings to practice ensures that schools are maximising this time away from formal learning and ensuring the proposed benefits of these school-based programmes to pupils are captured. In addition, the quantitative findings regarding the positive impact of The Daily Mile on children's cardiorespiratory fitness reassures schools of the benefits to reallocating time away from the curriculum towards pupils' health and wellbeing. Although the findings presented in Chapter 5 pose more relevance to the remaining two HPS principles, identifying the factors that are associated with children's educational attainment also has implications for the curriculum. For example, curriculum topics can be tailored to deliver health education regarding children's sleep and physical activity.

6.1.2 The School Environment and Ethos

Considering the relevance of HAPPEN with the wider school environment and ethos, the school report also allows the identification of priorities that require changes to the school environment. Thus, it is important for schools not to view the school report purely as a curriculum tool but also, as a measure to facilitate wider

adaptations to the school structure and ethos. Arguably, in order to adopt a whole-school approach to improving pupil health and wellbeing it is also necessary to focus on the school environment and ethos. This is an important reflection given that research has supported the modification of the school environment in improving health outcomes[529].

Embedding a programme such as outdoor learning or The Daily Mile within schools often requires significant changes to the school environment through for example, updated school policies. Findings in both studies highlighted factors relevant to the school environment for consideration by schools. For example, implementing a non-traditional teaching method such as outdoor learning was viewed to require bravery by schools, in addition to fulfilling children's right to be outdoors. This represents the ethos by schools towards the value they place upon different approaches to achieving curriculum aims. It is plausible that disseminating these findings to schools encourages a shift in thinking by other schools to place a higher value upon embedding an outdoor learning approach within the whole-school ethos. Qualitative findings from Chapter 4 also highlighted the potential of the active involvement of teachers within The Daily Mile towards improved pupil-teacher relationships. Indeed, building rapport between pupils and teachers is an important component to creating school environments for children to thrive both academically and socially.

A number of reflections can be made regarding a number of factors presented in the results of Chapter 5 in relation to the school environment. For example, the findings regarding children's fitness and out of school clubs highlight the importance of schools to consider the wider benefits of offering a range of extra-curricular activities and school environments that encourage physically active behaviours. The association between mental health and educational attainment also demonstrates the importance of school environments that foster positive relationships, wellbeing and support whole-school mental health. Therefore, the studies presented in Chapters 3, 4 and 5 offer insights into the barriers and facilitators within school environments that enable successful programme implementation. In addition, they

identify priorities for schools to consider in order to embed a whole-school approach to health and wellbeing.

6.1.3 The School's Links with the Wider Community

The third HPS principle to consider in relation to its relevance to the findings presented in this thesis is that of a school's links with the community. Indeed, the resources shared with schools by HAPPEN and that feature on the HAPPEN website include information and links to local and national resources. The purpose of this is provide access to follow-up support following participation in The HAPPEN Survey. In addition, the HAPPEN conferences provide a platform for networking and facilitating links between primary schools, local/national services (e.g local charities, Play Wales) and the wider community (e.g. AYP officers within the council).

Support from the wider community was also highlighted in qualitative findings presented in Chapter 4 in facilitating the effective implementation of The Daily Mile. Within this recommendation, teachers and headteachers advocated for community support such as engaging with sporting role models to inspire pupils. In addition, a barrier to implementation identified by schools included a lack of support from wider stakeholders such as the local authority, given the pressure placed on teachers to coordinate programmes with little support. These findings highlight the importance of partnership working and not viewing programmes delivered within the school setting in isolation but rather, as coordinated and joined up approaches with support from stakeholders and the wider community. Finally in consideration of the findings presented in Chapter 5, the emergence of the early years as an overarching theme from the results suggests the importance of HAPPEN engaging with wider early years stakeholders. This would enable HAPPEN to adopt a life course approach to child health, wellbeing and education by considering the factors prior to primary school that impact children's school readiness and subsequent development and educational attainment.

In conclusion, viewing the results presented in this thesis within the principles outlined by the HPS framework ensures that efforts to improve the health, wellbeing

and education outcomes of children are embedded within a whole-school approach. Indeed, the overall function of HAPPEN and the findings presented in three studies within this thesis have implications that span across the formal curriculum, the school environment and ethos and a school's links with the wider community. Mapping these findings to these principles enables HAPPEN to support the further development of the HPS framework within schools.

6.2 Phase Four – The Refined HAPPEN Model

The application of an action research model to the development of HAPPEN has enabled an iterative process of reflection and refinement throughout phases one to four of this PhD. At the time of writing, HAPPEN has been developed into a national primary school network. It is important to note that the term national refers to HAPPEN's expansion across all of the local authorities in Wales. By national, it is not intended as a top-down, enforced programme to be implemented in every primary school in Wales. Firstly, this would contradict one of the core elements of HAPPEN; that is a network that facilitates teacher autonomy and bottom-up directed change and impact. Secondly, the purpose of HAPPEN was not to develop a Government-led data surveillance tool but rather, a co-produced platform to support schools in prioritising and improving pupil health and wellbeing based on individual school needs. Instead, the infrastructure has been developed to support a larger scale network that enables a higher update of schools in which there are no geographical limitations to participating in HAPPEN. This subsection will outline the refined model of HAPPEN following the cycles of adaptation that have occurred throughout phases one to three.

As of September 2019, HAPPEN has expanded across every local authority in Wales. It is currently a national network constituting an online, teacher-led health and wellbeing survey for pupils in years 4-6 (ages 8-11) attending any primary school in Wales. Participating in The HAPPEN Survey is free of charge. Recruitment for The HAPPEN Survey is achieved through a number of methods including direct emails to schools, social media promotion, promotion by HAPPEN partners (e.g. healthy

schools) and through strategic partnerships (e.g. education consortia). Teachers or headteachers within a primary school register their interest to participate in HAPPEN directly through the HAPPEN website. They then receive a step-by-step email containing information about HAPPEN, instructions and a checklist on delivering the survey and information on receiving their school report. This information for schools is also available on the HAPPEN website. Next, schools are instructed to electronically send the parent and child information sheet to all parents/guardians of pupils though the school text messaging system. This informs the parent/guardian about the survey and instructions on opting out of the survey. In the case of a parental opt-out, schools are informed of the name of the child and instructed to exclude them from participating. Schools deliver the survey within the school setting either by whole class or small groups at a time that is convenient. After completion of the survey, the raw data obtained through google forms is coded using R software. This software automatically creates a number of datasets; a) it removes identifiable information (for SAIL) and assigns a unique ID number, b) it removes all entries of nonconsenting children, c) it creates a coded dataset of ID number and coded data d) it creates school-by-school reports. Each school report is then sent back to schools. This school report is aligned to the new curriculum (Appendix 3: HAPPEN School Report) and includes a HAPPEN action plan for schools to document and track curriculum and extra-curricular changes to be implemented.

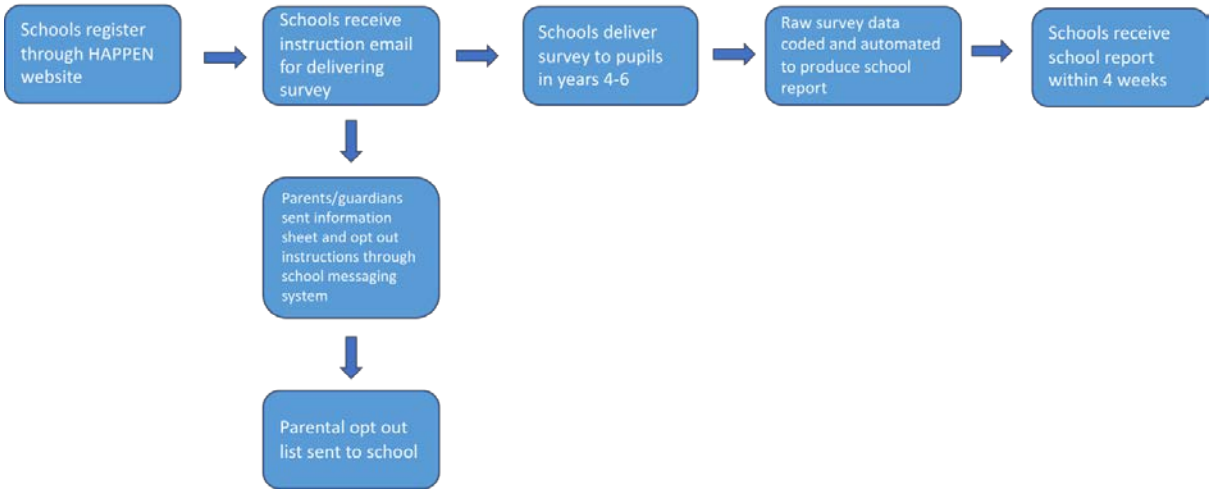

***Figure 7**: Process of HAPPEN participation*

Since the start of this PhD, HAPPEN has rebranded itself from a public health tool to a curriculum tool that aims to support schools in delivering the Health and Wellbeing Area of Learning and Experience aligned to pupils' needs identified within the school report. This was identified as a priority within the results of a consultation on HAPPEN that was shared with teachers and headteachers during phase three. This model encourages teacher autonomy in identifying and selecting health themes within the school report to prioritise through curriculum delivery. Thus, this final model represents a true synergy between health and education and facilitates ownership and empowerment by schools, all of which were advocated for and outlined in Chapter 1. Furthermore, schools are encouraged to utilise pupil voice groups in working through their HAPPEN action plan. Examples of completed school action plans can be found in Appendix 6: Individual School Impact and Action Plans. The following subsections will discuss the feasibility, scalability and sustainability of the development and expansion of HAPPEN to determine whether there is value in providing a national primary school network.

6.3 HAPPEN Expansion

At the time of writing, HAPPEN is in the process of expanding across Wales. As stated previously, national expansion refers to HAPPEN's ability to engage with schools to deliver the survey across all local authorities in Wales. This subsection will consider the components of HAPPEN that required developing in order to facilitate

expansion. This will be discussed as a reflective account based on experience over the previous phases and will consider the implications for practice. Furthermore, in order to deepen understanding of HAPPEN and provide a wider view of expansion, this subsection will incorporate teachers' and headteachers' experiences of engaging with HAPPEN and present additional evidence collected throughout this PhD.

6.3.1 Data Collection Refinement

In order to enable the expansion of HAPPEN across Wales, refinement of the data collection tools has been required to establish a system that minimises researcher burden and improves the efficiency of delivery. This refinement process will be discussed for both the objective measures of fitness (FFDs) and The HAPPEN Survey. Each subsection will conclude with discussions on the scalability and its implications for sustaining each method as part of the national expansion of HAPPEN.

6.3.2 Objective Fitness Assessment

During phase one, HAPPEN data collection was primarily delivered as a combined protocol of objective fitness assessments (Fitness Fun Days) and a self-report survey (HAPPEN survey). The objective fitness assessments were collected during the morning component of the Fitness Fun Days (led by School of Sport and Exercise Science PhD student) held at the University athletics facilities and The HAPPEN Survey during the afternoon (led by EM) within the school setting. As discussed in Chapter 2, the objective assessments involved a range of components of children's fitness that aside from cardiorespiratory fitness (20m SRT) are not included in this thesis and therefore will not be explored in detail. However, the objective fitness assessments played a significant role within the initial HAPPEN model and have contributed towards the annual refinement process. Therefore, it would be useful to outline how decisions regarding FFDs impacted the direction of HAPPEN and the subsequent expansion.

The overall logistical delivery of a FFD required the responsibility of a full-time PhD student (led by Sports Science). In addition, delivery of the morning session

required significant staff support from undergraduate and postgraduate research students and local authority AYP officers. This staff support was provided on a voluntary basis and with no contractual obligation to attend. Thus, staffing issues contributed to a limited capacity in delivering FFDs both in terms of practical delivery of fitness assessments, and the total number of FFDs available to schools during an academic year. Concerns over staff support were raised during phase one and a collaboration with Gower College was initiated by the School of Sport and Exercise Science (to resume in phase two) as an alternative method in providing practical delivery. This was trialled during phase two and allowed the practical support of between ten and twenty higher education students per FFD as part of their curriculum studies. This mutually beneficial partnership also provided higher education students with applied experience for research data collection with school children. However, unexpected changes in staff structure prevented the collaboration from continuing into phase three. This discontinued collaboration with Gower College, combined with changing research priorities (Sports Science PhD student) led to the suspension of FFDs for phase three.

At the time of writing (phase four), the objective assessment of children's fitness through FFDs have resumed in two local authorities (Swansea and Bridgend) through the recruitment of a full-time postgraduate Masters (Swansea) and PhD (Bridgend) research students (led by School of Sport and Exercise Science). These projects remain embedded within HAPPEN but with a more distinct focus that is delivered and led directly through the research students. This allows a more in-depth relationship with schools through a smaller and more localised sample. Furthermore, a strength of these projects is the strong partnership working with the respective local authority's AYP teams. This collaboration provides significant logistical support through the recruitment of schools and delivery of FFDs. However, questions arise about the sustainability of each project following completion of the postgraduate studies.

The practical barriers that impacted the sustainability of objective fitness assessments within HAPPEN demonstrate the conflict that exists between public health policy and priorities and the implications for practice. In addition, the positive

feedback received from schools suggests that there is value in offering schools the opportunity of an external school trip that also provides the platform for a data collection assessment;

> *"The Fitness fun day was a fantastic opportunity for pupils to use the facilities at the University and inspired many pupils to join Swansea Harriers. The pupils really enjoyed working with the Uni students and all children eagerly participated...Bring back the Fitness Fun Day!"(Teacher, HAPPEN feedback form)*

Recently, the Active Healthy Kids (AHK) Wales expert group, constituting academics, professionals and experts within the physical activity field and including the author of this thesis, synthesised the best available evidence for a number of indicators. Each indicator is assigned a standardised grade based on nationally representative data. The physical fitness indicator was assigned an 'inconclusive' grade due to the lack of national data covering all components of physical fitness[530]. The group highlighted that despite a number of national policies, more effort was required in generating nationally representative data on children's physical activity through systematic, robust data collection methods. Furthermore, formal recommendations to the Welsh Government included the urgent need for a national health surveillance tool that incorporates the objective measurement of children's fitness and included the example of FFDs. However, the measurement of children's physical fitness is at odds with the ethos of the new curriculum in Wales. Here, a more holistic view of physical and mental health has been adopted, encompassing elements of physical literacy. This represents the conflict that exists between the different academic communities (e.g. physical fitness and physical literacy), public health and education.

A national roll-out of FFDs as a health surveillance tool would require large scale funding and contractual collaborative support through local authorities (e.g. AYP teams) and higher education institutions (for practical delivery). This would also require top-down support and buy-in with for example, Welsh Government and Public Health Wales. However, the conflict outlined above between the competing commitments of the physical fitness and physical literacy fields generate barriers to collaboration and buy-in. As demonstrated in this thesis, the successful delivery of

FFDs and objective assessments of fitness is highly dependent on partnership working. Observations since phase one have highlighted the variability in local authority priorities and strategies (on health and wellbeing). For example, the Swansea AYP team are focussed primarily on structured sport provision whereas Bridgend utilises a more holistic view of health and wellbeing. This leaves the objective fitness component of HAPPEN vulnerable to any longer term sustainability as local authority priorities change. However, the suspension of FFDs during phase three allowed the focus to be placed primarily on HAPPEN expansion and the development of The HAPPEN Survey to a teacher-led, scalable data collection tool. This will be discussed in the following subsection.

6.3.3 The HAPPEN Survey

A key task in facilitating national expansion was developing the online HAPPEN survey into a widely scalable data collection tool. The preliminary work conducted with children prior to phase one contributed to the development of the survey from a paper-based questionnaire adapted from the SportsLinx project (Chapter 2) to a web-based questionnaire for children aged 9-11 (years five and six). Furthermore, the survey had been piloted on a local basis before the start of this PhD to primary schools in conjunction with objective fitness assessments. This model involving FFD continued during phase one and two as discussed in the previous subsection, with phase three focussing purely on the delivery of the survey prior to national expansion. The development of the survey during phases one to three involved a number of changes in procedures that allowed the refinement of the protocol proposed at the start of this chapter. Throughout the duration of this PhD, items within the survey have been added, removed or altered in order to reflect current public health priorities or the discourse during school visits. This included the addition of the validated assessment of children's emotional and behavioural mental health difficulties through the 'Me and My Feelings'[98] questionnaire during phase one. An example of the current HAPPEN survey can be found in Appendix 2: . This subsection will focus on the most significant amendments to the methodology that were necessary to expand the delivery of the survey across Wales. This will also be

discussed in terms of the survey's scalability, sustainability and implications for practice.

6.3.4 Consent

One of the most notable modifications to the HAPPEN protocol during HAPPEN expansion was the changes to consent procedures. During phase one, information sheet and consent forms (child assent and parental/guardian consent) for participating in HAPPEN data collection were collected through paper-based formats. The processing of paper-based consent required significant researcher time. In addition, reviewing levels of consent uptake highlighted the disparities between schools in areas of high and low socio-economic compositions. For example, an independent school constituting pupils from affluent areas received a 100% consent return compared to a school situated in a deprived area and with over 45% of pupils on FSM receiving just one returned parental consent. Discussions with schools suggested that low consent rates were not a reflection of motivation to participate (either child or parent/guardian), but rather an issue with the lack of parental engagement with school activities and the reliance on the child taking full responsibility for forms (giving to parent/guardian, returning to school). Thus, the data on children's health collected through The HAPPEN Survey was over-representing children from less deprived areas. This meant that the provision of services (e.g. council sport provision) and targeted interventions (from HAPPEN resource pack) based on this data was less likely to help children from deprived areas and prioritised those from affluent areas.

The importance of school parental engagement, recognised as a parent's relationship with their child's school and learning[531] has been the subject of government policy and priority[532,533]. This is due to evidence suggesting that parental engagement has a positive impact on children's learning and attainment[534]. The significance and influence of parental engagement has also been demonstrated in results from data linkage in Chapter 5. Thus, schools are invested in improving partnerships with parents in order to improve educational outcomes for its pupils. Technological advancements over the last decade have

provided a possible solution. The use of electronic methods have been highlighted as a convenient means for increasing levels of parental engagement with schools[535]. Electronic communication through websites, email and text messaging enables parents to remotely access information about their child's learning. Research exploring parental perceptions of communication with schools concluded that parents found electronic communication an easy, direct and efficient way of school-level information sharing. Thus, an alternative procedure proposed to address issues with low consent uptake in this study was the potential in utilising electronic methods through pre-existing school to parent/guardian communication systems. Therefore, an application for electronic consent was submitted and approved. Electronic procedures also allowed automatic translation of information sheets to families with English as an additional language (EAL). This has been highlighted in the literature as a benefit to those families with EAL by allowing them time to read, translate and process the information shared by a school[531]. The process of electronic consent for participation in The HAPPEN Survey was trialled during phase three.

Initial feedback from schools supported the transition from paper-based to electronic procedures. In addition, a strength of electronic consent was the significant reduction in both school and researcher burden and the utilisation of pre-existing school to parent/guardian communication systems. However, the trial of electronic consent during the first academic term of phase three generated similar challenges regarding the disparities in consent uptake and the over-representation of children from less deprived areas. Given these challenges and inaccurate representation of children in Wales, the potential in utilising a parental opt-out consent procedure was explored.

The measurement of children's health data on a national scale provides the opportunity for informed service delivery based on need. However, this relies on sampling methods that accurately reflect the population under study. During this time, HAPPEN was in the process of expanding across Wales and thus required sampling methods that would accurately represent children aged 8 to 11 years. As Strugnell *et al.* suggest[536], the majority of school-based studies require opt-in parental consent procedures. However, research examining the difference between

opt-in and opt-out parental consent for children participating in a healthy lifestyle study (collecting anthropometric measures and a health behaviour questionnaire) highlighted that opt-in consent methods significantly underestimate the prevalence of overweight and obesity in boys and girls aged 9 to 12 years. This study demonstrated that the study population using opt-in consent was significantly different from those that used opt-out procedures, highlighting the non-participation bias present in results. The authors suggest that this is particularly relevant to health studies in which results from opt-in methods reflect healthier populations and should be interpreted with caution. The study concludes that future school-based studies should consider the use of opt-out consent procedures in order to generate better science outcomes and this should be reflected in assessments by research ethics committees. Other research has suggested that parental opt-out procedures are acceptable in studies that pose a minimal risk. This has also been reflected in the National Child Measurement Programme for schools which operates through a parental opt-out consent system[537].

