THE RELATIONSHIP BETWEEN CHILDHOOD DEPRESSION, OBESITY AND POOR SCHOOL PERFORMANCE AMONG URBAN DISADVANTAGED CHILDREN

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Prakashini Banka

Declaration

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Summary

Background: Despite the recent emergence of literature establishing the prevalence of childhood depression, research has failed to provide insight in its concomitant factors. While depression in adults has been associated with multiple negative correlates such as rumination, loss of interest in pleasurable activities, overeating, and lack of concentration, the picture for children is less clear. There is a suggestion that urban disadvantaged children may be more at risk of depression and that obesity and school performance play a role in it, but how these variables interrelate is uncertain. The present study aims to address this issue.

Aims: The main aims of the study is to investigate the relationship between childhood depression, obesity and poor school performance among urban disadvantaged children, and to identify predictors of depression, obesity and poor school performance.

Methods: This study makes use of an observational cross-sectional design. Data for this PhD research was collected in 2013 from the original participating schools of the Healthy School Programme (HSP). The PhD data was collected in schools some time after the completion of the HSP. The HSP, which was funded by the Childhood Development Initiative (CDI), took place between 2009 and 2012 to implement a health promoting intervention among urban disadvantaged children in Irish primary schools. Data collected included Body Mass Index (BMI), depressive symptoms, indicators of wellbeing, quality of life, dietary patterns, physical activity, and indicators of school performance. Descriptive analyses were conducted and inferential analyses such as correlations, logistic regression models and mediation models were conducted. This study received ethical approval from the researcher's university.

Results: Three predictors were identified from the first model, indicating that physical wellbeing, body weight perception and school environment were significant predictors of obesity. There were four predictors of depression identified, and these were gender, psychological wellbeing, body weight perception and bullying. As for the third model, five predictor variables were statistically significant in relation to its impact on reading scores, and these were gender, BMI, maths scores, Parental relationship and body weight perception. Finally, in the fourth model, there were two significant predictors of maths performance and they were reading schools and physical wellbeing. Two mediation models were conducted, and the first model included depression as the predictor variable, BMI scores as the mediating variable and reading scores as the outcome variable. The findings from the first model indicated that there was a statistically significant direct effect between depressive symptoms and BMI scores, however, the indirect and direct effect was not significant, indicating that BMI did not have a mediating effect on depressive symptoms and reading scores, and depressive symptoms did not influence reading scores. The second model included depression as the predictor variable, BMI scores as the mediating variable and maths scores as the outcome variable. Similar to the first model, there was a statistically significant direct effect between depressive symptoms and BMI scores, however, the indirect and

direct effect was not significant, and therefore, indicating that BMI did not have a mediating effect on depressive symptoms and maths scores, and depressive symptoms did not affect maths scores.

Conclusion: The findings suggest that there is a relationship between depression and obesity. The mediational findings reported that depression affected BMI scores of children and identified the following variables as significant predictors for depression; gender, psychological wellbeing, bullying and body weight perception. For BMI, three predictors were identified; physical wellbeing, school environment and body weight perception. It was also identified that there is currently no combined treatment for depression and obesity in Ireland, and previously research suggesting that these two illnesses should be treated together, the study provided recommendations to address these issues. These recommendations are intended to inform policy makers, health professionals and researchers in order to improve treatment methods, policies and further investigate the relationship between depression and obesity in future research.

List of Abbreviations

APA: American Psychiatric Association

BMI: Body Mass Index

CBT: Cognitive Behavioural Therapy

CDC: United States Centres for Disease Control and Prevention

CDI: Child Development Initiative

CDI-S: Children's Depression Inventory (Short form)