Thus, if the purpose of research is to understand and develop solutions to complex public health problems, it is essential that the data collected to examine these problems accurately represents the population. With this said, an amendment application for The HAPPEN Survey to incorporate parental opt-out was submitted to the research ethics committee. This application was approved and parental opt-out consent was rolled out during the second half of phase three. The process involves primary schools sending a text message with the parent information sheet detailing the aims of the study and a link to opt-out if they do not wish their child to participate. The opt-out system is hosted through the HAPPEN website as a spreadsheet listing names of parents that have opted out. Primary schools are then contacted regarding those pupils who have parental opt-out and are excluded from participating in The HAPPEN Survey. Child consent is gained at the start of The HAPPEN Survey. The day before taking part, schools share the information sheet and show an instructional video to pupils inviting pupils to participate in the survey. Those that wish to participate complete the consent form at the start of the survey and are reminded not to continue if they do not wish to complete the survey. Any child who selects a

'no' consent option but continues with the survey is automatically removed from the responses during the coding process. The opt-out system now employed in HAPPEN's refined model has enabled the survey to be fully scalable. This has allowed the rapid national expansion of HAPPEN and has also ensured that the data collected through The HAPPEN Survey are representative of children aged 8-11 in Wales. The current information sheets and consent forms for pupils and parents/guardians are presented in Appendix 1: HAPPEN Information sheets and Consent Forms (pupils and parents/guardians).

Upon reflecting on the new consent procedures, one challenge stands out as being a barrier for a small minority of schools wishing to take part in the survey. In 2018, the new General Data Protection Regulation (GDPR) came into effect. Prior to its release, HAPPEN worked closely with the Medical School and the University's GDPR specialists and compliance officers, in addition to seeking legal advice to ensure that all HAPPEN processes were GDPR compliant. However, the introduction of the new GDPR law created a great deal of apprehension for schools in engaging with research projects that collected data on their pupils. Through dialogue with schools, it was clear that schools had not received appropriate training, advice or information about GDPR and lacked the confidence in ensuring that they were protecting their pupils. As a result, some schools were hesitant in taking part in The HAPPEN Survey due to concerns over collecting information on children. This is despite HAPPEN adhering to all regulations set out in the law and being fully GDPR compliant. It is clear that there is a large disconnect between the understanding of legal requirements and policies of those that it affects. This is no fault of schools. Rather, it is absolutely essential that new changes in the law are communicated with those it can impact in a clear and concise manner. It is also necessary to ensure that technical wording of law and policies is summarised in lay terms to those in practice. Research projects such as HAPPEN also have a responsibility in ensuring all information regarding ethics, GDPR compliance and any legal concerns are easily accessible to pupils, teachers, schools, parents and the wider community in order to maintain transparency in processes and safeguard those involved. It is also important to conclude that schools expressing apprehension of participating due to concerns over

data protection are very rare. However, it is a reminder to ensure that all researchers are confident in handling queries or concerns of this nature and are able to communicate the project's compliance to schools in an informative, professional and understandable manner.

6.3.5 From Researcher-led to Teacher-led

In order to enable national expansion, it was necessary to develop the HAPPEN infrastructure to support wider scalability of the survey. This involved the practical considerations of survey delivery. During phases one and two, the survey was delivered directly by EM as a researcher-led tool. However, this significantly limited the capacity of the number of schools that HAPPEN could engage with and required considerable time commitments of the lead researcher (EM). Therefore during phase three the resources to develop the survey from researcher-led to teacher-led were developed. This included creating an information video for pupils, a more detailed information sheet for teachers and schools, a phased email response for schools containing instructions for each stage and a checklist for schools to ensure all necessary procedures are adhered to (e.g. sending parental opt-out via school messaging system).

The subsequent delivery of the survey as a teacher-led tool enabled wide scalability. In addition, it allowed the flexibility for teachers and schools to deliver the survey on a convenient day and time. This was a particular benefit for HAPPEN as it was not uncommon during the first two phases to encounter challenges when delivering the survey as a researcher-led activity within the school environment. Schools are faced with increasing pressures on time and accountability, and there were many instances in which timetable clashes and other school priorities took precedence over survey delivery.

On reflection, the benefits of delivering the survey as a researcher-led tool included the facilitation of a positive rapport between HAPPEN and schools. Having a schools facing 'HAPPEN person' provided a more direct relationship between the network and schools. Feasibly however, it would be impossible to maintain this level

of researcher-school contact and expand across Wales. Therefore, it was necessary to risk losing this level of contact between schools and HAPPEN in order to expand efficiently. At the time of writing, HAPPEN maintains a strong relationship with schools through email and telephone communication and to conclude, this decision has made little impact on the relationship with schools and has facilitated the growth of the network. Ideally, projects such as HAPPEN would benefit from a sole 'School Engagement Officer' role, however, restrictions with funding tend to prevent this from happening.

6.3.6 School Report Development – from Public Health to Curriculum Tool

The information presented in the school report during phases one and two followed the thematic structure of the WNHSS. The report also included detailed information about health messages, guidelines and links to localised projects within each theme. The overall structure was outlined primarily as a public health tool for schools. However, expanding HAPPEN across multiple local authorities in Wales would require individual county reports based on local public health service provision, requiring significant time and resources to develop. In addition, identifying a set of criteria which programmes would have to fulfil in order to be promoted is also challenging e.g. low or no cost, project accreditation etc. During these phases, more information regarding the new curriculum was being announced. In response to developments in the new curriculum, attending a number of curriculum events and through communication with schools, a gap became evident in curriculum-focussed health and wellbeing resources. Furthermore, schools expressed concerns over how to incorporate the health and wellbeing Area of Learning and Experience within future curriculum delivery. Therefore there was a clear opportunity to shift the focus of HAPPEN from a public health tool to a curriculum tool. This required a restructure of the school report in order to reflect education and curriculum wording for example, in relation to the 'What Matters' statements. In addition, a separate national electronic resource pack was developed for schools.

Recent feedback from schools that have participated in The HAPPEN Survey demonstrate the survey and report's applicability to the school curriculum;

> *"This is such a valuable survey - was easy to use and very child friendly. The results helped us so much and we were shocked with some of the stats. The results help us plan our whole school approach to wellbeing and we targeted self care, getting enough sleep, drinking enough water, eating enough fruit and veg and not having too much sugar as our January whole school theme" (Teacher, HAPPEN feedback form)*

> *"It has helped us shape some of the curriculum we teach at school" (Teacher, HAPPEN feedback form)*

Maintaining the focus on the new curriculum within the school report will require annual refinements to ensure that the dialogue remains consistent with curriculum messaging. This is an important investment that will remain as part of the future functioning of HAPPEN.

In conclusion, the current HAPPEN school report supports schools in two dimensions. It facilitates their health-promoting capabilities through the identification of health and wellbeing priorities specific to their learners. Actions to target these health topics identified within the school report can encompass a HPS framework and a whole-school approach by incorporating the three central components of the framework. These are (1) the formal curriculum (e.g. through curriculum activities aligned to school report findings), (2) the school environment and ethos (e.g. through school policy) and (3) the school's links with the wider community (e.g. by accessing community school-based health programmes). This model also supports the autonomy aspect of school health promotion that was advocated for by headteachers[42] by enabling a bottom-up approach to school health. Finally, this shift from a public health tool to curriculum tool supports the discussions presented in Chapter 1. Schools are more likely to engage with the health sector when the educational benefits are clear and can be embedded within the curriculum and incorporated with learning outcomes[40].

Following the distribution of the HAPPEN school report, it is important to consider the subsequent level of participation, recognised by the WHO as a process

in which individuals are involved in and can influence decisions that affect them[538]. Although participation is a complex process, in this case it is suitable to view this concept in relation to the involvement and participation of pupils following a school's engagement with HAPPEN. During phases one and two school reports were shared with teachers and headteachers and therefore the level of pupil input or involvement was not captured. Conceptually, action taken by schools would most likely be acted upon on the level of 'Consulted and informed', or 'Adult-initiated, shared decisions with children' within Hart's ladder of young people's participation[539].

Pupil participation is most notably recognised within Welsh education settings as the 'Pupil Voice' movement. The value placed upon pupil voice has increased considerably in recent years in conjunction with the development of the new curriculum, and acknowledged by Estyn as fundamental to effective school practice[540]. With this growing recognition of the importance of involving pupils within curriculum design and education delivery, HAPPEN also shifted focus towards ensuring pupil involvement following the distribution of school reports detailing information regarding their health and wellbeing.

Outlined in the phased development of HAPPEN in Chapter 2, a pilot project was launched during phase three in collaboration with Lleisiau Bach Little Voices (based in the Wales Observatory on Human Rights of Children and Young People, Swansea University). The aim of HAPPEN Little Voices was to enable pupil-led change through a 'Children as Researchers' methodology. This enabled pupils to design and deliver a research project with peers to identify priorities within their HAPPEN school report and determine pupil-directed action, supported by teachers and senior leadership. Bruun Jensen and Simovska state that it is also important that teachers play an active role in pupil participation through facilitating discussion and providing resources[541]. In the case of this pilot project, teachers provided support to pupils both in terms of insight and knowledge regarding pupils' ideas, and the time and resources that allowed their research project to be delivered within the school. Within Hart's ladder of young people's participation, this would be viewed at the top of the ladder among the level of 'Child-initiated, shared decisions with adults'[539]. Thus, the level of pupil participation has increased throughout the development of

HAPPEN. From phase four, a pupil-led action plan now features within the HAPPEN school report and serves as a fundamental component of the HAPPEN process.

However, consistently ensuring a higher level of pupil participation with HAPPEN across the multiple layers of education (e.g. curriculum, school environment, school policy) and on a national basis requires new pedagogical skills, resources and formal structures. One possible method in addressing this would be through the development of complete work packages for schools that provide bulk resources. For example, these could include multiple lesson plans (e.g. a term workstream) incorporating pupil participation activities with the HAPPEN school report and case studies outlining previous examples of involving pupils with school policy change based on the HAPPEN school report. In addition, the development of a pupil HAPPEN advisory group would enable children to provide input and contribute towards the future direction of HAPPEN, from the perspective of pupils. Thus, this would embed pupil participation within all HAPPEN processes and its further development and expansion.

6.3.7 Website Development

The development of the HAPPEN website was an important step in setting up the infrastructure to support the hosting of various survey resources and parental opt-out consent. It also presented all relevant information about HAPPEN suitable for school recruitment such as the purposes of the network and how to take part in the survey. In addition, it provided a platform to disseminate HAPPEN research and to share latest news from the network. Thus, the website is instrumental in school recruitment, hosting research processes and sharing research findings with a wide audience and will continue to be an important function of HAPPEN. The statistics on website visitors is presented in **Figure 8** below.

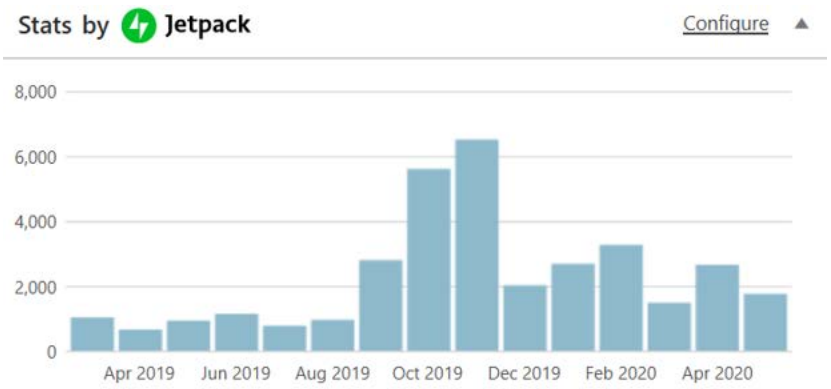

***Figure 8**: Latest HAPPEN website visitors*

6.3.8 HAPPEN Conferences

The annual HAPPEN conferences have been a significant component of the HAPPEN model and in facilitating knowledge exchange. This subsection will discuss the annual conferences during phases one and three, offer insights into the benefits of hosting a conference for HAPPEN stakeholders, and suggest future opportunities for knowledge exchange during HAPPEN's expansion. Furthermore, feedback from attendees acquired through conference feedback forms will be presented to support the themes that will be discussed. Conference feedback forms had two purposes; firstly to gather feedback on the conference components and agenda and secondly, as a process evaluation to ensure that there was value in offering annual conferences.

Prior to this PhD, the conferences were branded as 'Network Meetings'. Following reflection during phase one, these were rebranded as a conference with the aim of widening attendance and engagement by schools and practitioners. This rebranding not only ensured that conferences provided a platform to disseminate HAPPEN findings and generate feedback from stakeholders, but also provided a platform for networking opportunities, group discussions on conference topics between schools and stakeholders and shared action planning.

> *"I have been attending the HAPPEN network meetings for some time and always come away with something useful. I also feel they are getting better each time. This one in particular was so relevant to the needs of schools at the moment." (Teacher attendee, phase one conference)*

The conference agendas typically constituted a combination of HAPPEN presentations on latest findings and presentations by external speakers. The findings presented each year were dependent on the stage of research at that time (phase one: outdoor learning, phase two: The Daily Mile quantitative data and initial educational attainment findings, phase three: The Daily Mile qualitative data and HAPPEN Little Voices pilot project). The external speakers were also selected to align with current trends and support the HAPPEN research. In phase one and two, this included inspectors from Estyn (education and training inspectorate for Wales) presenting about the new arrangements for wellbeing inspections within schools.

> *"Excellent presentations - very relevant themes backed up by data and school presentations. I also think Emily is an outstanding presenter. Thank you for all HAPPEN do with schools" (Teacher attendee, phase two conference)*

In phase three, the Welsh Government curriculum lead for the Health and Wellbeing Area of Learning and Experience delivered an insightful presentation for schools regarding the new curriculum. Furthermore, phases two and three incorporated presentations from primary school pupils involved with HAPPEN research projects (The Daily Mile and HAPPEN Little Voices), demonstrating HAPPEN's commitment to pursuing the pupil voice agenda. The agendas for all conferences can be found in Appendix 4: HAPPEN Conference Agendas.

> *"I found the information about the senedd [pupil voice group] really useful as it would open up 'Pupil voice' to all not just a small group. I would like to take this on board and plan to speak to the staff" (Teacher attendee, phase two conference)*

The integration of workshops and group sessions was introduced following feedback from phase one attendees who requested more time to network and discuss conference topics with other attendees.

> *[What theme would you like to see in future conference]: "More opportunity to have around the table discussions and network." (Organisation attendee, phase one conference)*

As a result, the conferences agendas in phases two and three included group workshops, allowing attendees to jointly consider conference presentation topics

and facilitate shared action planning. This also enabled HAPPEN to gather feedback from stakeholders in health and education on the direction and delivery of HAPPEN. This feedback was made into infographics and shared with conference attendees and wider HAPPEN stakeholders (e.g. Welsh Government Health and Wellbeing Curriculum Lead).

Throughout the three phases of conference delivery, attendance has increased each year, from 60 in phase one to over 120 in phase three. Attendees have been a combination of school staff (teachers, headteachers, healthy school coordinators) and public health practitioners (local public health teams, local authority sport and health team, third sector charities, health organisations). Observations and reflections of the conference registration prompted the decision to stagger promoting the conference attendance based on priority. Schools were identified as the key target audience and thus, from phase two were given priority registration.

> *"Fantastic to be on a course with a range of people who work within/alongside education and educators. Made lots of new contacts." (Teacher attendee, phase two conference)*

With HAPPEN expansion underway, the question of conference sustainability arises. Firstly, the national expansion of HAPPEN presents geographical limitations. During phases one and two, HAPPEN was delivered solely within the Swansea and Bridgend local authorities. Thus, a conference hosted in Swansea was a viable option for schools and the public health field to travel to and attend. However, schools across all local authorities in Wales have participated in The HAPPEN Survey during phase four, presenting issues regarding conference location. One option to address this would be the delivery of regional conferences to ensure an equal opportunity for all schools to attend. This option is dependent on cost and current constraints with budget limit the possibility of a conference in phase four. Nonetheless, given the positive feedback on HAPPEN conferences by previous attendees it is important to consider alternative arrangements that maintain the knowledge exchange function of the network.

In order to address this challenge in maintaining an event style platform for schools, a pilot regional planning workshop was designed and delivered in collaboration with the regional consortium Education through Regional Working (ERW). This regional planning event was hosted by over 20 schools within the ERW local authorities region (Swansea, Neath Port Talbot, Carmarthenshire, Pembrokeshire, Powys, Ceredigion). This strategic partnership has enabled HAPPEN to deliver school facing events, whilst also providing staff support, venue hire and logistical provision (e.g. school recruitment to event, agenda planning). The purpose of the regional planning workshop was to 1) support schools in using their HAPPEN school report to deliver the new curriculum, 2) to co-produce the HAPPEN action plan resource in line with the new curriculum and 3) to gather feedback on other HAPPEN resources to ensure they are tailored to need. The event was divided into two sessions. During the morning, previous HAPPEN schools attended and worked with ERW staff in developing an action plan in response to their individual school reports and aligned to the new curriculum. During the afternoon, the schools from the morning presented their action plans to new schools, followed by a joint planning session focusing on further developing the HAPPEN action plan template to align with the new curriculum.

This regional planning workshop will now be shared with the other education consortia with the aim of co-delivering a similar event. Thus, if successful and based on attendee feedback, the future provision of HAPPEN conferences will be achieved through the delivery of regional planning workshops in collaboration with the education consortia. This would both ensure that schools are provided with an opportunity to collaborate and share curriculum planning, and strengthen the strategic partnerships between HAPPEN and the regional consortia.

6.4 Platform for Evaluating Interventions

The potential for HAPPEN acting as a platform in the evaluation of school-based programmes has been demonstrated in Chapters 3 and 4. From a research perspective, the network has the ability to collect both quantitative and qualitative

data. The network is also able to recruit schools to research studies through existing HAPPEN relationships or facilitated through established collaborations with for example local authorities. From a schools perspective, these evaluations have provided valuable information regarding health and wellbeing outcomes and implementation factors.

Indeed, the benefits of this strand of the network are wide ranging. From a quantitative perspective, the data provides an indication both to schools and to the wider research community whether school-based programmes are providing the intended benefits to children's health and wellbeing. However, reflecting upon how schools have engaged with HAPPEN research findings over the last few years suggests that schools place more value on qualitative findings and school experiences. The findings from headteachers, teachers and pupils regarding the experiences of delivering or participating in school-based programmes has provided important insights into the barriers and facilitators to effective implementation. These implementation factors are crucial for schools in addressing barriers that have been previously identified by schools, and also in delivering programmes based on positive experiences and factors cited by pupils. In addition, there is a sense of pressure for schools to deliver certain school-based programmes and in some cases, these programmes lack any foundation research examining their acceptability and effectiveness. As discussed in Chapter 1, less than 30% of schools implement interventions that are evidence-based[52]. Therefore, the evaluation of school-based programmes through the platform of HAPPEN is an important component that should remain in the expansion and roll-out of HAPPEN. Not only do research findings benefit schools within Wales and add an important contribution to the literature, the widespread dissemination facilitated through for example, publishing in The Conversation[105,112], helps to raise the profile of HAPPEN and share the findings to a wide international audience. Thus, the impact of HAPPEN is not limited to just Wales, but to schools across the UK and globally.

6.5 COVID-19

The COVID-19 pandemic begun during phase four and at a time of national expansion. With it brought various challenges regarding how HAPPEN operates, the network's functions and its purposes. This unexpected situation required a rapid adaptation to The HAPPEN Survey and a reorganisation of HAPPEN priorities. Most importantly, it was necessary to consider how HAPPEN can support schools during this challenging time in which the majority of pupils are home learning. It was initially clear that the current processes of HAPPEN required adaptation. In particular, it was necessary to change The HAPPEN Survey to reflect the current situation, given that a number of questions were redundant (e.g. active travel). Furthermore, there were concerns that some questions would cause emotional distress to children such as asking how happy they are with school. To address this and ensure HAPPEN was supporting schools during this situation, a new survey was developed in order to explore how the COVID-19 pandemic was affecting children's health and wellbeing. For schools that had taken part in HAPPEN during this academic year (2019-20), this allowed comparisons to be made. In addition, the new survey provided schools with an electronic resource to use as a teaching activity. At the time of writing, ethical approval has been granted for the COVID-19 survey, the process of recruiting schools has begun and a social media campaign is underway. Reflecting on this current situation, this demonstrates HAPPEN's ability to rapidly adapt within a changing picture of health and education in Wales. In addition, it reinforces the importance of HAPPEN's primary function in supporting schools to prioritise and improve the health and wellbeing of its pupils.

6.6 Limitations

Before concluding this final chapter, it is important to consider some of the barriers and limitations to developing, expanding and coordinating a primary school network. Firstly, running and managing a network based purely on a single source of PhD funding is a challenge, both financially and in terms of capacity. The nature of PhD funding means that there lacked a source of direct income to support the project

resources and infrastructure. In addition, acting as the sole manager and coordinator limited the capacity for delivery during the first two phases in which the researcher input was high. Embedding the network within the National Centre for Population Health and Wellbeing Research (NCPHWR) allowed financial and structural support for the network to expand.