CSO: Central Statistics Office

DCYA: Department of Children and Youth Affairs

DEIS: Delivering Equality of Opportunity in Schools

DES: Department of Education and Science

DES: Department of Education and Skills

DOE: Department of Education

DSM: Diagnostic and Statistical Manual of Mental Health Disorders

FDA: Food and Drug Administration

GDP: Gross Domestic Product

GUA: Growing Up in Scotland

GUI: Growing Up in Ireland

GUS: Growing Up in Scotland

HRBQ: Health Related Behaviour Questionnaire

HRQoL: Health Related Quality of Life

HSE: Health Service Executives

HSP: Healthy Schools Programme

IOTF: International Obesity Task Force

IUNA: Irish Universities Nutrition Alliance

MCS: Millennium Cohort Study

NAPS: National Anti-Poverty Strategy

NCMP: National Child Measurement Programme

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

SAGO: Special Action Group on Obesity

SDQ: Strength and Difficulties Questionnaire

SES: Socioeconomic Status

SILC: Survey on Income and Living Conditions

WHO: World Health Organisation

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Chapter 1: Introduction

1.1 Introduction

There is growing concern in schools about children's physical and mental health, and their school performance, more so in areas of economic deprivation. Health outcomes among school-aged children may vary depending on the schools that they are attending, and this is due to the variation in the school environment. More disorder is observed among school-level disadvantage, and school-level disadvantage is defined as schools that provide free meals, are larger and have more children who need special educational assistance. As a result, health-promoting programmes in schools often attempt to improve socio-emotional outcomes, and health behaviours such as substance use, physical activity, and diet within in a school setting. These concerns among school-aged children needs to be addressed, in particular, the physical health outcomes, mental health outcomes and school performance of children from disadvantaged settings. This chapter provides an overview of the key health outcomes affecting school-aged children from disadvantaged populations and its impact on children's school performance. The key factors that will be discussed are childhood depression, obesity and poor school performance.

According to the World Health Organisation (WHO), more than 350 million people worldwide, of all ages, suffer from depression (WHO 2012). Depression is defined as "a mood state characterised by a sense of inadequacy, a feeling of despondency, a decrease in activity or reactivity, pessimism, sadness and related symptoms" (Reber & Reber 2001, p.189). It is one of the most common mental health disorders, which is also considered the leading cause of ill health globally. Depression could have negative consequences relating to the physical and mental health of a person (Jenkins *et al.* 2011). If depression is left untreated, it could also lead to suicide (WHO 2012); hence, it is important to address this issue. Another reason for addressing depression is that there is adequate evidence to suggest that depression could have detrimental effects on children, such as low self-esteem, eating disorders and conduct problems, which could potentially continue into adulthood (Jenkins *et al.* 2011).

Childhood depression was once believed to be non-existent (Weiss *et al.* 1991), however it has since been subjected to extensive exploration in clinical and research settings, and is now recognised by health professionals, as well as the Diagnostic and Statistical Manual of Mental Health Disorder (DSM) (Kovacs *et al.* 1993). There have been various researches which reported

on the high prevalence of depressive symptoms among children and adolescents (Kashani *et al.* 1981, 1985, Fitzpatrick *et al.* 2005, Williams *et al.* 2009, Comiskey *et al.* 2012). These findings have led health professionals and policy makers to investigate and design effective interventions to reduce the levels of depression in children (Walhbeck 2009, World Health Orgnization 2005, Gladstone *et al.* 2011). Despite this, the prevalence of childhood depression is increasing (Comiskey *et al.* 2012).

Another health concern, which is at present a serious public health challenge globally, is obesity, specifically childhood obesity (WHO 2014). The increased rate of childhood obesity has caused major concern for health professionals and for policy makers due to the physical health, mental health and social complications associated with obesity. According to the WHO, over 42 million children under the age of five are overweight and this is on the increase (WHO 2014). Some of the consequences of obesity include the likeliness of developing cardiovascular disease, diabetes, poor mental health and many other diseases in adulthood (WHO 2014). In Europe, approximately 15 to 32% of school children were reported to be either overweight or obese in 2010 (Heinen 2014). In the Irish Universities Nutrition Alliance report (2006), one in ten children aged between five and 12 years were described as being overweight in Ireland and one in ten children were obese, giving a total of 23% of overweight or obese children (as cited in Walton 2012). The most recent report on childhood obesity in Ireland reported that 20% of nine-year-old boys were overweight in 2012, while 4.1% were obese. It was also stated that 22% of nine-year-old girls were overweight and 4.3% were obese in 2012 (Heinen 2014). Slight improvements were reported in the body weight of children at seven years of age for boys (18.3% in 2008 and 14.4% in 2012) and girls (26.4% in 2008 and 21.4% in 2012); however this improvement was not observed in the Body Mass Index (BMI) of children from a disadvantaged population (Heinen 2014). BMI is the most universally used index for measuring and the most practical and inexpensive method of classifying overweight and obesity (Onis *et al.* 2010). It is an index for weight-for-height measurement defined as an individual's weight in kilograms divided by height in metres squared (kg/m^2) (WHO 2014).