With this said, the wider scale expansion of HAPPEN would likely require a larger source of funding that supported a number of research staff and project infrastructure. In addition, this requires longer-term commitment from a range of partners in health and education. For a truly national network, a collaboration between academic institutions, public health bodies and government organisations is required. However, this raises the barrier regarding competing commitments and rapidly changing priorities. From an academic perspective, institutions are competing for external funding and this can impact and inhibit institutional collaboration. From a public health perspective, the priorities of local authority and public health services vary greatly across areas and regions. Therefore, mutually beneficial partnerships between HAPPEN and these services are dependent on the alignment of priorities. Finally from an education perspective, the changing landscape of education delivery and the curriculum reform observed within Wales has complemented the roll-out of HAPPEN. Indeed, this has required the strategic development of HAPPEN in parallel with the new curriculum.

Another limitation to consider is the conflict between the rapid functioning of the network to fit with changing education and health priorities, ensuring fast dissemination of findings and the nature of academic functioning. Ensuring thorough and transparent research operations and outputs, and adhering to all academic processes and requirements can be a lengthy process. This can result in a limited ability to respond to rapidly changing circumstances. Incongruity also exists between the quick dissemination of research findings to schools, and the need to protect results prior to academic publication. In addition, the length of time between manuscript submission, review, corrections and publication can mean that although research findings are novel, they are no longer new. Therefore, research findings are often shared with schools through reports prior to peer-review or publication.

This point also brings to the surface the debate of impact. Within academic institutions, impact is generally considered in relation to publications. Of course, publishing the findings of research studies provides important contributions to the literature that advances practice and guides policy. On an academic level, the publications in this thesis have been included as citations within recently published papers. On a non-academic level, these publications have received Altmetric scores in the top 5% of all research output and have also been shared internationally, gaining significant media interest. The impact generated through these publications was facilitated mainly through articles published in The Conversation[105,112]. The purpose of The Conversation is to translate and communicate research to the general public. This is a stark reminder that however important it is to publish and share findings within the academic field, it is equally as important to utilise methods that allow the dissemination of research to the public.

It is vital to not forget that the core purpose of HAPPEN is to improve outcomes for children through the engagement with schools. It is possible to suggest that academic publications are not user friendly for those outside of the research arena. Therefore, summarising research to schools is of paramount importance if we are to truly strive towards generating impact on the ground. In addition, the importance of public engagement must not be overlooked. This requires pro-active steps aside from traditional academic processes to ensure that the results found through HAPPEN result in a change in practice and generate real impact. On a school level, it can be difficult to track and identify individual impact. Often, any changes to school practice as a result of engaging in HAPPEN have been received through informal communication with schools. Nevertheless, these positive examples of school level impact are best communicated and shared through the form of case studies. In order to address this, a 'HAPPEN action plan' template developed by a primary school has been rolled out and included within all school reports. This action plan encourages schools to document changes and interventions as a result of receiving their school report. Furthermore, this can be shared with HAPPEN to track school-level impact.

Finally, it is plausible that the schools that engage with HAPPEN are already 'healthy and engaged' schools. At the centre of HAPPEN is the ethos of a bottom-up approach to improving school health. Participation and engagement with HAPPEN is achieved through a voluntary system. The benefit of this is that schools do not feel forced into meaningless participation, or judged by top-down results and accountability. In comparison, the barrier is that there is a risk of only engaging with already engaged schools. Perhaps those most hard to reach, and who would receive the greatest benefit are less likely to engage. With this said, HAPPEN continues to engage with schools from a range of socio-economic areas and proportions of FSM (presented in **Table 4**: A summary of school participation by local authority and free school meal eligibility from phases one to four (2016-20)). With the announcement of the new school curriculum, a wider range of schools have been seeking support and help with delivering health and wellbeing activities (see **Table 5**: List of schools registered through the HAPPEN website for 2020-21 academic year (as of October 2020)).

It is important to consider the limitations to HAPPEN. However, it is also evident that the benefits far outweigh the barriers. The following subsections will conclude this thesis and set to provide an answer as to the sustainability of HAPPEN in the future.

6.7 Conclusion

The final question of this PhD thesis is to answer whether there is value in sustaining a national primary school network in Wales with the aim of improving the health, wellbeing and education outcomes of children. Reflecting upon the last four years that have been dedicated to developing HAPPEN, the clear answer is yes. The current protocol and function of HAPPEN fills an important gap in the provision of a free, teacher-led online survey, developed with children and refined annually to reflect current trends in public health and education. The development of HAPPEN over the last four years has followed an action research model and has been guided by the evolving climate of education in Wales through alignment with the new

curriculum. The teacher-led survey provides schools with important information on the health and wellbeing of their pupils, allowing the design and delivery of curriculum and whole-school approaches tailored to learners' needs. Indeed, the announcement of the new curriculum and in particular, the distinct focus placed upon health and wellbeing created a new appetite for schools to engage with HAPPEN. It also provided an opportunity to reassess the functioning of HAPPEN and align with curriculum priorities in order to support schools in their curriculum delivery.

> *"HAPPEN is tailor made to individual schools so schools can get a really good understanding of the needs of their school and cater to those needs. HAPPEN also provides excellent sign posts on their webpage to a wealth of resources that teachers may not be aware of." (Teacher, HAPPEN feedback form)*

The processes for expanding HAPPEN have allowed scalability of the survey across a wide geographical area. This has included the shift from a researcher-led to a teacher-led survey, the inclusion of parental opt-out consent to ensure representation of all children in Wales and the development of the website to host consent procedures, share latest news and disseminate HAPPEN findings. In order to reflect the change in focus from a public health tool to an education tool, all HAPPEN resources such as the website and school report have been restructured to include curriculum dialogue and align with the field of education. Thus, although the survey is focussed on the health and wellbeing of pupils, the emphasis is on incorporating school report results within an individual school's curriculum, making it a tool that remains relevant and easily applicable throughout the future. It is clear from recent engagement with schools that this shift in focus and alignment with the curriculum has increased the motivation for schools to participate with HAPPEN activities.

At the start of this PhD, HAPPEN had engaged with 2,600 pupils from 30 schools in Swansea. At the time of writing, over 12,000 pupils from 150 schools in 18 local authorities have participated in The HAPPEN Survey. This significant increase in the number of children and schools from various regions across Wales represents the value and enthusiasm for HAPPEN. Importantly, despite its expansion the network has continued to use a bottom-up approach to improving health and wellbeing, as

opposed to a top-down surveillance tool. Furthermore, the shift from a public health tool to an education tool ensures a constant applicability.

The components of both school-based programme evaluation and data linkage with health and education records remains an important strand of HAPPEN's function. Providing schools with important insights into implementation factors and quantitative outcomes facilitates schools in effective programme delivery. An interesting reflection is of the increased value that schools place on qualitative findings and highlights the importance of gathering whole-school experiences of school-based programmes in the future. Furthermore, the use of data linkage and the sharing of research findings with a wider public health audience encourages evidence-based service delivery and resource allocation. Disseminating HAPPEN's research findings and publications through platforms such as The Conversation has allowed widespread impact. Both publications presented in Chapters 3 and 4 have been scored by Altmetric in the top 5% of all research outputs. In addition, international media coverage has helped to increase the profile of HAPPEN.

Recent changing circumstances in relation to the COVID-19 pandemic have also demonstrated HAPPEN's ability to rapidly adapt and evolve to reflect current public health situations. Indeed, the current situation that Wales is facing is unique and challenging. However, the priority of HAPPEN remains to be identifying how it can best support schools in ensuring the health and wellbeing of its pupils is not neglected. Although the current function of HAPPEN is somewhat different to the final phase four model, it is a temporary adjustment that is required to mirror the situation that we are facing. HAPPEN intends to return to phase four functioning when the schools return.

> *"I have thoroughly enjoyed working with Emily and the HAPPEN team and have been inspired by speakers at the HAPPEN conferences. We all know that happy children learn and by giving pupils a voice we can ensure they are happy, therefore we can provide the best possible opportunities for pupils to reach their full potential" (Teacher, HAPPEN feedback form)*

Finally, the impact generated through HAPPEN must be recognised. At the individual school level, schools have demonstrated making considerable changes to their functioning through curricular and extra-curricular activities.

The HAPPEN school reports have allowed the tailored provision of health and wellbeing activities based on their learners' needs. These have been promoted through case studies on the HAPPEN website, showing examples of best practice and how engaging with HAPPEN can facilitate schools in prioritising health and wellbeing. On a local level, the annual school report shared with stakeholders in health and education such as local authorities has helped to inform service delivery and data collected through HAPPEN has been fed back to a range of public health providers. The expansion of HAPPEN across Wales will provide national datasets and trends in children's health and wellbeing and will continue to inform public health and education provision. The recognition of HAPPEN on a national level was recently demonstrated in the 2018-19 Chief Medical Officer for Wales' annual report, *Valuing our Health*[111]. On a global level, the publications of research findings on outdoor learning and The Daily Mile have been shared internationally. In addition, promoting the findings through channels such as The Conversation has enabled the widespread media coverage and endorsement by The World Economic Forum.

6.8 Future Directions

The development of HAPPEN during the phases within this PhD has enabled the network to expand from a local project to a national primary school network. Following an action research model presented in Chapter 2, the network's development has been enabled through annual reflections and adaptations, responding to real-world challenges and reacting to the barriers and facilitators to expansion that have emerged during development. The research findings presented within Chapters 3, 4 and 5 have shown HAPPEN's ability to act as a platform in evaluating school-based programmes on health and education within the curriculum. In addition, performing the linkage of survey and routine data helps to understand the complex relationship between social, lifestyle and epidemiological influences on

children's educational attainment. Ultimately, this thesis demonstrates that HAPPEN can provide Wales with a national primary school network, it can capture important information on children's health and wellbeing and has demonstrated local, national and international impact that advances our understanding of health and education and improves outcomes for children.

It is important to finish this thesis with an outline of the future direction of HAPPEN based on the findings and in relation to the landscape of public health and education within Wales. For the rest of the duration of this current academic year (2019-20), HAPPEN will continue to expand throughout Wales and engage with primary schools across all local authorities. This will be facilitated through newly established partnerships with education consortia (ERW, EAS, GwE, CSC), pre-existing partnerships with stakeholders in health and education (e.g. Play Wales), in addition to more general promotion and publicity of HAPPEN through social media. However at the time of writing, the COVID-19 pandemic has resulted in a drastic change in school functioning, with the majority of children now learning from home. This has required a rapid adaptation to The HAPPEN Survey and its protocol. This has also caused a temporary pause in planning given the lack of clarity of when schools will be returning to normal functioning and the lack of understanding of what this functioning will be. Nonetheless, this unpredictable situation has been an opportunity for HAPPEN to support schools in continuing to provide focus to children's health and wellbeing.

The findings in Chapter 5 emphasise the importance of the early years period on children's development, school readiness and subsequent educational attainment during primary school. The results also highlight parental engagement and involvement as important factors in children's development. During the duration of this PhD, HAPPEN has developed resources for parental engagement such as family workbooks. However, the likelihood of parents using these resources is of course dependent on the levels of parental engagement exhibited. It is possible to suggest that influencing parental engagement is outside of the scope of HAPPEN. However, there is still value in providing resources for parents and this will continue to be part of HAPPEN's remit. In relation to the early years, perhaps there is greater value in

shifting towards engagement with early years stakeholders. Following this PhD, the author will be conducting a workstream commissioned by Cwm Taf Health Board and working with their early years team in examining the vulnerability of pre-school children. Part of this work will involve the review of literature on factors affecting children's school readiness. Findings from this review aim to inform the Health Board's service delivery and Flying Start provision. In addition, this review can contribute towards HAPPEN's progression into engaging with the early years and identifying priority areas for stakeholders.

Another direction that HAPPEN will be moving towards is incorporating elements of workplace health. Indeed, the teaching profession itself is an understudied area of HAPPEN and there is potential in examining how HAPPEN can facilitate schools in not just supporting pupil wellbeing, but also that of teachers and school staff. Thus, this would contribute towards an ethos of whole-school health and wellbeing.

Given the findings in Chapters 3 and 4 regarding the studies of outdoor learning and The Daily Mile, there is great value in HAPPEN acting as a platform for evaluating school-based programmes. The study on outdoor learning examined the impact of regular outdoor learning within the primary school curriculum. However, these schools were all situated within areas of low deprivation and with easy access to the outdoors. Therefore, further research would warrant examining the acceptability of incorporating outdoor learning within urban schools with limited access to the natural environment. Furthermore, HAPPEN intends to conduct future research on The Daily Mile with a larger sample of schools

6.9 Final Remarks

This thesis provides an important contribution towards our understanding of the complex relationship between health and education through the perspective of a primary school network. The historical context of school health discussed in Chapter 1 was followed by a set of recommendations for school-based health promotion and practice. A solution to these recommendations presented in Chapter 2 through the

development of HAPPEN. This chapter concluded with a final HAPPEN model that is currently being delivered and expanded across Wales. This model fills an important gap in the provision of a synergistic health and education tool for primary schools at a time of curriculum reform. The HAPPEN school report allows schools to align their curriculum design and delivery specific to learners' needs and their individual school contexts. This allows primary schools to prioritise pupils' health and wellbeing whilst simultaneously fostering learning progression, reflecting a true collaboration between health and education. The published studies presented in Chapters 3 and 4 on outdoor learning and The Daily Mile demonstrate HAPPEN's ability to evaluate health and education school-based programmes. These findings have been disseminated to schools, the research field and the public health and education sectors on a local, national and international platform. Importantly, these studies contribute to the evidence-informed implementation and practice of school-based programmes. Chapter 5 displays the epidemiological capabilities of HAPPEN through the linkage of survey and routine data. The results presented in this chapter provide an understanding into the association between social, lifestyle and epidemiological factors and children's educational attainment. Finally, Chapter 6 outlines HAPPEN's scalability, sustainability and implications for practice and concluded that there is indeed value in continuing the operation of the primary school network across Wales. The new curriculum is due to be implemented in Wales in 2022. With the inclusion of Health and Wellbeing as one of six Areas of Learning and Experience, this distinct focus provides an exciting opportunity for schools. To conclude this thesis one can refer back to the title; investing in health and wellbeing is an investment in education.

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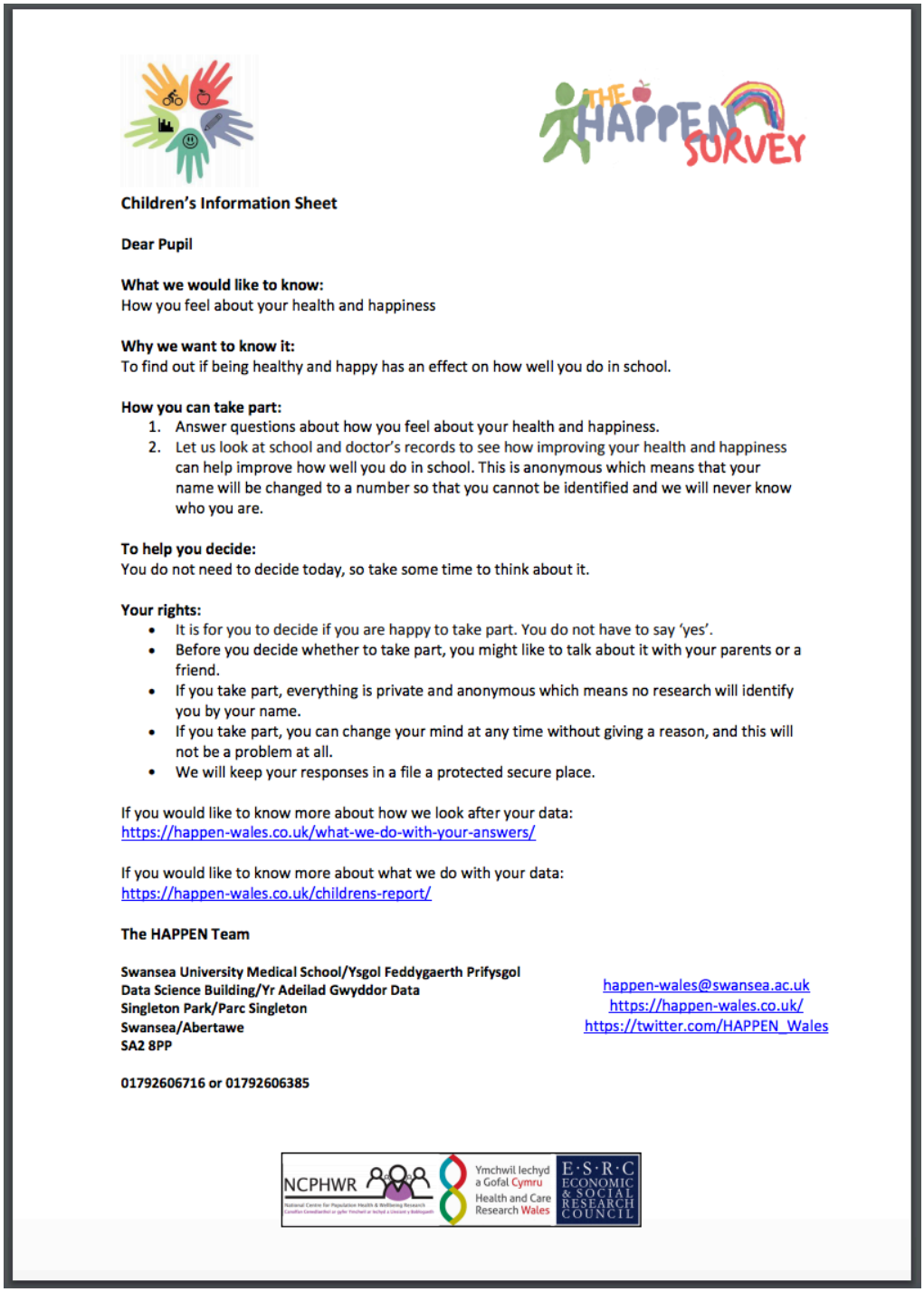
Appendix 1: HAPPEN Information sheets and Consent Forms (pupils and parents/guardians)

Children's Information Sheet (also available electronically at www.happen-wales.co.uk/runningthesurvey/)



Children's Information Sheet

Dear Pupil

What we would like to know:
How you feel about your health and happiness

Why we want to know it:
To find out if being healthy and happy has an effect on how well you do in school.

How you can take part:

1. Answer questions about how you feel about your health and happiness.
2. Let us look at school and doctor's records to see how improving your health and happiness can help improve how well you do in school. This is anonymous which means that your name will be changed to a number so that you cannot be identified and we will never know who you are.

To help you decide:
You do not need to decide today, so take some time to think about it.

Your rights:

- It is for you to decide if you are happy to take part. You do not have to say 'yes'.
- Before you decide whether to take part, you might like to talk about it with your parents or a friend.
- If you take part, everything is private and anonymous which means no research will identify you by your name.
- If you take part, you can change your mind at any time without giving a reason, and this will not be a problem at all.
- We will keep your responses in a file a protected secure place.

If you would like to know more about how we look after your data:
https://happen-wales.co.uk/what-we-do-with-your-answers/

If you would like to know more about what we do with your data:
https://happen-wales.co.uk/childrens-report/

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NCPHWR Ymchwil Iechyd a Gofal Cymru Health and Care Research Wales E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Child Consent Form (in The HAPPEN Survey)

Consent Form

Before you start please click this link to read the information sheet -> https://happen-wales.co.uk/wp-content/uploads/2019/02/Child-Consent-2019.pdf

I have read the child information sheet -> https://happen-wales.co.uk/wp-content/uploads/2019/02/Child-Consent-2019.pdf (click the link if you haven't read it) and understand that if I take part I can change my mind at any time, and this will not be a problem at all. *

- ○ Yes
- ○ No

I am happy for you to use my questionnaire for research. Only the researchers in the team will know my name and will not tell anyone else my answers *

- ○ Yes
- ○ No do not use my questionnaire

I am happy for you to look at my school and health records to see how my school is doing (as a group). This is anonymous which means I cannot be identified *

- ○ Yes
- ○ No

Parent Information Sheet and Opt-out Consent Form (also available electronically at www.happen-wales.co.uk/runningthesurvey/)

Parent Information Sheet

Your child is being asked to complete a short survey on their health and well-being as part of our primary school health network – HAPPEN (www.happen-wales.co.uk). They will be asked questions such as how active they are, how well they can concentrate, what activities they would like to try in school and how happy they are in school and with their friends. The results are used to help schools make their pupils healthier and happier (e.g. having an afternoon break to allow children to be more active). If you would like to see the questionnaire it can be found here: https://happen-wales.co.uk/the-chat-questionnaire-can-be-downloaded-here/

We would like to let you know that:

- **Your child will be asked for their consent to take part in this questionnaire.**
- **Your child's participation is voluntary and you can withdraw your child at any time.**
- **The data collected may be looked at by researchers who are members of the Primary School Network Research team in Swansea University.**
- **The answers your child gives can be linked in an anonymised way (e.g. your child cannot be identified but we can see if children with asthma, for example, do better or worse in school) to medical and educational records. This is in an anonymised way and we can NOT identify any individual child in any linkage with health or educational records.**
- **Your child's school will be asked to provide the research team with your postcode. This is used to look at how area and local environment affects health.**

Parent Information Sheet
(Version 2.0, Date 11/12/2018)

Project Title: HAPPEN – The Health and Attainment of Pupils in a Primary Education Network

Please read the information below carefully.

Invitation Paragraph: The children in your child's class have been invited to take part in a study that will look at the relationship between health, wellbeing and educational attainment.

1. What is the purpose of the study?

The data we collect from all of the children taking part in the study will help us assess the children's health, fitness, happiness in school and overall wellbeing and education.

2. Why has my child been chosen?

All of the children in your child's class, including your child, have been invited to take part in the study. If your child does not feel happy about anything that they are asked to do, they can stop at any time, without fear of penalty, and will be reminded of this throughout the study. If you need any

more information about the study, then please contact any member of the team on the details above.

3. What will happen to your child if they take part?

Your child will be asked for their consent to complete an online questionnaire about their health, wellbeing and lifestyle, which will take about 30 minutes. The questionnaire is completed with their class teacher present in the classroom. The questionnaire may be repeated again within 12 months to look at changes in health and wellbeing. The questionnaire used is exactly the same as the baseline questionnaire. Your child's school may also see how far the children can run in 6 minutes. This will be within a PE lesson. We would like the distance ran to be included with the along with your child's questionnaire (so we can see how fitness, attainment in school, wellbeing are all related in children). We will also use your child's information for data linkage. This means that your child's name will be changed to a number and entered into an anonymous database. This is done by a trusted third party: the NHS Wales Informatics Service. Once in the anonymous database, numbers can not be tracked back to children's names This database can be used to look into other records such as exam results and doctor's records. Your child cannot be identified during this process and all linked data can only be looked at by group (for example, whether a group of who were physically active had better health compared to the group who were not).

4. What are the possible disadvantages of taking part?

The questionnaire will be completed sensitively in a group setting within the classroom. Your child does not have to take part in the questionnaire if they do not wish to do so. You/your child are reminded of your right to withdraw at any time, without giving any reason at various stages of the study.

5. What are the possible benefits of taking part?

Taking part in this study can help improve our understanding of the impact of health and wellbeing on education, and encourage schools to take part in school-based initiatives in the future. Taking part in the research can be an enjoyable experience for children, and they will get to take part in an exciting questionnaire that they might not have taken part in before.

6. Will my child taking part in the study be kept confidential?

All the data we collect will be kept private and confidential; the children's names will be changed to numbers. Any hard copies of the data will be kept in a secure office and computer files and any personal information will be password protected. The data obtained will only be looked at by responsible individuals of the research team from Swansea University.

7. What if I have any questions?

If you have any questions about the study please don't hesitate to contact anyone from the research team (see contact details below). If after the study you are concerned about how any aspect of the research was conducted please contact the Chair of the School of Medicine Ethics Committee on: **sumsresc@swansea.ac.uk**

If you do not want your child to complete the questionnaire please complete this form below:

I do not want my child taking part in the HAPPEN questionnaire as outlined in the information sheet*

I do not want my child to complete the HAPPEN Survey ☐

Parent Name *
First_____
Last_____

School Name*_____

Child Name*
First_____
Last_____

Child Date of Birth_____

The HAPPEN Team

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Appendix 2: The HAPPEN Survey

THE HAPPEN SURVEY

* Required

Consent Form

Before you start please click this link to read the information sheet -> https://happen-wales.co.uk/wp-content/uploads/2019/02/Child-Consent-2019.pdf

1. I have read the child information sheet -> https://happen-wales.co.uk/wp-content/uploads/2019/02/Child-Consent-2019.pdf (click the link if you haven't read it) and understand that if I take part I can change my mind at any time, and this will not be a problem at all. *

Mark only one oval.

- ◯ Yes
- ◯ No

2. I am happy for you to use my questionnaire for research. Only the researchers in the team will know my name and will not tell anyone else my answers *

Mark only one oval.

- ◯ Yes
- ◯ No do not use my questionnaire

3. I am happy for you to look at my school and health records to see how my school is doing (as a group). This is anonymous which means I cannot be identified *

Mark only one oval.

- ◯ Yes
- ◯ No

If you do not wish to take part in the questionnaire please do not continue.

Please click next to start the questionnaire!

About You

4. First Name *

5. Last Name *

6. Home Post Code *

7. What school do you go to? *

8. What year are you in? *

Mark only one oval.

- ◯ Year 4
- ◯ Year 5
- ◯ Year 6
- ◯ Year 7

9. Gender *

Mark only one oval.

- ◯ Boy
- ◯ Girl
- ◯ Prefer not to say

Date of Birth

10. Year *

Mark only one oval.

- ◯ 2007
- ◯ 2008
- ◯ 2009
- ◯ 2010
- ◯ 2011
- ◯ 2012

11. Month *

Mark only one oval.

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

12. Day *

Mark only one oval.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26
- 27
- 28
- 29
- 30
- 31

YESTERDAY

CHAT

Child Health and Activity Tool

Firstly, think carefully about what you did YESTERDAY and then answer the following questions....

13. 1. What did you eat for breakfast YESTERDAY? *

Check all that apply

14. 2. How did you get to school YESTERDAY morning? *

Mark only one oval.

- On the bus
- On bike

- In the car/taxi
- Walked

- Ran/jogged
- Scooter

- Skateboarded/Rollerbladed

15. 3. What did you have to eat for lunch YESTERDAY? *

Mark only one oval.

- School dinner
- Packed lunch
- Nothing

16. 4. What did you do for MOST of your break-times YESTERDAY? (This includes lunchtime) *

Mark only one oval.

- Sat around inside or outside
- Ran around

- Stood around
- Walked around

17. 5. Do you have an afternoon break at school? *

Mark only one oval.

- YES
- NO

18. 6. How did you get home YESTERDAY? *

Mark only one oval.

- On the bus
- On bike
- In the car/taxi
- Walked
- Ran/jogged
- Scooter
- Skateboarded/Rollerbladed

AFTER SCHOOL

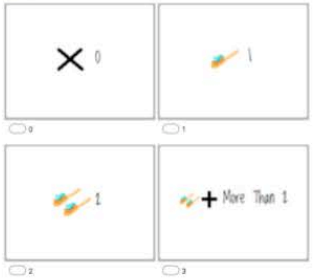
19. 7. How many portions of fruit and vegetables did you eat YESTERDAY? *

Mark only one oval.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

20. 8. How many times did you brush your teeth YESTERDAY? *

Mark only one oval.



- 0
- 1
- 2
- 3

21. 9. What time did you fall asleep YESTERDAY (to the nearest half hour)? *

Mark only one oval.

- 7:00pm
- 7:30pm
- 8:00pm
- 8:30pm
- 9:00pm
- 9:30pm
- 10:00pm
- 10:30pm
- 11:00pm
- 11:30pm
- 12:00am
- 12:30am
- 1:00am
- 1:30am
- 2:00am
- 3:00am
- 3:30am
- 4:00am

22. 10. What time did you wake up TODAY (to the nearest half hour)? *

Mark only one oval.

- 5:00am
- 5:30am
- 6:00am
- 6:30am
- 7:00am
- 7:30am
- 8:00am
- 8:30am
- 9:00am

THE LAST WEEK

NOW think about what you did in the last 7 days...

23. 11a. In the last 7 days, how many days did you do sports or exercise for at least 1 hour in total (This includes doing any activities or playing sports where your heart beat faster, you breathed faster and you felt warmer? *

Mark only one oval.

- 0 days
- 1-2 days
- 3-4 days
- 5-6 days
- 7 days

24. 11b. In the last 7 days, how many days did you watch TV/play online games/use the internet etc. for 2 or more hours a day (in total)? *

Mark only one oval.

- 0 days
- 1-2 days
- 3-4 days
- 5-6 days
- 7 days

25. 11c. In the last 7 days, how many days did you feel tired? *

Mark only one oval.

- 0 days
- 1-2 days
- 3-4 days
- 5-6 days
- 7 days

26. 11d. In the last 7 days, how many days did you feel like you could concentrate/pay attention well in class? *

Mark only one oval.

- 0 days
- 1-2 days
- 3-4 days
- 5-6 days
- 7 days

27. 11e. In the last 7 days, how many days did you drink at least one fizzy drink (e.g. coke, fanta, sprite) *

Mark only one oval.

- 0 days
- 1-2 days
- 3-4 days
- 5-6 days
- 7 days

28. 11f. In the last 7 days, how many days did you eat at least one sugary snack (e.g. chocolate bar, sweets) *

Mark only one oval.

- 0 days
- 1-2 days
- 3-4 days
- 5-6 days
- 7 days

29. 11g. In the last 7 days, how many days did you eat take away foods (e.g. McDonalds, KFC, chinese) *

Mark only one oval.

- 0 days
- 1-2 days
- 3-4 days
- 5-6 days
- 7 days

Sport and Activity

30. 12. These questions are going to ask you how you feel about physical activity (This includes any activity where your heart beats faster, you breathe faster and you feel warmer) *

Mark only one oval per row.

	Strongly agree	Agree	Disagree	Strongly disagree
I want to take part in physical activity				
I feel confident to take part in lots of different physical activities				
I am good at lots of different physical activities				
I understand why taking part in physical activity is good for me				

31. 13a. How many times do you take part in a sports club OUTSIDE OF SCHOOL each week?

Mark only one oval.

0 1 2 3 4 5 6 7 8 9 10

32. 13b. If you take part in a sports club OUTSIDE of school, what is the name of the sports club? (For example Swansea Rugby Club Under 11's)

33. 14. Are you a member of cubs, brownies, scouts or guides? *

Mark only one oval.

Yes

No

34. 15. Which of these sports or physical activities would you MOST like to try? (That you haven't tried before) *

Mark only one oval.

Athletics

Basketball

Cricket

Dance

Gymnastics

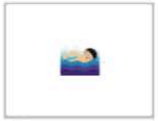
Hockey

Multi Skills

Netball

Rugby

Tennis



Swimming

I do not want to try anything I don't like sport or activity

Other:

35. 16. Can you ride a bike WITHOUT STABILISERS? *

Mark only one oval.

Yes No

36. 17. Can you swim 25 metres WITHOUT A FLOAT OR ARMBANDS? (This is 1 length of a standard swimming pool) *

Mark only one oval.

Yes No

You and your feelings

This part of the survey is going to ask you how you feel. There are no right or wrong answers. You should just pick the answer which is best for you.

37. 18. Tell us if you agree or disagree with the following: *

Mark only one oval per row.

	Strongly agree	Agree	Don't agree or disagree	Disagree	Strongly disagree
I am doing well at school					
I have lots of choice over things that are important to me					
There are lots of things I'm good at					

19. On a scale of 0 to 10 (0 being very unhappy and 10 being very happy, how do you feel about:
*Based on the Good Childhood Index by the Children's Society

38. Your Health *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
Very unhappy												Very happy

39. Your School *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
Very unhappy												Very happy

40. Your Family *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
Very unhappy												Very happy

41. Your Friends *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
Very unhappy												Very happy

42. Your Appearance (how you look) *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
Very unhappy												Very happy

43. Your Life *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
Very unhappy												Very happy

You and your Feelings

Based on the Me and My Feelings Questionnaire | Deighton, Tymms, Vostanis, Belsky, Fonagy, Brown, Martin, Patalay, & Wolpert, 2012)

44. 20. Remember, there are no right or wrong answers, just pick which is right for you. *

Mark only one oval per row.

	Never	Sometimes	Always
I feel lonely	◯	◯	◯
I cry a lot	◯	◯	◯
I am unhappy	◯	◯	◯
I feel nobody likes me	◯	◯	◯
I worry a lot	◯	◯	◯
I have problems sleeping	◯	◯	◯
I wake up in the night	◯	◯	◯
I am shy	◯	◯	◯
I feel scared	◯	◯	◯
I worry when I am at school	◯	◯	◯
I get very angry	◯	◯	◯
I lose my temper	◯	◯	◯
I hit out when I am angry	◯	◯	◯
I do things to hurt people	◯	◯	◯
I am calm	◯	◯	◯
I break things on purpose	◯	◯	◯

Your Local Area

45. 21. On a scale of 0 to 10 (0 being not very safe and 10 being very safe), how safe do you feel playing in your area? *

Mark only one oval.

	0	1	2	3	4	5	6	7	8	9	10	
Not very safe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

46. 22a. From your house, can you walk to school?

Mark only one oval.

◯ Yes
◯ No

47. 22b. From your house, can you easily walk to a park?

Mark only one oval.

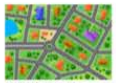
◯ Yes
◯ No

48. 22c. From your house, can you easily walk to a leisure centre/sports centre?

Mark only one oval.

◯ Yes
◯ No

49. 23. Are you happy with the area that you live in?



Mark only one oval.

◯ Yes
◯ No

24. If you could change something to make you and your friends healthier and happier, what would you change...

50. IN SCHOOL? *

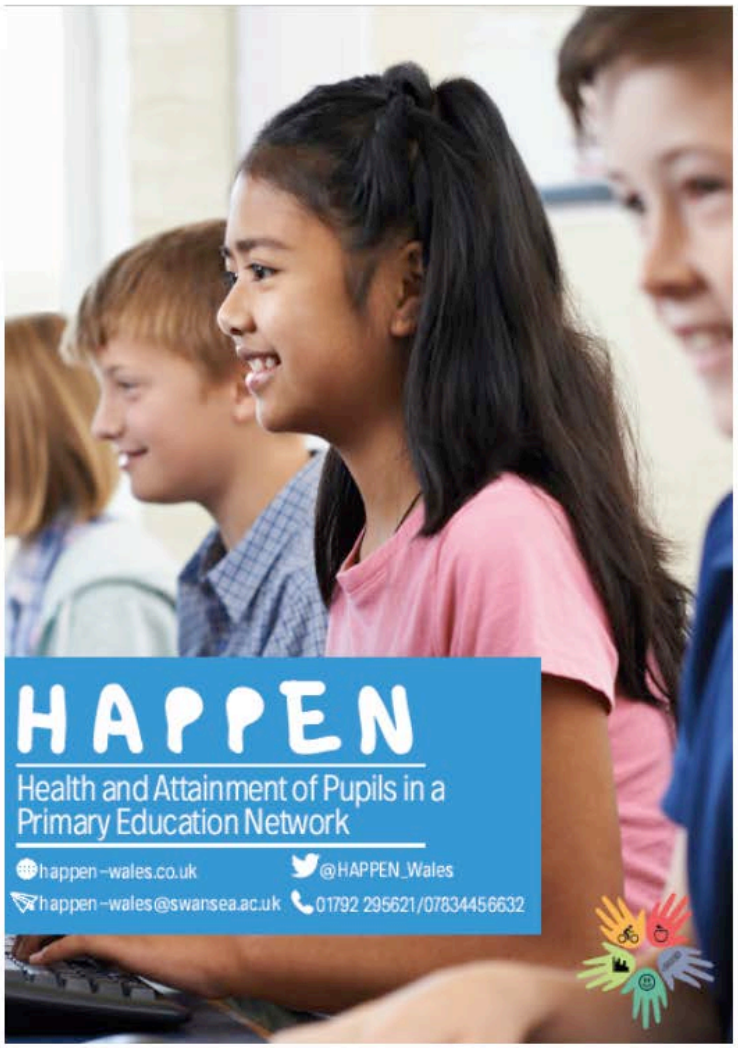
51. OUT OF SCHOOL? *

Well done, you've completed the questionnaire.
Thank you!

Don't forget to press submit below!

Appendix 3: HAPPEN School Report

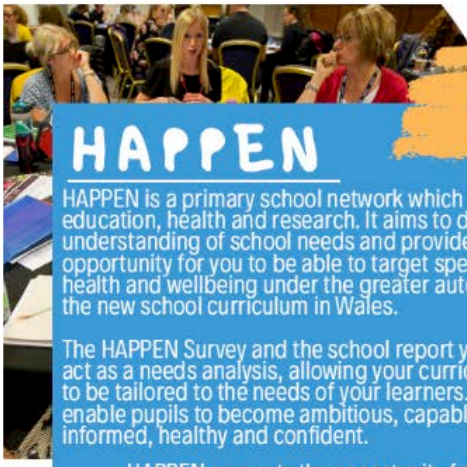
Your HAPPEN Survey Report



THE HAPPEN SURVEY

1

About HAPPEN



HAPPEN

HAPPEN is a primary school network which brings together education, health and research. It aims to develop a better understanding of school needs and provides an opportunity for you to be able to target specific areas of health and wellbeing under the greater autonomy given by the new school curriculum in Wales.

The HAPPEN Survey and the school report you receive can act as a needs analysis, allowing your curriculum delivery to be tailored to the needs of your learners. This will enable pupils to become ambitious, capable, enterprising, informed, healthy and confident.

HAPPEN presents the opportunity for pupils to learn and make informed decisions about different aspects of health and wellbeing. We encourage the use of the report in school programmes such as Pupil Voice to allow children to be ambitious and creative to improve their health.

Results from your school report will enable your pupils to become:

- **Ambitious, capable learners** who are ready to learn throughout their lives.
- **Enterprising, creative contributors** who are ready to play a full part in life and work.
- **Ethical, informed citizens** who are ready to be citizens of Wales and the world.
- **Healthy, confident individuals** who are ready to lead fulfilling lives as valued members of society.

Click below to access our resource pack and family workbook:

Resource pack

Family workbook

Physical Health

Physical Activity

Children Reported:	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
Physically active for 1 hour or more every day	XX%	22%

* It is recommended that children aged 5-18 should take part in moderate to vigorous activity for an average of at least 60 minutes per day across the week. Click here to see these guidelines and what counts as moderate to vigorous physical activity

Active Travel

Children Reported:	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
Can walk to school from their house	XX%	71%*
Travel to school using an active method	XX%	40%
Travel from school using an active method	XX%	45%

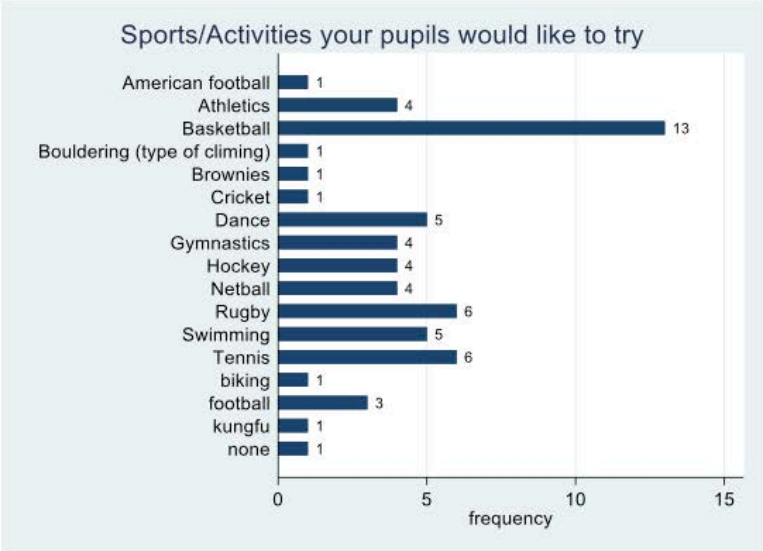
*This question has recently been added so the comparison average is based on a smaller number of responses.
Sustrans offer a range of resources to make active journeys to school easy and enjoyable. Click here to take you to our resource pack to see what Sustrans can offer on Page 7.