High BMI scores among children has often been associated with disadvantaged populations, and poverty to date remain as one of the main barriers to improving children's physical health, mental health and social wellbeing. Research has shown that poverty on its own can induce serious health consequences in children (Aber *et al.* 1997). For example, empirical studies have shown that children who come from disadvantaged backgrounds are more likely to suffer from

asthma or other respiratory illnesses (Ernst *et al.* 1995). Further research has shown that the environment in which a child lives in is very important for the mental health of the child (Bradley *et al.* 1994). Previous research suggests that children who come from disadvantaged backgrounds might be more likely to suffer from mental health problems (Elder *et al.* 1995). Some of the problems consistently associated with poverty are depression, stress, behavioural conduct, and low self-esteem (Aber *et al.* 1997). Another factor that has been linked to poverty is poor school performance among children (DES 2011). There are various factors related to the occurrence of poor school performance among children, including low levels of self-esteem, depression, stress, and anxiety (Aber *et al.* 1997). These factors, as previously mentioned, have also been shown to be correlated with disadvantaged backgrounds (Aber *et al.* 1997, Elder *et al.* 1995, DES 2011). The occurrence of poor school performance among children has been recognised as an important factor affecting children's lives in the Republic of Ireland. In relation to the decline in school performance, the Department of Education and Skills (DES) in the Republic of Ireland, stated that such decline among school children can lead to social exclusion and economic disadvantages (2011). Hence, improving educational outcomes and reducing school failure is a priority for the Irish and other governments. To achieve this, the Irish government has put in place various programmes and interventions (DES 2011). Despite undertaking these preventative measures, the performance decline among school children from the disadvantaged population continued to remain high (Williams *et al.* 2009, Gallop *et al.* 2013, Bradshaw 2013, Daraganova *et al.* 2012). This could perhaps be due to other factors that the interventions have not accounted for or have not been considered as a contributor of poor school performance. Therefore, it is important to investigate performance decline among disadvantaged children in more depth. Previous research has shown that children who are obese are more likely to be depressed (Chau *et al.* 2013), however, these findings have been inconsistent across research (Sigfusdottir *et al.* 2007). Similarly, depression and low school performance has often been associated in various correlational studies (Chau *et al.* 2013). Despite the emergence of studies associating childhood depression with obesity and low school performance, fewer studies have investigated this relationship among this key population of urban disadvantaged children. Gender and age plays a significant role with regards to obesity, generally girls are more likely to be obese compared to boys (Heinen 2014), and higher rates of older children are in the obese category compared to younger children (Heinen 2014). The gender and age role also came up as a significant factor in regard to depression and poor school performance (Chau *et al.* 2013, Smith *et al.* 2013, Gunnarsdottir *et al.* 2012).

This current study focuses on investigating the relationship between childhood depression, obesity and poor school performance among a key population of urban disadvantaged children, using cross-sectional observational data. This study has taken into account of the current gap in the literature in relation to the relationship of childhood depression, obesity and poor school performance, and therefore, aim to further investigate these links and other associated factors, which will be discussed in chapter two.

1.2 The current study

The aim of this study is to investigate the relationship between depression, obesity and poor school performance among urban disadvantaged children. This will be explored in an Irish context. A narrative literature review will also be conducted to explore the relationship between depression, obesity and poor school performance among children. There has been previous research which attempted to investigate the relationship between depression, obesity and poor school performance, however, few studies are from a child population and even fewer from an urban disadvantaged setting. By understanding the relationship between these keys variables and identifying the predictors of depression, obesity and poor school performance, effective prevention and intervention programmes can be designed based on the findings. The relationship between these three factors may be different in affluent areas, however the focus of the current study is on disadvantaged areas. The specific research questions, which the study aims to answer, are:

1. What is the relationship between depression, obesity and poor school performance among urban disadvantaged children?
2. What are the predictors of depression, obesity and poor school performance?
3. Are there gender and age differences in depression, obesity and poor school performance of children?

1.3 Background of the current study

Data for this data was collected in 2013 from the original participating schools of the Healthy School Programme (HSP). The HSP, which was funded by the Childhood Development Initiative (CDI), took place between 2009 and 2012 to implement a health promoting intervention among urban disadvantaged children in Irish primary schools (Comiskey *et al.* 2012). The impact and the process of implementation of the intervention was independently evaluated by a group of researchers from the School of Nursing and Midwifery in Trinity College Dublin. The programme was first implemented in 2009 and it was a three-year longitudinal study with three follow up data collection points (baseline, year one, and year two). The aim of the HSP was to improve