What Matters Statements

Developing physical health and well-being has lifelong benefits
Our decision-making impacts on the quality of our lives and the lives of others

Physical Competence

Agree or strongly agree:	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
Want to take part in physical activity	XX%	94%
Feel confident to take part in lots of different physical activities	XX%	90%
Feel good at lots of different physical activities	XX%	85%
Understand why taking part in physical activity is good for me	XX%	97%



Some of the entries in the above graph are based on free text responses written in the "Other" option of the questionnaire, hence there may be misspelling of items

What Matters Statements

Developing physical health and well-being has lifelong benefits

Our decision-making impacts on the quality of our lives and the lives of others

Physical Health

Diet and Dental Health

Children Reported:	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
They had something to eat at breakfast (previous day)	XX%	93%
They had 5 portions of fruit and vegetables a day (previous day)	XX%	26%
They had a fizzy drink every day of the week	XX%	7%
They had sugary snacks every day of the week	XX%	18%
Brushing their teeth twice or more (previous day)	XX%	81%

*Guidelines suggest eating a minimum of 5 portions of fruit and vegetables per day. This can lower the risk of a number of health problems including heart disease, cancer, stroke, type 2 diabetes and obesity. Suggestions to help children achieve their 5 a day can be found here

What Matters Statements

Developing physical health and well-being has lifelong benefits

Our decision-making impacts on the quality of our lives and the lives of others

Physical Health

Sedentary Behaviour and Sleep

Children Reported:	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
Sedentary screen time for 2 hours or more every day	XX%	32%
They had at least 9 hours of sleep	XX%	81%

Limiting sedentary (sitting) time and in particular screen time is recommended. Some guidelines suggest use of electronic media for entertainment (e.g. television, seated electronic games and computer use) should be limited to no more than 2 hours a day, with lower levels associated with reduced health risks.

Having enough sleep is crucial for good health, good quality of life and performing well throughout the day11. As a guideline, children between 9 and 11 are recommended to have 9.5-10 hours sleep per night 12. Tips on helping children to get adequate sleep can be found here

Concentration

Children Reported:	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
They felt tired every day of the week	XX%	15%
They felt that they could concentrate in class every day of the week	XX%	56%

What Matters Statements

Developing physical health and well-being has lifelong benefits

Our decision-making impacts on the quality of our lives and the lives of others

Mental Health and Well-being

Autonomy and Competency

	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
They agreed/strongly agreed that they were doing well in school	XX%	87%
They agreed/strongly agreed that there were lots of things they were good at	XX%	88%
They agreed/strongly agreed that they had lots of choice over things which were important to them	XX%	86%

Wellbeing

Children Reported:	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
They were very happy with their health (>=$^{8}/_{10}$)	XX%	73%
They were very happy with their school * (>=$^{8}/_{10}$)	XX%	71%
They were very happy with their family ** (>=$^{8}/_{10}$)	XX%	89%
They were very happy with their friends *** (>=$^{8}/_{10}$)	XX%	85%
They were very happy with their appearance (>=$^{8}/_{10}$)	XX%	64%
They were very happy with their life as a whole (>=$^{8}/_{10}$)	XX%	78%

*The above questions are based on questions from t The Children's Society Good Childhood Index and are based on areas identified as important by children and strongly linked to their overall wellbeing.

What Matters Statements

How we process and respond to our experiences affects our mental health and emotional well-being.

Healthy relationships are fundamental to our sense of belonging and well-being

Mental Health and Well-being

Mental Health

Children Reported:	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
Emotional difficulty****	XX%	18%
Behavioural difficulty****	XX%	9%

This represents those children who had a borderline or clinical emotional or behavioural difficulty according to the validated Me and My Feelings Survey

What Matters Statements
How we process and respond to our experiences affects our mental health and emotional well-being.

The Community

Local Area

Children Reported:	Your School (n=XX)	HAPPEN data 2017 - 2019 (n=2288)
Happy with their area*	XX%	88%
Feel safe playing in local area (>=$^{8}/_{10}$)	XX%	72%

*2018-2019 (n=1325)

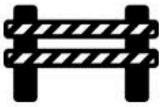
Our Research – Outdoor Learning

We interviewed **pupils, teachers and head teachers** from schools who **incorporated outdoor learning into the curriculum** 1-2 lessons a week. We found:

Benefits

- Gave pupils a sense of freedom and increased engagement with learning
- Offered quieter pupils space to express themselves
- Engaged more challenging pupils
- Catered for different styles of learning
- Improved skills through 'fun' learning e.g. communication, team work
- Improved behaviour, wellbeing and increased physical activity for pupils
- Improved personal wellbeing and job satisfaction for teachers

Barriers



- Lack of equipment e.g. outdoor clothes
- Lack of outdoor learning specific resources
- Staff ratios
- All dependent on enthusiasm and personality of teacher

Recommendations

- Clear rules and boundaries are needed to ensure safety outdoors
- Lessons should be once or twice a week to maintain novelty
- Shared practice between schools

Click here for our published research

Click here for our news article

Further Information

www.happen-wales.co.uk

happen-wales@swansea.ac.uk

07834456632

@HAPPEN_Wales

@HAPPEN.Wales

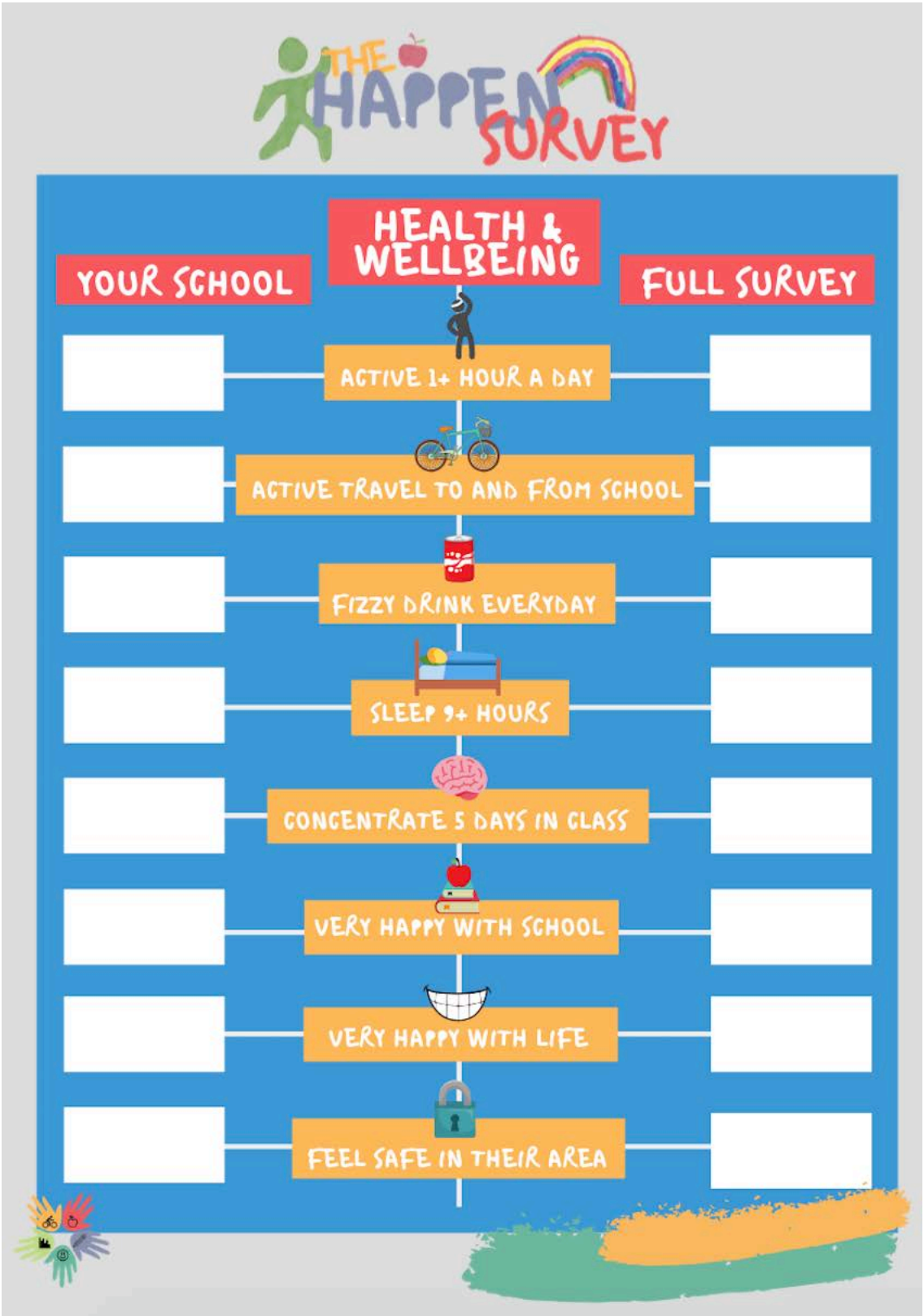
HAPPEN is supported by funding from the National Centre for Population Health and Wellbeing Research (NCPHWR) which is Welsh Government Funded and the Economic and Social Research Council (ESRC).

NCPHWR National Centre for Population Health & Wellbeing Research

Ymchwil Iechyd a Gofal Cymru Health and Care Research Wales

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

HAPPEN SURVEY

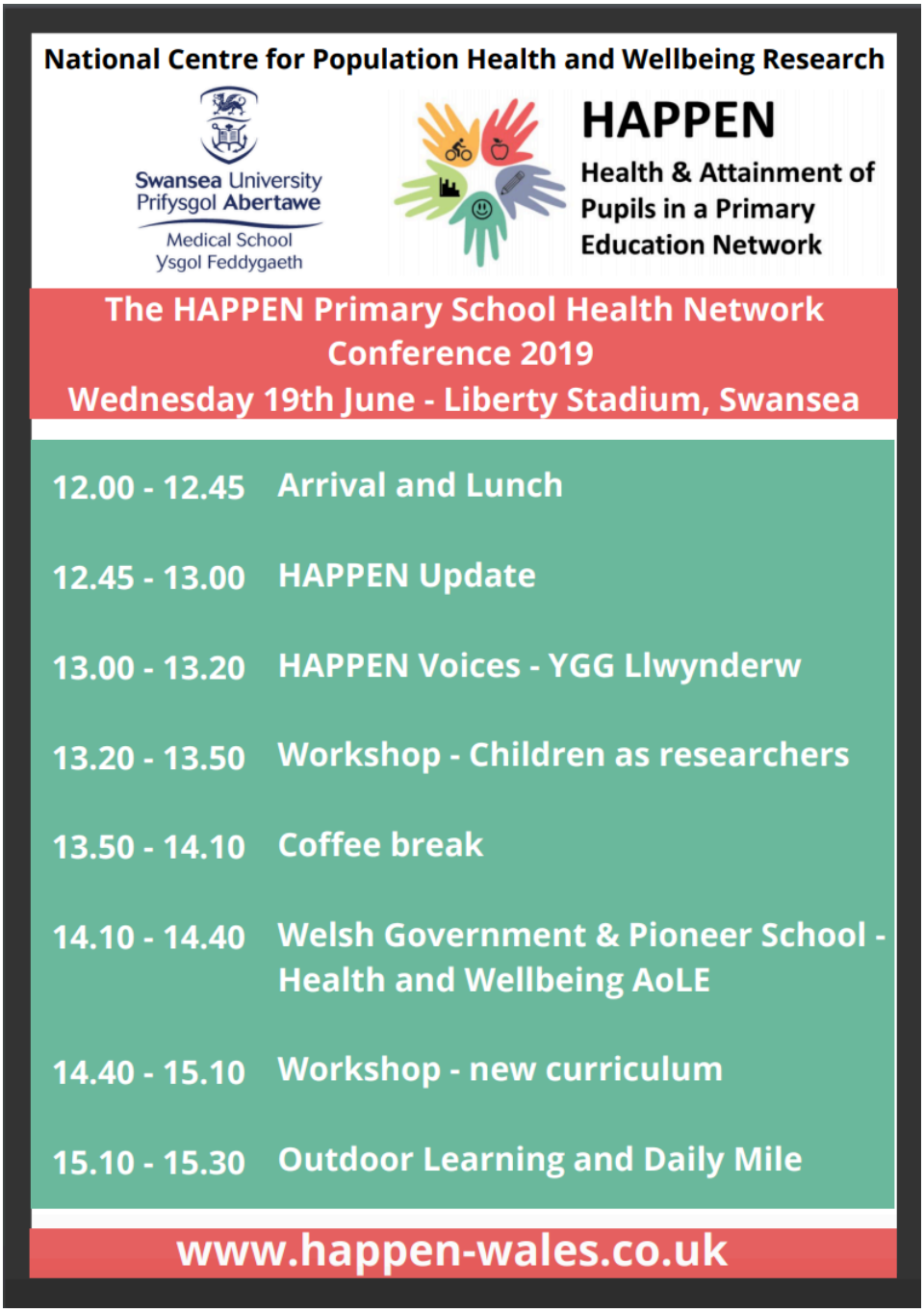

THE HAPPEN SURVEY
HEALTH & WELLBEING
YOUR SCHOOL
FULL SURVEY
ACTIVE 1+ HOUR A DAY
ACTIVE TRAVEL TO AND FROM SCHOOL
FIZZY DRINK EVERYDAY
SLEEP 9+ HOURS
CONCENTRATE 5 DAYS IN CLASS
VERY HAPPY WITH SCHOOL
VERY HAPPY WITH LIFE
FEEL SAFE IN THEIR AREA

Appendix 4: HAPPEN Conference Agendas

HAPPEN Conference 2017

HAPPEN Conference 2018

HAPPEN Conference 2019



HAPPEN/ERW Regional Workshop 2020

Improving | Learning | Together
www.erw.wales

February 13th 2020

Y Llwyfan, College Rd,

Carmarthen SA31 3EQ

1. HAPPEN team would like a mix of experienced and new schools to contribute to a process evaluation which will have two focus areas:
   (a) How can the presentation of the report be improved?
   (b) How can HAPPEN develop so that it engages more with wider communities?

2. The HAPPEN team and ERW would like to explore how HAPPEN reports can support development of the Health and Well-being AoLE (HW-b) in Curriculum for Wales 2022
   (a) How can a school use their HAPPEN report to help identify priority areas for HW-b?
   (b) How can the existing HAPPEN 'action plan' template be adapted to support above?

Morning workshop 09:30-12:00

The morning workshop is for schools that have been using HAPPEN for some time and have volunteered their time and expertise. ERW staff from the curriculum development team and also colleagues from Health and Well-being AoLE will also be attending to contribute their expertise on the AoLE and also broader principles of curriculum design.

Emily Marchant will provide and update on recent changes to HAPPEN and facilitate a discussion around Qu1. Delegates will then split into groups and turn their attention to Qu2.

Afternoon workshop 13:00-15:30

This workshop is for schools who are newer/ completely new to HAPPEN and have expressed an interest in working with the HAPPEN team and ERW to consider the 2 questions above. Emily Marchant will deliver a presentation on HAPPEN and answer any questions about the survey and the report. Emily will then facilitate a discussion on Qu1 gathering initial thoughts based on the sample report that is provided. Delegates will then be asked to re-visit Qu1 once they have completed the survey and received their report.

Delegates will then split into groups to consider Qu2.

Next steps

ERW will:

- Provide support to schools once they have received their HAPPEN report.
- Facilitate school to school working between all schools who attended the workshops
- Develop 'case studies' that can be shared on Dolen/Porth
- Identify areas for further development in order to offer wider support to schools across ERW

Appendix 5: Impact and Public Engagement

Date	Event	Description
August 2016	Public Health Network Cymru (online)	Featured in monthly e-bulletin
October 2016	Farr Institute (online)	Featured in '100 ways of using data tomake lives better' case study
November 2016	Patient and Population Health Informatics seminar series, Swansea University	Oral presentation
January 2017	The Conversation Article (online)	'Schools shouldn't be left alone to deal with child health and wellbeing any longer'[103]
February 2017	Public Sector Focus Magazine (online)	'Investing in Health and Wellbeing is an Investment in Academic Achievement'[104] 4000 print copies, 59,000 digital subscribers
March 2017	Public Health Network Cymru-Research in Wales Conference, Cardiff	Poster presentation

March 2017	HAPPEN Conference, The Village Hotel, Swansea	Theme: Wellbeing 60 attendees Agenda: HAPPEN findings (Emily Marchant), Launch of Swansea Outdoor Schools Network (Dylan Saer, Crwys Primary School), Estyn (Fiona Arnison, Estyn inspector)
April 2017	Pan Wales Sports Science Conference, Swansea University	Oral presentation
May 2017	Swansea University Medical School Postgraduate Research Conference	Poster presentation Winner poster presentation, prize £500 travel bursary
June 2017	National Centre for Population Health and Wellbeing Research Conference, Cardiff	Oral presentation
September 2017	Swansea Science Festival, Swansea	HAPPEN stand
October 2017	Welsh Public Health Conference, Newport	Oral presentation Invited to present in Belfast at WHO International Healthy Cities Conference

January 2018	International Journal of Population Data Science (online)	Youtube video about experience with The Conversation[542]
January 2018	Active Healthy Kids Wales group	Invited to join the Active Healthy Kids Wales expert group to produce Wales Report Card. 2018 Report Card published[530]
March 2018	Swansea Headteacher meeting, Swansea	Oral presentation
March 2018	Education through Regional Working Headteacher Development Day, Swansea	Oral presentation
April 2018	HAPPEN conference, The Liberty Stadium, Swansea	100+ attendees Agenda: HAPPEN findings (Emily Marchant), The Daily Mile experiences (pupils from St Davids RC Primary School), Health and Wellbeing Pupil Voice groups (headteacher and pupils from Pennard Primary School), Estyn Wellbeing Inspection (Kevin Davies, Estyn inspector)
May 2018	Swansea Council School Governors event, Swansea	Oral presentation

May 2018	Swansea University Medical School Postgraduate Research Conference	Oral presentation
June 2018	Swansea University Research and Innovation Awards	Shortlisted in 'Outstanding Impact on Health and Wellbeing' category
June 2018	Bridgend Festival of Learning	Oral presentation
June 2018	Swansea University Research Institute of Ethics and Law	Oral presentation – 'Invisible children in child health research'
July 2018	Bridgend Inspired for Life Awards	Shortlisted in 'Innovation' category
July 2018	WISERD Conference, Cardiff	Oral presentation
July 2018	Bridgend Wellbeing Conference	Oral presentation
October 2018	WHO International Healthy Cities Conference, Belfast	Oral presentation

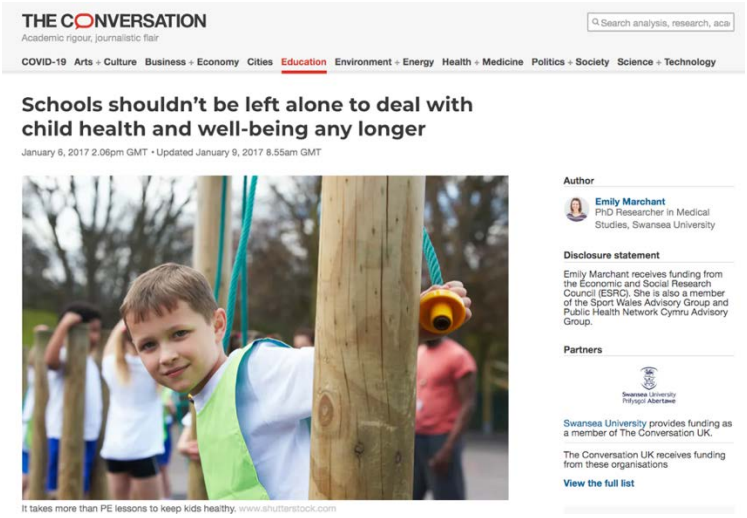
November 2018	Swansea University Medical School awards	Nominated for two awards: Outstanding contribution to Research Student Ambassador Award for Outstanding Contribution
May 2019	National Centre for Population Health and Wellbeing Research symposium, Swansea	Oral presentation
May 2019	Swansea University Medical School Postgraduate Research Conference	Oral presentation
May 2019	Chief Medical Officer's annual report – Valuing our health (online)	HAPPEN featured in CMO report[111]

June 2019	The Conversation article (online)	'Outdoor learning has huge benefits for children and teachers so why isn't it used in more schools?'[105] Republished and featured in media e.g. World Economic Forum[107], Metro news[105], CBS Boston news[106], Channel News Asia[543], Canadian radio station Used in a proposal to the BBC for an outdoor learning documentary Also republished in Italy, Poland, South Africa
June 2019	HAPPEN Conference, The Liberty Stadium, Swansea	120+ attendees Agenda: HAPPEN findings (Emily Marchant), HAPPEN Little Voices pilot project (pupils from YGG Llwynderw, Helen Dale – Little Voices project), Health and Wellbeing Area of Learning and Experience (Lloyd Hopkin, Lead Health and Wellbeing AoLE), Workshops
June 2019	Health and Care Research Wales 'Lets Talk Research' event, Cardiff	Delivered a TED style talk on outdoor learning study
September 2019	Newport Primary School Event	Event for primary schools in Newport promoting HAPPEN. Oral presentation.

October 2019	Cardiff Met Physical Health Education for Lifelong Learning	Oral presentation in seminar series
November 2019	National Conference 2019: Learning Beyond the Classroom, Blackpool	Invited to sit on an expert panel discussion at national outdoor learning conference
November 2019	5th European Conference on Health Promoting Schools, Moscow, Russia	Oral presentation at 'Health, Wellbeing and Education: Building a Sustainable Future' conference
January 2020	Schools for Health in Europe (SHE) Research Group	Accepted as a member of the SHE Research Group
February 2020	HAPPEN ERW joint regional workshop, Carmarthen	Workshop attended by 20+ schools working on how to incorporate HAPPEN school report into new curriculum.
February 2020	The Conversation article	'Running a mile a day can make children healthier – here's how schools can make it more fun'[112] Republished in media websites e.g. Metro News[544]
February 2020	The Daily Mile Research Advisory Group, London	Presented findings from The Daily Mile study to The Daily Mile Research Advisory Group

March 2020	Public Health England, Active Mile Briefings	The Daily Mile research used within Public Health England Briefing Documents[545]

The Conversation articles (click picture to access online articles)



THE CONVERSATION
Academic rigour, journalistic flair

Search analysis, research, aca

COVID-19 Arts + Culture Business + Economy Cities Education Environment + Energy Health + Medicine Politics + Society Science + Technology

Schools shouldn't be left alone to deal with child health and well-being any longer

January 6, 2017 2.06pm GMT • Updated January 9, 2017 8.55am GMT

It takes more than PE lessons to keep kids healthy. www.shutterstock.com

Author

Emily Marchant
PhD Researcher in Medical Studies, Swansea University

Disclosure statement

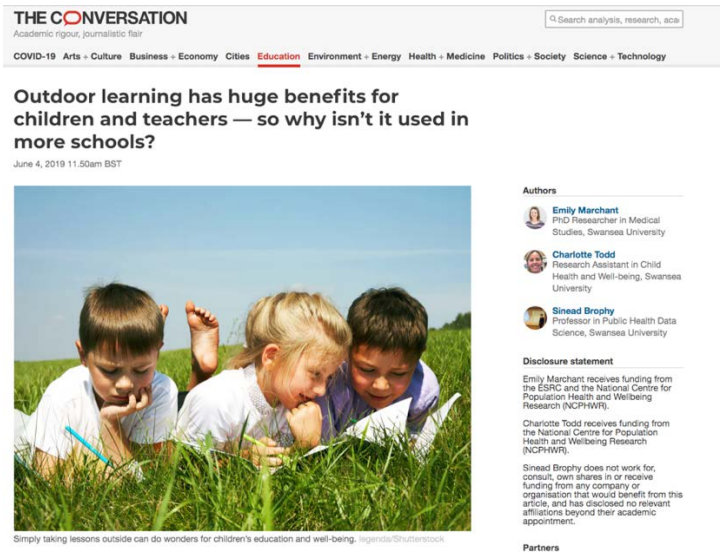
Emily Marchant receives funding from the Economic and Social Research Council (ESRC). She is also a member of the Sport Wales Advisory Group and Public Health Network Cymru Advisory Group.

Partners

Swansea University provides funding as a member of The Conversation UK.

The Conversation UK receives funding from these organisations

View the full list



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Outdoor learning has huge benefits for children and teachers — so why isn't it used in more schools?

June 4, 2019 11.50am BST

Simply taking lessons outside can do wonders for children's education and well-being. legenda/Shutterstock

Authors

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Professor in Public Health Data Science, Swansea University

Disclosure statement

Emily Marchant receives funding from the ESRC and the National Centre for Population Health and Wellbeing Research (NCPHWR).

Charlotte Todd receives funding from the National Centre for Population Health and Wellbeing Research (NCPHWR).

Sinead Brophy does not work for, consult, own shares in or receive funding from any company or organisation that would benefit from this article, and has disclosed no relevant affiliations beyond their academic appointment.

Partners

THE CONVERSATION
Academic rigour, journalistic flair

Search analysis, research, aca

COVID-19 Arts + Culture Business + Economy Cities Education Environment + Energy Health + Medicine Politics + Society Science + Technology

Running a mile a day can make children healthier – here's how schools can make it more fun

February 7, 2020 2.07pm GMT

The Daily Mile gets children out of the classroom for fifteen minutes every day to run or jog, at their own pace. The Daily Mile

Authors

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Gareth Stratton
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Michaela James
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Disclosure statement

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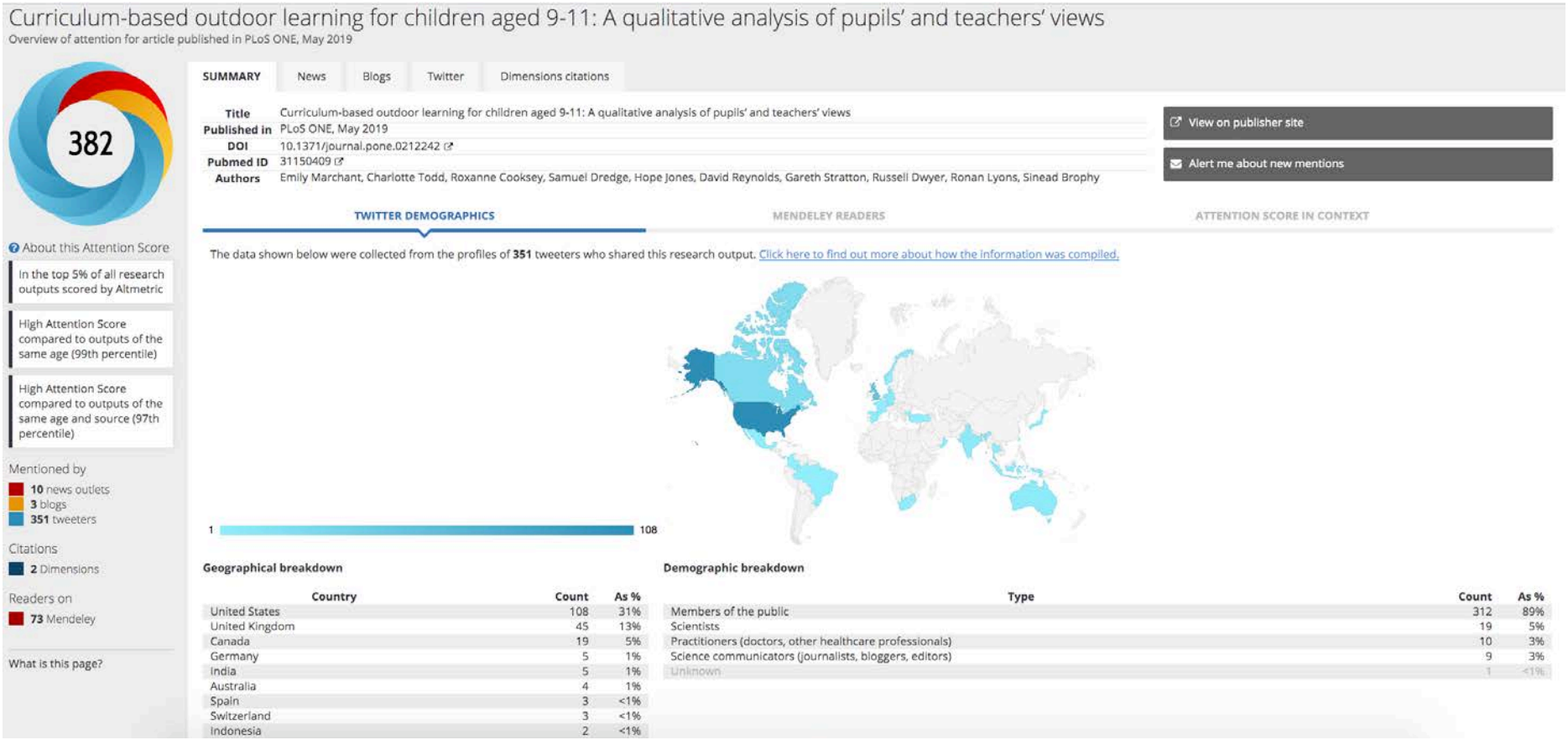
Altmetric scores – Outdoor learning publication (click picture to access online summary)



Curriculum-based outdoor learning for children aged 9-11: A qualitative analysis of pupils' and teachers' views

Overview of attention for article published in PLoS ONE, May 2019

382

About this Attention Score

In the top 5% of all research outputs scored by Altmetric

High Attention Score compared to outputs of the same age (99th percentile)

High Attention Score compared to outputs of the same age and source (97th percentile)

Mentioned by

10 news outlets
3 blogs
351 tweeters

Citations

2 Dimensions

Readers on

73 Mendeley

What is this page?

SUMMARY | News | Blogs | Twitter | Dimensions citations

Title	Curriculum-based outdoor learning for children aged 9-11: A qualitative analysis of pupils' and teachers' views
Published in	PLoS ONE, May 2019
DOI	10.1371/journal.pone.0212242
Pubmed ID	31150409
Authors	Emily Marchant, Charlotte Todd, Roxanne Cooksey, Samuel Dredge, Hope Jones, David Reynolds, Gareth Stratton, Russell Dwyer, Ronan Lyons, Sinead Brophy

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1 — 108

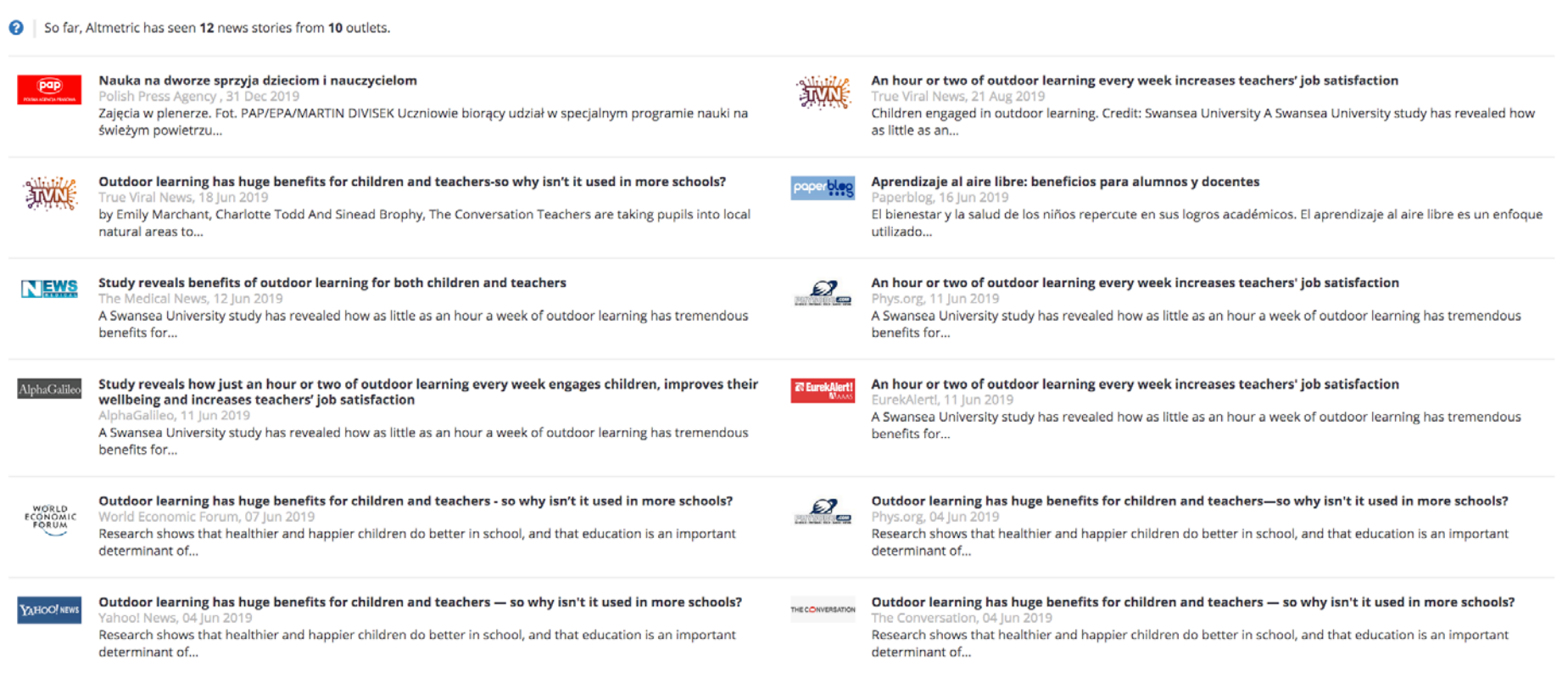
Geographical breakdown

Country	Count	As %
United States	108	31%
United Kingdom	45	13%
Canada	19	5%
Germany	5	1%
India	5	1%
Australia	4	1%
Spain	3	<1%
Switzerland	3	<1%
Indonesia	2	<1%

Demographic breakdown

Type	Count	As %
Members of the public	312	89%
Scientists	19	5%
Practitioners (doctors, other healthcare professionals)	10	3%
Science communicators (journalists, bloggers, editors)	9	3%
Unknown	1	<1%

Altmetric scores – Outdoor learning news stories (click picture to access online summary)



So far, Altmetric has seen **12** news stories from **10** outlets.

Nauka na dworze sprzyja dzieciom i nauczycielom
Polish Press Agency , 31 Dec 2019
Zajęcia w plenerze. Fot. PAP/EPA/MARTIN DIVISEK Uczniowie biorący udział w specjalnym programie nauki na świeżym powietrzu...

An hour or two of outdoor learning every week increases teachers' job satisfaction
True Viral News, 21 Aug 2019
Children engaged in outdoor learning. Credit: Swansea University A Swansea University study has revealed how as little as an...

Outdoor learning has huge benefits for children and teachers-so why isn't it used in more schools?
True Viral News, 18 Jun 2019
by Emily Marchant, Charlotte Todd And Sinead Brophy, The Conversation Teachers are taking pupils into local natural areas to...

Aprendizaje al aire libre: beneficios para alumnos y docentes
Paperblog, 16 Jun 2019
El bienestar y la salud de los niños repercute en sus logros académicos. El aprendizaje al aire libre es un enfoque utilizado...

Study reveals benefits of outdoor learning for both children and teachers
The Medical News, 12 Jun 2019
A Swansea University study has revealed how as little as an hour a week of outdoor learning has tremendous benefits for...

An hour or two of outdoor learning every week increases teachers' job satisfaction
Phys.org, 11 Jun 2019
A Swansea University study has revealed how as little as an hour a week of outdoor learning has tremendous benefits for...

Study reveals how just an hour or two of outdoor learning every week engages children, improves their wellbeing and increases teachers' job satisfaction
AlphaGalileo, 11 Jun 2019
A Swansea University study has revealed how as little as an hour a week of outdoor learning has tremendous benefits for...

An hour or two of outdoor learning every week increases teachers' job satisfaction
EurekAlert!, 11 Jun 2019
A Swansea University study has revealed how as little as an hour a week of outdoor learning has tremendous benefits for...

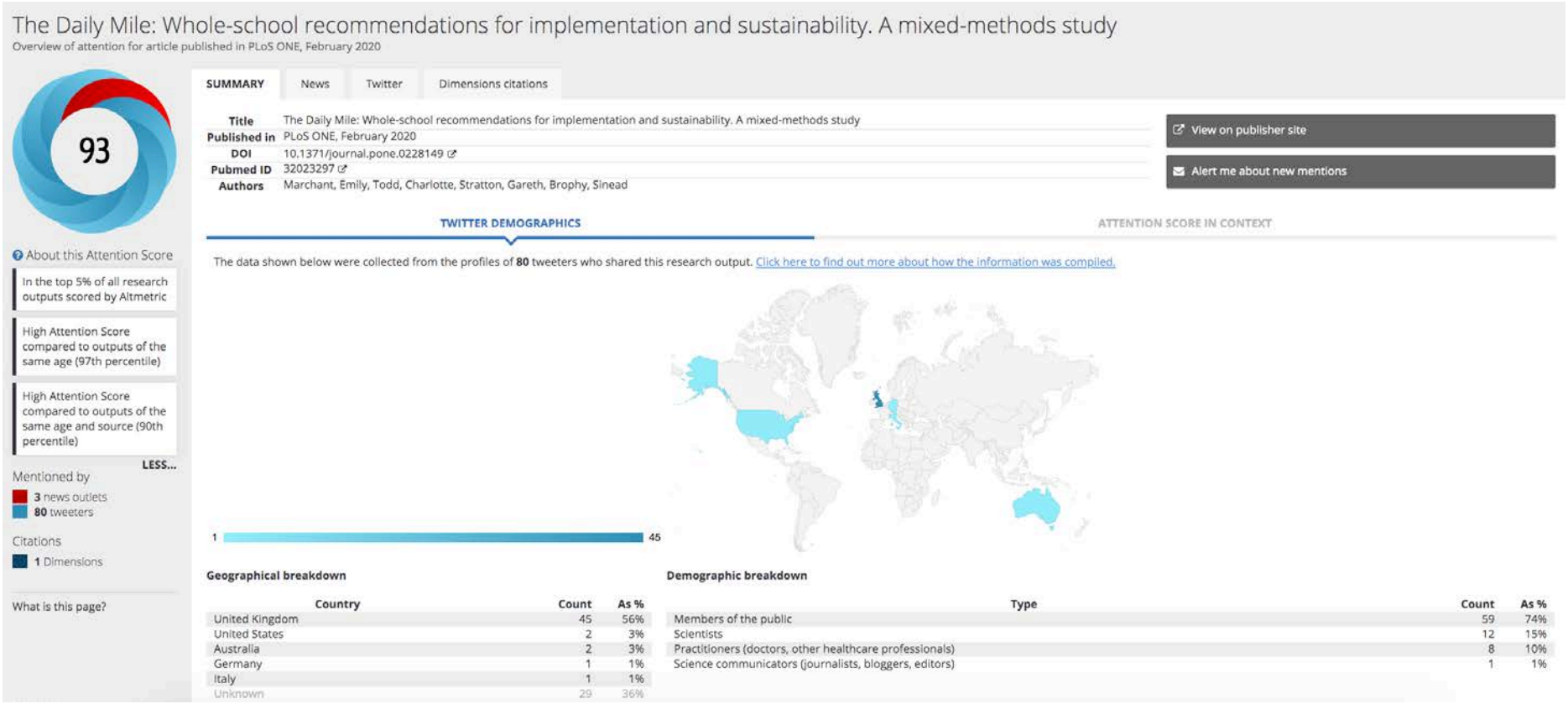
Outdoor learning has huge benefits for children and teachers - so why isn't it used in more schools?
World Economic Forum, 07 Jun 2019
Research shows that healthier and happier children do better in school, and that education is an important determinant of...

Outdoor learning has huge benefits for children and teachers—so why isn't it used in more schools?
Phys.org, 04 Jun 2019
Research shows that healthier and happier children do better in school, and that education is an important determinant of...

Outdoor learning has huge benefits for children and teachers — so why isn't it used in more schools?
Yahoo! News, 04 Jun 2019
Research shows that healthier and happier children do better in school, and that education is an important determinant of...

Outdoor learning has huge benefits for children and teachers — so why isn't it used in more schools?
The Conversation, 04 Jun 2019
Research shows that healthier and happier children do better in school, and that education is an important determinant of...

Altmetric scores – The Daily Mile publication (click picture to access online summary)



The Daily Mile: Whole-school recommendations for implementation and sustainability. A mixed-methods study

Overview of attention for article published in PLoS ONE, February 2020

93

About this Attention Score

In the top 5% of all research outputs scored by Altmetric

High Attention Score compared to outputs of the same age (97th percentile)

High Attention Score compared to outputs of the same age and source (90th percentile)

LESS...

Mentioned by

3 news outlets

80 tweeters

Citations

1 Dimensions

What is this page?

SUMMARY | News | Twitter | Dimensions citations

Title	The Daily Mile: Whole-school recommendations for implementation and sustainability. A mixed-methods study
Published in	PLoS ONE, February 2020
DOI	10.1371/journal.pone.0228149
Pubmed ID	32023297
Authors	Marchant, Emily, Todd, Charlotte, Stratton, Gareth, Brophy, Sinead

View on publisher site

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TWITTER DEMOGRAPHICS | ATTENTION SCORE IN CONTEXT

The data shown below were collected from the profiles of **80** tweeters who shared this research output. Click here to find out more about how the information was compiled.