children's physical and mental health wellbeing through health promotion in school and the community, as well as increasing access to primary care services (Comiskey *et al.* 2012). The HSP was a manualised school-based health promoting initiative, developed by the CDI, which identified the health needs of children living in urban disadvantaged regions, based on the findings from A Place for Children (CDI 2005) and How Are Our Kids 2004 (Axford *et al.* 2004). The CDI explored the literature of what is beneficial in addressing children's health. As a consequence, a Health Promoting Schools initiative was endorsed, and the Healthy Schools manual was developed (Lahiff 2008). It is important to note that the current study is independent from the original HSP study and was not conducted as part of an evaluation for the HSP intervention. The HSP committee, and funder, CDI, acted as gatekeepers for access to the sample. The evaluation of the HSP intervention has been conducted and the findings were presented in the 2012 report by Comiskey and colleagues. The findings suggest that the intervention had not been implemented correctly therefore, no statistically significant impact was noted on children's health from baseline to year two (Comiskey *et al.* 2012). The intervention ended in 2012 and no further activities were conducted in the schools after the intervention. Data collected in 2013 from the original HSP participants was used for this study to analyse the relationship between childhood depression, obesity and poor school performance within a population of disadvantaged children (Comiskey *et al.* 2015).

1.4 Chapter Summary

This chapter provided an introduction on the key variables of interest for the current study; depression, obesity and poor school performance. The rationale and aim for investigating the relationship between childhood depression, obesity and school performance among urban disadvantaged children, was presented along with the key research questions. A brief background of the study and access to data for analyses were provided. The next segment provides an overview of the dissertation.

1.5 Overview of the dissertation

Chapter 2: An overview on childhood depression, obesity, school performance, and associated factors

Chapter two provides an overview of childhood depression, factors associated with depressive symptoms, the screening measures widely used to detect childhood depression and concludes with a summary of childhood depression. A review on childhood obesity is provided, including its definition and the various ways in which childhood obesity is measured. Chapter two also reviews the impact of obesity on children and associated predictors. Both the physical and

mental health impact is discussed and it concludes the review provided. Finally, chapter two presents a review on poor school performance and how children are affected by it. It also discusses the physical and mental health predictors of poor school performance. Some of the predictors mentioned are biological factors, psychological factors and social factors.

Chapter 3: A narrative literature review on the relationship between childhood depression, obesity and poor school performance among urban disadvantaged children

Chapter three presents the narrative literature review on the relationship between childhood depression and obesity, the relationship between depression and poor school performance. The IMRAD format was adopted in reporting. The chapter discussed the eligible studies which helped inform the current study.

Chapter 4: Methodological and ontological approaches

The philosophical framework adopted in this study was the positivism paradigm. This chapter also presents the conceptual framework which underlies the current research study. The conceptual framework which have had a strong influence on the current research study, was the biopsychosocial model. The research methodology of this study is also detailed in chapter four. It provides information on the study design, settings, power analysis, participants, measures, consent, procedures, ethical considerations, role of the researcher and the statistical analyses conducted.

Chapter 5: Describing children's demographic background and health status

This chapter begins by describing the children who took part in the study. Information on the demographics is provided and the descriptive findings on the children's overall health status are presented. This is followed by a gender comparison of the children's health status using inferential statistics.

Chapter 6: Correlational findings, Logistic Regression model and Mediation model

This chapter presents the findings of the correlation analyses, logistic regression models and the mediation models. The correlational findings informed the regression and mediation models. The logistic regression was conducted four times, with different dependent variables each time (e.g. depression, obesity, reading and maths performance). The mediation findings

are also presented in this chapter, with obesity as the mediating factor between depression and school performance.

Chapter 7: Discussion and conclusion

Chapter seven provides a detailed discussion of the findings from current study. The chapter begins by restating the aims and research questions of the study. This is followed by the key findings from chapters five, and six, which covers descriptive findings, the correlational findings, and the regression and mediation models. The findings are then discussed in light of previous research and recommendations for policy and future research is presented. The chapter ends with a section on the strength and limitations of the current study, and a conclusion of the overall study.

Chapter 2: Overview of poverty, childhood depression, obesity and poor school performance, and associated factors

2.1 Introduction

This chapter introduces the concept of poverty, childhood depression, obesity, and school performance. The definitions, measures, statistics and the impact of poverty, depression, obesity and school performance on children's health is also presented. The next segment begins by defining poverty as there are various definitions (section 2.2). The psychological and sociological definitions of poverty are discussed in detail as well as the Irish definition of poverty. As previously mentioned in chapter one, poverty and disadvantaged are linked (Meyer & Sullivan 2012), hence it is essential to first understand poverty and how it is measured.