1 — 45

Geographical breakdown

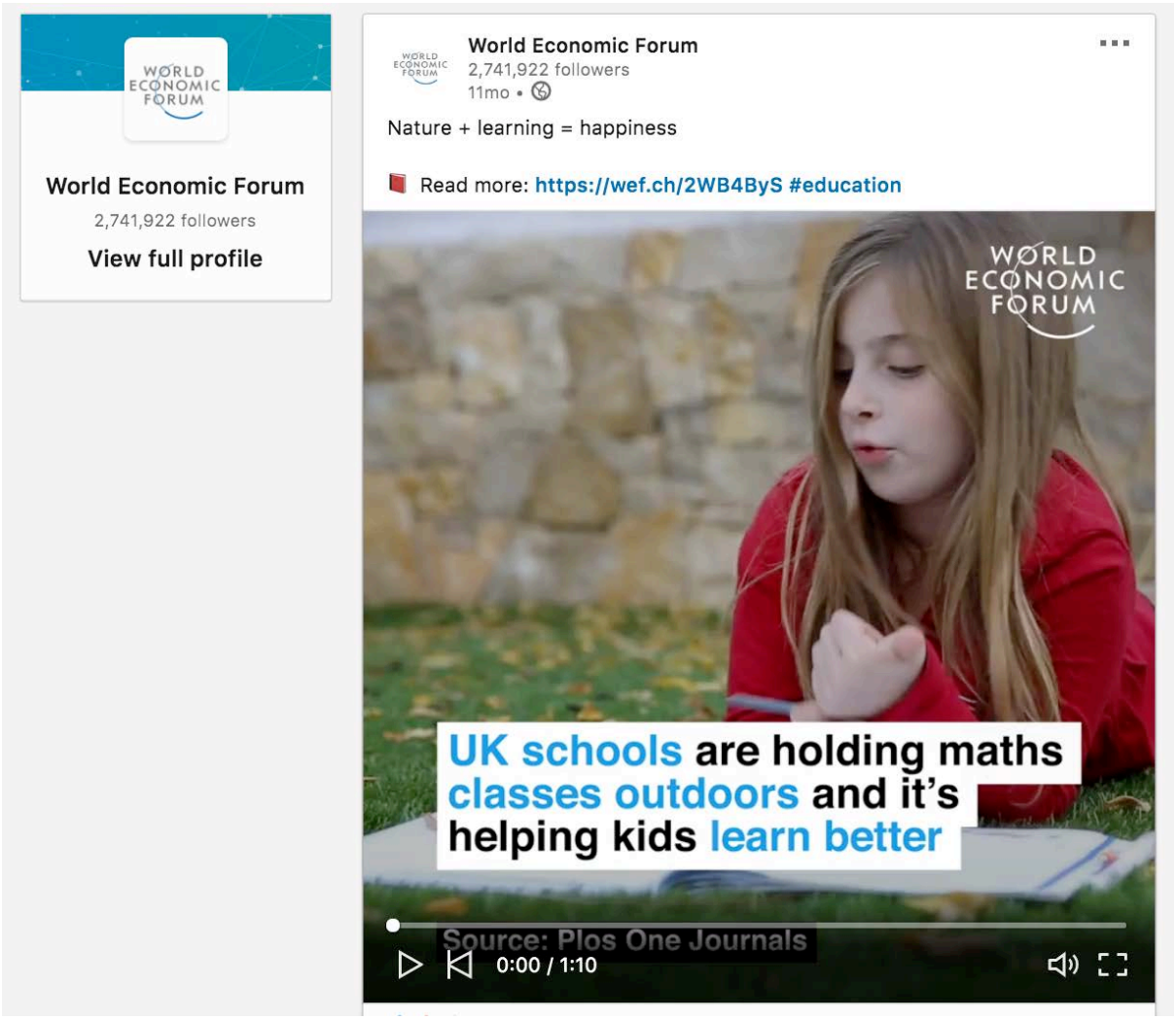
Country	Count	As %
United Kingdom	45	56%
United States	2	3%
Australia	2	3%
Germany	1	1%
Italy	1	1%
Unknown	29	36%

Demographic breakdown

Type	Count	As %
Members of the public	59	74%
Scientists	12	15%
Practitioners (doctors, other healthcare professionals)	8	10%
Science communicators (journalists, bloggers, editors)	1	1%

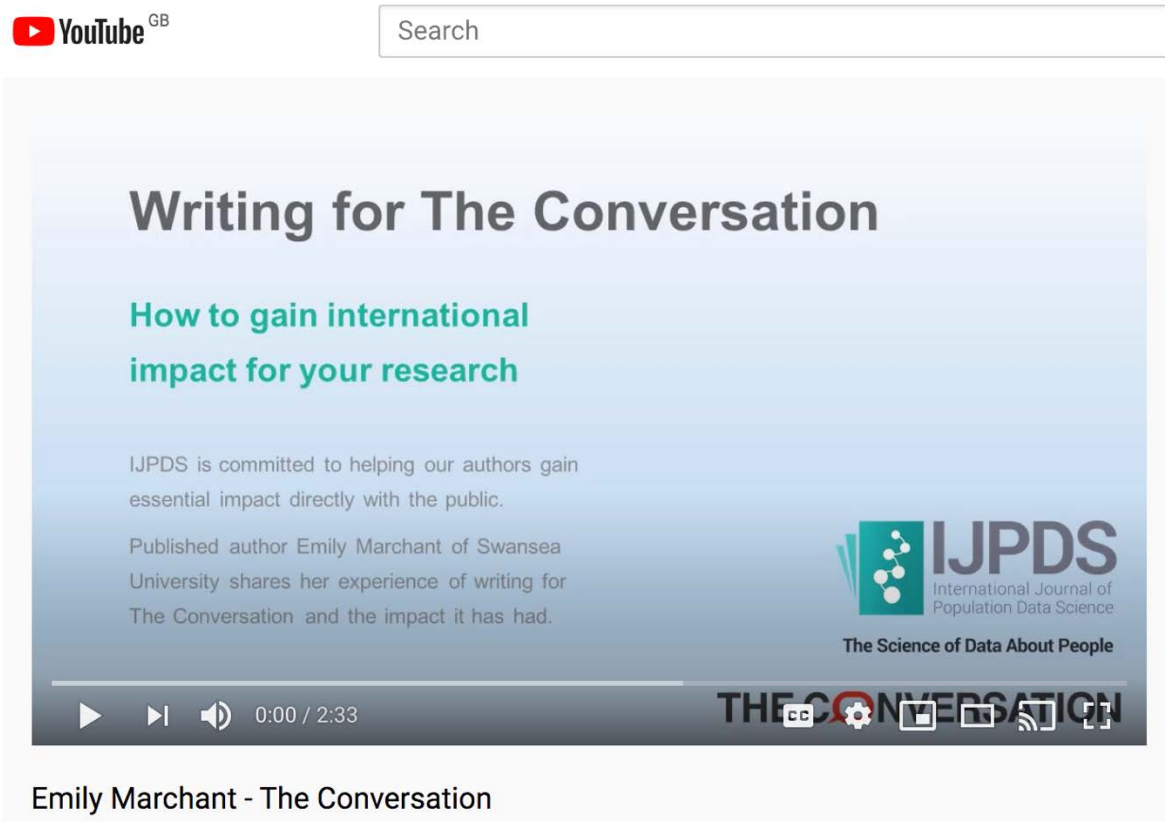
World Economic Forum video – Outdoor Learning research

(click picture to access online video)



International Journal of Population Data Science – Writing for The Conversation

(click picture to access online video)



Emily Marchant - The Conversation

Public Sector Focus magazine article (4000 print copies, 59,000 digital subscribers) (click picture to access online article)

INVESTING IN HEALTH AND WELLBEING IS AN INVESTMENT IN ACADEMIC ACHIEVEMENT

The focus on literacy and numeracy targets within primary schools has left the health and wellbeing of pupils neglected. Research shows the relationship between health and education, so how do we prioritise this in schools? HAPPEN believes they have the answer through collaboration with schools, the local authority, health professionals and researchers.

Emily Marchant is a PhD researcher at Swansea University, specialising in health and education data linkage of primary school children.

Emily Marchant

The health and wellbeing of children plays a pivotal role in their future health outcomes and employment prospects during adulthood. Research has shown that health and education are interconnected; children with better health and wellbeing display higher academic achievement. Children spend a significant time at school. To put things into context, school-time consumes 39 of the 52 weeks in a year. This places schools in an ideal position to drive change, reduce inequalities, and improve the health and wellbeing of their pupils.

However, an intense focus from educational inspectorates on literacy and numeracy targets leaves schools with little room to prioritise health and wellbeing. Schools are very much aware of the benefits of good pupil health and wellbeing, yet feel like they are being treated as the only solution. Headteachers have voiced that they feel overburdened with initiatives and ever-changing health messages with little consideration of school needs. This has left schools feeling isolated, tackling these shortfalls alone while constantly having to place pressure and resources on educational outcomes.

Evidence indicates that investing in health and wellbeing is an investment in education. Therefore, how do we engage with schools to achieve targets whilst simultaneously working to improve health and wellbeing? To accomplish this, a multidisciplinary approach is needed. Here in Swansea, we have developed a new way of helping schools to ensure that the health of today's children is not neglected, by bringing together a range of health, education and research professionals. Through effective collaboration, we have found a way for schools to prioritise pupil health and wellbeing whilst maintaining a focus on academic targets.

The aim of HAPPEN (Health and Attainment of Pupils in a Primary Education Network) is to enhance children's learning, enable schools to see how they compare with others in their county, and to act autonomously in identifying specific areas of need – for example high percentages of children not eating breakfast. Partnership working is at the centre of each stage of the HAPPEN model, and schools are placed at the heart of decision making.

We collect data on children aged nine to 11-years-old who complete health and wellbeing assessments through Swan-Linx; a fitness and lifestyle project developed in 2013, and delivered as a joint initiative between the University and the Council's Sports Development team. Pupils in years 5 and 6 from local primary schools are invited to participate in a Fitness Fun Day held at the University Athletics Centre. In the morning, a range of fitness data is collected through an inclusive, 'give it a go' atmosphere. In the afternoon, pupils complete the CHAT (Child Health and Activity Tool) questionnaire back at school, self-reporting health behaviour such as sleep, concentration, dietary habits, wellbeing and mental health.

This wealth of information collected is summarised in individualised school reports, written in line with curriculum frameworks. Here, pupil averages are compared to county averages, and links to local health providers alongside health messages are presented. Schools are also directed to the HAPPEN website where further information on local health initiatives and what they can offer schools are showcased under six health themes.

A novel and exciting component of HAPPEN is the use of data linkage and our work with the SAIL (Secure Anonymised Information Linkage) databank. Removing participants' identities to protect their privacy, data is linked with anonymous, routinely collected health and education data; primarily, GP records, hospital admissions and educational attainment. This allows us to further explore the health and education profile of pupils and schools within HAPPEN. To date, we have gathered health and wellbeing data on over 3,000 children in the Swansea area.

HAPPEN also plays host to bi-annual, themed network meetings, attended by over 60 representatives from local schools, public health professionals, the Local Authority and charities. Here, findings from our research are presented and insights from speakers are shared. Workshops provide an opportunity for teachers and health professionals to network and discuss challenges, steps forward and the direction of HAPPEN, together.

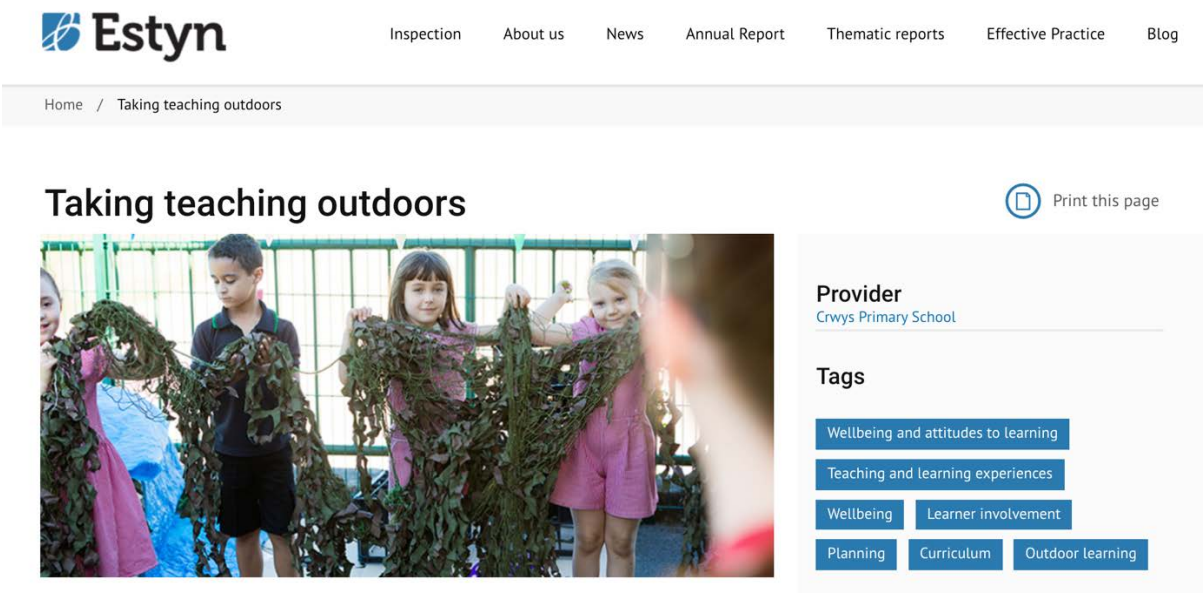
In times of funding cuts, external pressures and target-driven ways of working, effective collaboration and multi-agency approaches seem the only way forward in achieving change. Collectively, we are narrowing the gap between pupil health and academic targets within schools. By supporting schools in monitoring and maintaining the health of their pupils, health and wellbeing is now at the forefront of improving educational outcomes.

As I said earlier, an investment in health and wellbeing is an investment in academic achievement. A new curriculum will be coming into effect in Wales over the coming years. This curriculum places health and wellbeing in one of six areas of learning and experience. The aim is to develop "healthy, confident individuals who are ready to lead fulfilling lives as valued members of society". The future could look brighter for children here in Wales. Healthier and happier pupils achieve more, and now have the opportunity of reaching their potential and having a long, successful and healthy adulthood.

www.happenswansea.co.uk

Estyn Effective Practice Case Study

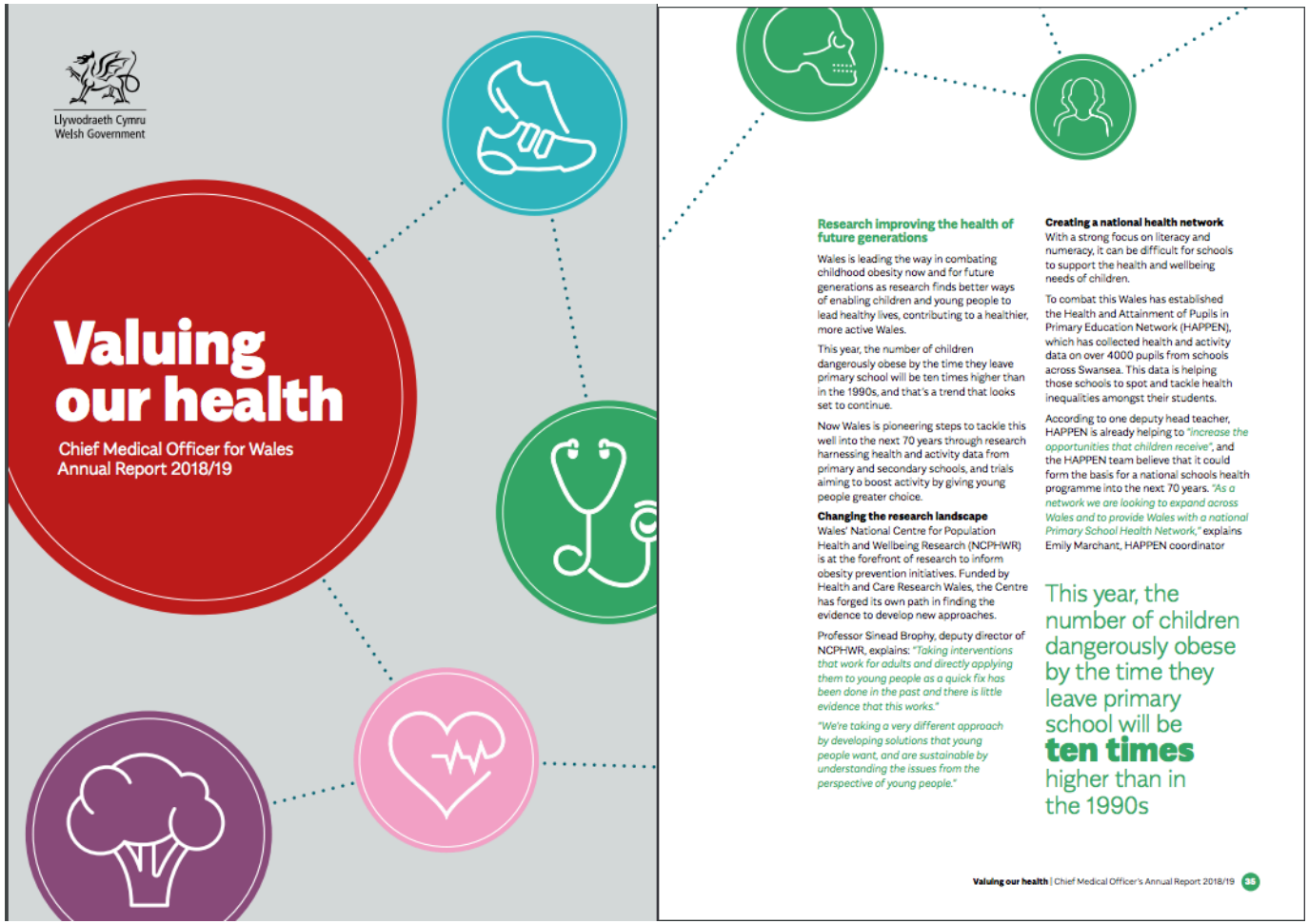
(click picture to access online article)



What impact has this work had on provision and learners' standards?

Analysis of both pupil and parent questionnaires shows that the increased focus on outdoor learning has had a very positive impact on pupil wellbeing and their enjoyment of school, as well as their attitudes to learning. The school approached the HAPPEN Network based in Swansea University, who carried out a qualitative study on the impact of the school's increased focus on outdoor learning on pupils and staff. Their findings found that the approach is having a positive impact on staff wellbeing. Importantly, teachers spoke of increased job satisfaction, and they felt it was "just what I came into teaching for". The study; https://t.co/h7czGtRjkV has received global recognition, from North America and Canada, to New South Wales in Australia. In addition, the school's high academic standards have been sustained and improved. Whole school attendance has risen to almost 97%.

Valuing our health. Chief Medical Officer for Wales. Annual Report 2018/19 (click picture to access online report)



National Conference 2019: Beyond the Classroom – Expert Panel Discussion

Discussion Panel

New to the conference this year, we hosted two discussion panels featuring experts covering the breadth of educational visits and learning outside the classroom experiences. The speakers discussed the pressing issues facing schools and the sector as well as answering questions from the audience. Speakers include:

Discussion Panel 1: Learning on your doorstep: how to embed regular Learning Outside the Classroom experiences into the everyday.

- Rachel Tranter, Director, GEM
- Mike Hamilton OBE, Director, Commando Joes
- Matt Robinson, Training Director, Learning through Landscapes Scotland
- Taff Bowles, Outdoor Education Advisers Panel member
- Emily Marchant, Phd Researcher, Swansea University
- Julie Chambers, Willaston CE Primary School

The 5th European Conference on Health Promoting Schools. Health, Wellbeing and Education: Building a Sustainable Future. Moscow, Russia.

Appendix 6: Individual School Impact and Action Plans

Eveswell Primary School
Ysgol Gynradd Eveswell
Head Teacher: Mrs Cathy Barnett

Target	Success Criteria	Resources	Monitoring	Timescale	Impact
To reduce sedentary screen time	• Pupils will report less time spent in front of a screen • Pupils will report an increase in the amount of time spent exercising, communicating, playing outdoors/ indoors	• After school Clubs-Board game Club to include parents • Parent workshop to share with parents research around 2+ hours of screen time per day • Lunch time Club linked to outdoor learning	• JWC/ VB • Well Being Group	• Autumn Term 1 2019 • Autumn Term 2	Board game club established with 14 pupils attending weekly.
To increase the amount of exercise pupils are participating in	• Pupils will take part in a greater amount of exercise during and after school	• Greater range of exercise available at playtimes e.g balls, hoops, parachutes etc • Playpal refresher training • Daily Mile reintroduced (Newport Live) • Swimming, cycling made available through school prizes • Greater choice of After School Clubs	• Newport Live • JWC/ VB • Well Being Group • TS (Play Pals)	• Daily Mile reintroduced by the end of Autumn 1 • Refresher training 22.10.19 • Playground Equipment- Autumn 2	Daily Mile re-established and taking place 3X per week Audit of playground

					equipment planned w/c 14.10.19 16 pupils due to take part in Playmakers Training 22.10.19
To increase opportunities/ awareness for/ of healthy-eating	• To increase the amount of fruit and vegetables children eat each day • Reduce amount of takeaways eaten each week	• Fruit Tuck Shop Makeover • Parent Workshops-quick, affordable meals for all the family • Pupil Workshops-fakeaways • One assembly each week linked to nutrition • Parent information to be sent home linked to good eating habits https://parentinfo.org/article/healthy-eating-a-parents-guide	• JWC/ VB • Well Being Group • ECO committee	• Autumn 2 and continuing throughout the year	Fruit Tuck Shop relaunched with a greater uptake of pupils Fakeaway cookery classes

					booked for 20.11.19
To increase pupils' awareness of their strengths and areas for improvement	• Learners will have an accurate understanding of things they are good at and be able to say how they know this and ways to improve in other areas	• Learners to have visible targets for literacy and numeracy across the school. These to be referred to at the start of each focussed task.	• SLT • Well Being Group	• Autumn 2	To be discussed in SLT 10. 10.19

EVESWELL & SOMERTON PRIMARY SCHOOL: USING THE HAPPEN SURVEY TO DEVELOP A WHOLE SCHOOL APPROACH TO HEALTH AND WELLBEING

To reduce sedentary screen time

Children designed posters asking parents 'do you want your child to sleep better?' 'do you want your child to concentrate well in school?' to generate interest in a **Screen Time Workshop**. We then held an event with our local educational psychology team. 25 parents, members of the local community, teacher advisors and governors attended. Teachers presented HAPPEN survey findings and educational psychologists delivered a workshop focusing on parents as role models, the effect of screen time on behaviour, concentration and sleep, measures for limiting screen time & the body's physiological response to video games. It was very interactive and parents engaged very well, giving real insight into children's behaviours post screen-time and challenges of managing this.

During Internet Safety Week we had **Internet Safety specialists** in to school from our local library who also spoke to the children about self-regulating their screen time.

A **Board Game club** has been developed for Foundation Phase pupils and is currently full. Pupils love it & staff often come along and join in games like Monopoly, Scrabble, Connect 4. Parents have reported children asking to play more games at home and adding to their christmas lists. We have noticed these pupils have improved their turn-taking & communication skills.

To increase the amount of exercise pupils do

Playpals (pupils trained to encourage positive play at break-times) have had refresher training to encourage active games at lunchtimes. Mid-day supervisors' performance management has included the importance of encouraging physical activity when pupils are on the yard using parachutes & traditional playground games.

Newport Live have delivered football sessions in Year 2, a 'Healthy and Active' programme in Year 4, swimming in year 5, cycling in Year 5 and 6. They have also provided the school with vouchers for swimming, badminton and tennis at our local sports centre so competitions in school are rewarded with healthy prizes. We have relaunched the Daily Mile in Key Stage 2 with the support of Newport Live who liaise regularly to ensure this is still working well and is manageable for staff and pupils. Our range of after school clubs has been further developed to include yoga for pupils and high intensity training for staff, as well as a parent/staff choir to further enhance staff wellbeing and strengthen parental engagement.

To increase pupils awareness of their strengths & areas for improvement

Target sheets have been implemented across the school for literacy and numeracy. These are on tables for pupils to refer to at the start of each activity and for them to reflect against once their work is completed. **Pupil voice** has been strengthened by **pupils directly influencing what and how they learn** and teachers' planning has been adapted to evidence this. Pupils input into planning documents with their enquiries around a particular topic.

To increase opportunities & awareness of healthy eating

Newport Live have delivered **'fakeaway' sessions** to pupils in Year 4, making healthy pizzas in boxes for them to take home and share with their families. Our **Fruit Tuck Shop** has had a 'make-over' with greater choices of fruits and vegetables being included, members of the Wellbeing group are now giving certificates in assembly for those pupils who consistently make healthy choices and we have healthy lunchbox workshops booked in for reception children and parents for April.

HAPPEN Action Plan – Primary School "B"

Section of report	Target	Success Criteria	Resources	Monitoring	Timescale
Physical and sedentary behaviour	To increase physical activity	• There are more planned opportunities for bike riding as part of physical activity – not just for Y6 • Bike riding to school is promoted using SUSTRANS • There are more after school and in school opportunities for physical activity	• Staff meeting to plan provision – decide on classes/year groups or as an after school provision • Use SUSTRANS scheme – eco group to promote bike riding to school and use of school shelter • Link with Nuffield wellbeing team and plan lessons	• Staff members initials • Well Being Group	• Spring term 2020 • Summer term 2020
Diet and dental health	To increase the amount of pupils who brush their teeth twice a day	• Class to run a tooth brushing campaign across the school undertaking research and conducting a survey with pupils	• Class Make a difference planning • Visit to or from dental service • Dental leaflets • Time to conduct survey	• SLT learning review	• Spring term 2020
Sleep concentration and competency	To increase the number of pupils that feel that they are good at lots of things	• More pupils feel that they are good at lots of things	• Promotion of growth mind set at whole school level – what we are good at through assemblies • Class research and promotion of growth mind set • Link with Nuffield wellbeing team	• Listening to learners – review by student leadership group	• Summer term 2020

HAPPEN Action Plan – Primary School "B"

Well-being and mental health	To increase the number of pupil who feel good about their appearance	• More pupils feel good about their appearance	• Class make a difference research on pupil appearance. • Use of Youtube and video clips – design and make video promoting positive self image • Whole school assembly led by class	• SLT learning review	• Spring term 2020

Appendix 7: Consolidated Criteria for Reporting Qualitative Studies checklist (Outdoor Learning)

Please note page numbering refers to published paper:

https://doi.org/10.1371/journal.pone.0212242

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	8
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	8
Occupation	3	What was their occupation at the time of the study?	1
Gender	4	Was the researcher male or female?	8
Experience and training	5	What experience or training did the researcher have?	8
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	7

Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	8
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	8
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	6
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	7
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	7
Sample size	12	How many participants were in the study?	7
Non-participation	13	How many people refused to participate or dropped out? Reasons?	N/A

Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	8
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	8
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	7,8
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	8 (Appendix)
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	7
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	8
Field notes	20	Were field notes made during and/or after the inter view or focus group?	8
Duration	21	What was the duration of the interviews or focus group?	8
Data saturation	22	Was data saturation discussed?	N/A
Transcripts returned	23	Were transcripts returned to participants for comment and/or correction	N/A
Domain 3: analysis and findings			

Data analysis			
Number of data coders	24	How many data coders coded the data?	8
Description of the coding tree	25	Did authors provide a description of the coding tree?	Appendix
Derivation of themes	26	Were themes identified in advance or derived from the data?	8
Software	27	What software, if applicable, was used to manage the data?	N/A
Participant checking	28	Did participants provide feedback on the findings?	8
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	9 - 29
Data and findings consistent	30	Was there consistency between the data presented and the findings?	9 - 29
Clarity of major themes	31	Were major themes clearly presented in the findings?	9 – 29
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	9 - 29

Appendix 8: Interview and Focus Group Topic Guides (Outdoor Learning)

Focus Group Topic Guide (Pupils)

Baseline (January)

Brief introduction

1. Can you tell me what you know about outdoor learning? Prompt: Have you done any learning outdoors in the past?
2. What do you think about learning outdoors? Prompts: what do you think is good about it? What do you think is bad about it?
3. Do you think being outdoors makes any difference to how you and the people in your class learn or behave? In what way??
4. What does everyone else in your class think about outdoor learning?
5. What are you looking forward to? Is there anything you are not looking forward to?
6. Can you tell me if you think there will be any problems with learning outside? Do you have any suggestions of how to make it work well?
7. Do you think learning outdoors will change how well you do in school and in what way?
8. Do you have anything else to add about your thoughts about this project in general?

Focus Group Topic Guide (Pupils)

Follow up (July)

Brief introduction

1. What did you think about learning outdoors? Prompts: what did you think was good about it? What do you think was bad about it?
2. What did everyone else in your class think about outdoor learning?
3. Do you think being outdoors made any difference to how you and the people in your class learnt or behaved? In what way??
4. Can you tell me if there were there any problems with learning outside? Do you have any suggestions of how to make it work better in the future?
5. Do you think learning outdoors is changing how well you are doing in school and in what way?
6. Would you like to carry on with learning outdoors? Prompts: Does everyone in your class want to carry on with learning outdoors?
7. Can you tell me if you think other schools should do learning outdoors and why??
8. Do you have anything else to add about your thoughts about this project in general?

Interview Topic Guide (Teachers)

Baseline (January)

Brief introduction

1. What do you know about outdoor learning? Prompt: Have you or your pupils done any learning outdoors in the past?
2. How do you feel about delivering outdoor learning to your class? Do you feel confident in teaching outdoors? If not, why?
3. Can you tell me whether you think being outdoors will make any difference to how your pupils learn or behave? Or any other effects?
4. Can you tell me whether you think learning outdoors will change how well your pupils do in school and in what way?
5. Do you think there will be any problems with learning outside? Do you have any suggestions of how to make it work well?
6. How do your pupils feel about taking part in outdoor learning? Prompts: What are they looking forward to? What are they not looking forward to?
7. Do you have anything else to add about your thoughts about this project in general?

Interview Topic Guide (Teachers)

Follow up (July)

Brief introduction

1. Can you tell me about how the outdoor learning programme went? Prompt: How was it different to teaching indoors?
2. How did you feel about delivering outdoor learning to your class? Did you feel confident in teaching outdoors? If not, why? Would you feel confident in teaching another outdoor learning project now?
3. Did you feel supported throughout the delivery of the project? Did you receive any training to deliver it?
4. Can you tell me whether you think being outdoors made any difference to how your pupils learnt or behaved? Or any other effects?
5. Can you tell me whether you think learning outdoors changed how well your pupils were doing in school and in what way?
6. Do you think there were any problems with learning outside? Do you have any suggestions of how to make it work better if other schools were to deliver the project?
7. How did your pupils feel about taking part in outdoor learning?
8. Would you like to continue teaching the outdoor learning programme? Do you think other schools should deliver outdoor learning? Why/why not?
9. Do you have anything else to add about your thoughts about this project in general?

Interview Topic Guide (Head teachers)

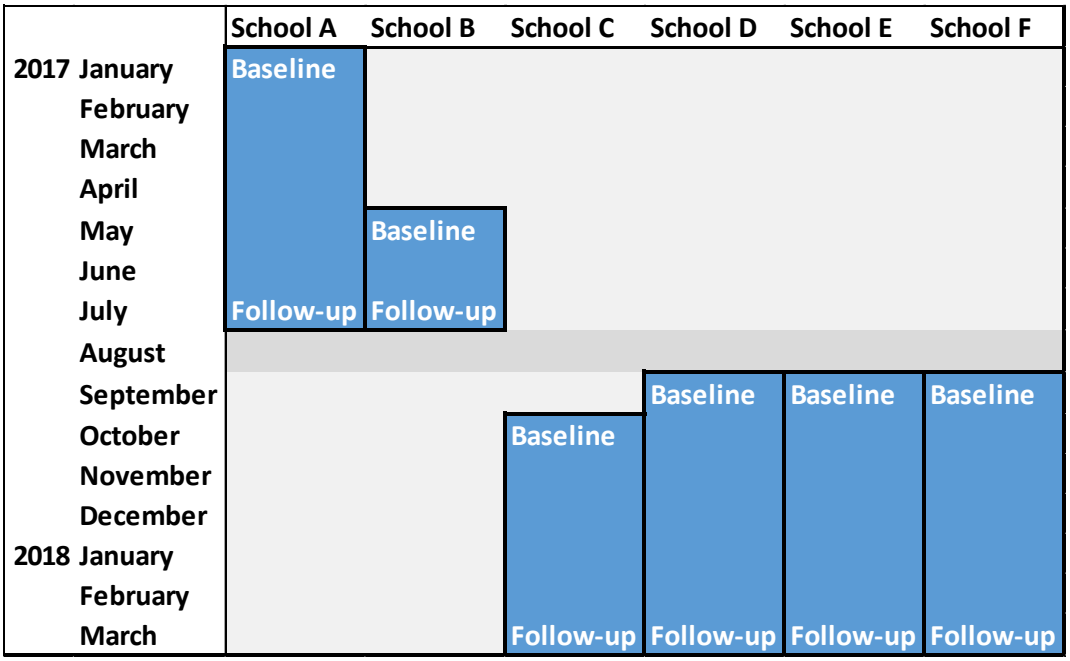
Follow up (July)

1. Can you tell me why you first became interested for your school to take part in outdoor learning? What were the main outcomes you were interested in?
2. Can you tell me how the outdoor learning programme went? What went well, didn't go so well?
3. How did your school deliver outdoor learning? Where, how often?
4. How did your staff feel about delivering outdoor learning? Did they receive training?
5. How did pupils feel about taking part in outdoor learning?
6. Can you tell me whether you think outdoor learning made any difference to pupils?
7. Have you had any feedback from pupils/parents/staff?
8. Do you think there were any problems with outdoor learning? Do you have any suggestions of how to make it work better if other schools were to deliver the project?
9. Would you like/will your school continue outdoor learning?
10. Do you think other schools should deliver outdoor learning? Why/why not? Any recommendations?
11. Do you have anything else to add about your thoughts about this project in general?

Appendix 9: Themes and Sub-themes (Outdoor Learning)

Theme	Sub-Theme
Expectations and experience of outdoor learning	Feeling free
	Exposure to environment and safety
	Pupil engagement
Factors influencing outdoor learning	Motivations
	Curriculum pressure and accountability
	Natural resources
	Physical resources
	Support
	Teacher influence
Perceived impact on learning and development	Behaviour
	Concentration and memory
	Key skills development
	Health and wellbeing

Appendix 10: Schematic Diagram of Data Collection (The Daily Mile)



Appendix 11: Interview and Focus Group Topic Guides (The Daily Mile)

Focus Group Topic Guide (Pupils)

Baseline

Brief introduction

1. Can you tell me what you thought about the daily mile when you first heard about it?
2. Do you think you will enjoy the daily mile? Will your classmates enjoy the daily mile?
3. What time of day and where will you do the daily mile? Do you think this is the best time of day and the best place to do it?
4. Do you think the daily mile will make any difference to how you and the people in your class learn or behave? In what way?
5. Do you think the daily mile will change how well you are doing in school and in what way?
6. Can you tell me if you think there will be any problems with the daily mile? Do you have any suggestions of how to make it work better?
7. Do you want to do the Daily Mile? Prompts: Does everyone in your class want to do the daily mile?
8. Do you have anything else to add about the daily mile?

Focus Group Topic Guide (Pupils)

Follow-up

Brief introduction

1. Can you tell me what you thought about the daily mile when you first heard about it? And what do you think about it now? Prompt: What is good/bad?
2. Do you enjoy the daily mile? Do your classmates enjoy the daily mile?
3. What time of day and where do you do the daily mile? Do you think this is the best time of day and the best place to do it? Prompt: Have there been any times when you haven't been able to do the daily mile and what were the reasons? What did you do instead?
4. Do you think the daily mile is making any difference to how you and the people in your class learn or behave? In what way? Is it making any difference to your concentration?
5. Do you think the daily mile is changing how well you are doing in school and in what way?
6. Can you tell me if there are any problems with the daily mile? Do you have any suggestions of how to make it work better?
7. Would you like to carry on with the daily mile and why? Prompts: Does everyone in your class want to carry on with the daily mile?
8. Do you have anything else to add about the daily mile?

Interview Topic Guide (Headteacher)

Follow-up

Brief introduction

1. Can you tell me about how the daily mile has gone?
2. What was your motivation for starting the daily mile in your school?
3. How did you feel about the implementation of the daily mile?

   Barriers/challenges. Were there any issues? Were all staff happy with the implementation?
4. How did your staff/pupils feel about taking part in the daily mile?
5. Can you tell me whether you think the daily mile made any difference to how your pupils learnt or behaved? Or any other whole school effects?
6. Do you think there were any problems with the daily mile? Do you have any suggestions of how to make it work better if other schools were to deliver the project?
7. Would you like to continue the daily mile? Do you think other schools should deliver the daily mile? Why/why not?
8. Do you have anything else to add about your thoughts about this project in general?

Interview Topic Guide (Teacher)

Baseline

Brief introduction

1. What do you know about the daily mile? Prompt: Have your pupils done the daily mile or anything similar in the past?
2. What were your initial thoughts of the Daily Mile?
3. How do you feel about delivering/implementing the daily mile to your class and why?
4. How is the daily mile being implemented within the school? Prompt: Are all staff onboard? Any issues?
5. Can you tell me whether you think the daily mile will make any difference to how pupils learn or behave? Or any other effects?
6. Can you tell me whether you think the daily mile will change how well your pupils do in school and in what way?
7. Are there currently any problems with the daily mile? Do you have any suggestions of how to make it work well?
8. How do your pupils feel about the daily mile? Prompts: What do they like/dislike?
9. Do you have anything else to add about your thoughts about this project in general?

Interview Topic Guide (Teacher)

Follow-up

Brief introduction

1. Can you tell me about how the daily mile has gone?
2. How did you feel about the implementation of the daily mile? Were there any issues? Were all staff happy with the implementation?
3. Did you feel supported throughout the delivery of the project? Did you receive any training to deliver it?
4. Can you tell me whether you think the daily mile made any difference to how your pupils learnt or behaved? Or any other effects?
5. Can you tell me whether you think the daily mile changed how well your pupils were doing in school and in what way?
6. Do you think there were any problems with the daily mile? Do you have any suggestions of how to make it work better if other schools were to deliver the project?
7. How did your pupils feel about taking part in the daily mile?
8. Would you like to continue the daily mile? Do you think other schools should deliver the daily mile? Why/why not?
9. Do you have anything else to add about your thoughts about this project in general?

Appendix 12: Themes and Sub-themes (The Daily Mile)

Theme	Sub-theme
The Daily Mile implementation	Flexible vs rigid principles
	Curriculum time vs playtime
	Competitive vs non-competitive
	Active teachers vs passive teachers
	Supported vs unsupported
	Summer vs winter
Impact on learning, health and wellbeing	Behaviour and concentration
	Physical activity and sport
	Psychological benefits
	Social benefits

Appendix 13: Descriptive Characteristics of Shuttles and Cardiorespiratory Fitness by School (The Daily Mile)

	School A	School B	School C	School D	School E	School F
Difference in shuttles (baseline – follow-up)	1.4 ± 12.8 (38) (95% CI: -2.8 to 5.6)	1.5 ± 6.9 (26) (95% CI: -1.3 to 4.3)	8.1 ± 13.8 (29) (95% CI: 2.9 to 13.3)	7.9 ± 9.0 (46) (95% CI: 5.2 to 10.6)	2.8 ± 17.5 (41) (95% CI: -2.7 to 8.3)	12.6 ± 8.7 (23) (95% CI: 8.8 to 16.4)
Difference in shuttles imputed (baseline – follow	2.0 ± 12.6 (42) (95% CI: -1.9 to 5.9)	4.8 ± 11.6 (39) (95% CI: 1.0 to 8.6)	5.2 ± 14.7 (39) (95% CI: 0.4 to 10.0)	7.3 ± 12.6 (51) (95% CI: 3.8 to 10.8)	1.8 ± 19.3 (60) (95% CI: -3.2 to 6.8)	10.4 ± 15.2 (31) (95% CI: 4.8 to 16.0)
Baseline shuttles	43.2 ± 20.7 (42)	26.2 ± 17.3 (33)	14.9 ± 10.4 (29)	28.8 ± 16.6 (49)	36.1 ± 19.1 (47)	28.7 ± 18.0 (29)
Follow up shuttles	45.4 ± 22.4 (38)	29.6 ± 20.1 (32)	23.5 ± 12.8 (39)	36.4 ± 18.3 (47)	37.6 ± 20.1 (53)	41.2 ± 22.0 (25)
Baseline shuttles imputed	43.2 ± 20.7 (42)	25.0 ± 16.4 (39)	18.2 ± 11.4 (39)	29.4 ± 16.5 (51)	36.3 ± 17.5 (60)	29.7 ± 17.5 (31)
Follow up shuttles imputed	45.3 ± 21.5 (42)	29.8 ± 19.0 (39)	23.5 ± 12.8 (39)	36.7 ± 18.0 (51)	38.1 ± 19.4 (60)	40.1 ± 20.5 (31)
Fit (baseline)	79% (33)	40% (13)	7% (2)	39% (19)	64% (30)	48% (13)

Fit (follow up)	76% (29)	41% (13)	32% (12)	68% (32)	58% (31)	75% (18)
Fit imputed (baseline)	79% (33)	33% (13)	13% (5)	41% (21)	67% (40)	53% (16)
Fit imputed (follow up)	79% (33)	44% (17)	32% (12)	69% (35)	63% (38)	73% (22)