2.2 Defining poverty

As mentioned above, there are various definitions of poverty. These different definitions play a major role in how poverty is measured. Consequently, it is essential to discuss these definitions, how they differ and how they influence the different measures. A general definition of poverty is: "The condition of having little or no wealth or few material possessions; indigence, destitution" (OED 2016). In psychology, poverty is simply defined as having a relatively low living standard based on people's access to goods and materials (Reber & Reber 2001). The sociological definition of poverty is "a state in which resources, usually material but sometimes cultural, are lacking" (Marshall 1998, p. 517). There are two types of poverty: absolute poverty and relative poverty. Absolute poverty is defined as having severe deprivation of basic human needs and it depends on income and access to services. Relative poverty is when people earn less than the minimum income required to maintain the average standard of living in the society that they are from (Marshall 1998). According to Tovey & Share, there are very few people who are living in absolute poverty in Ireland (2003). According to the National Anti-Poverty Strategy (NAPS), the most common type of poverty in Ireland is relative poverty (1997).

Townsend (1979) claimed that individuals are considered poor when (1) the resources available to them are extremely low compared with the average individual or family, (2) they are excluded from ordinary living arrangements and social activities (Whelan & Maître 2012). Low Gross Domestic Product (GDP) and unemployment have been found to be among the strongest influences on people's perceptions of social exclusion (Whelan & Maître 2012).

2.2.1 Defining disadvantaged

The literature on poverty overlaps greatly with the concepts of being disadvantaged, class, ethnicity and race (Marshall 1998). The term disadvantaged itself is often used synonymously with the terms low socioeconomic status, socioeconomic disadvantaged or *underclass,* which was famously termed by Wilson in the book The Truly Disadvantaged (1987). The work by Wilson has had a strong influence in shaping society's understanding of urban poverty (Wilson 1987). Interestingly, according to Mayer (2003), the term disadvantaged focuses on "denied access to the tools needed for self-sufficiency" (2003, p. 1). Mayer proposed that, disadvantaged is a lack of access to services or tools that the majority of people in the society have access to. These include (Mayer 2003):

- Independence
- Motivation
- Responsibility
- Self-esteem
- Support from community
- Health
- Education
- Information
- Jobs
- Money
- Accessible support systems

Another important term which is often associated with disadvantaged is educational disadvantaged. This is defined as being a barrier to education arising from socioeconomic disadvantage that prevents students from benefitting from their school education (Education Act 1998). This causes performance decline among children, and as previously mentioned, such decline can have negative consequences for children and also adults in later life. According to the OECD, some of the consequences of performance decline include reduced wellbeing, health problems, low self-esteem and reduced participation in the family and community life (DES 2005). This led the Irish government to develop educational programmes as a solution to educational disadvantaged. One such programme is the Delivering Equality of Opportunity in Schools (DEIS) programme. The aim of DEIS is to address the educational needs of children and young people from disadvantaged communities (DES 2005). This is further explained in chapter four.

2.2.2 Measuring poverty

In Ireland, there are three primary measures for poverty: Relative or At Risk of Poverty, Material Deprivation and the Consistent Poverty measure (EAPN 2013). The Relative or At Risk of Poverty measure is the most commonly used measure across the rest of Europe. This measures income that is considered to be less than the acceptable norm, for example, an income of less than 60% of the median. The Material Deprivation measure is based on a deprivation index that consists of 11 items of basic needs and assesses individuals' access to resources. The deprivation index takes into account the inability to afford the following (Maitre 2006)

- two pairs of strong shoes;
- a warm, waterproof overcoat;
- buy new not second hand clothes;
- eat meat, chicken, fish or vegetarian equivalent with meal every second day;
- have a roast joint or its equivalent once a week;
- have heating during the past year;
- keep the home adequately warm;
- buy presents for family or friends at least once a year;
- replace any worn out furniture;
- have family or friends for a drink or meal once a month;
- and have a morning, afternoon or evening out in the last fortnight, for entertainment

The Consistent Poverty measure is the preferred method of measurement in Ireland and it has been developed by the Irish Economic and Social Research Institute (Whelan *et al.* 2006). This type of poverty occurs when individuals have an income of less than 60% of the median and also experience material deprivation (DSP 2012). Consistent Poverty is the overlap between At Risk Poverty and Material Deprivation. These methods of calculating poverty, which remain unchanged since the 1960s, have been criticised for being inaccurate by many researchers (Meyer & Sullivan 2012) with some researchers arguing that money should not be the sole factor of measuring poverty (Whelan & Maître 2012).

2.2.3 Child poverty rate in Europe, UK & Ireland

The poverty rate in Europe increased to 23.4% in 2010, a population of 119.6 million (Eurostat 2012). Bulgaria, Romania, Spain and Greece had the highest rates of poverty, while France and Sweden had the lowest rate in Europe. Quoting figures from the 2010 Eurostat report, Inequality Watch estimated that 20.2% of children under the age of 16 were considered to be living in poverty in Europe (Inequality Watch 2010). The northern European countries showed lower

rates of child poverty while the highest rates were in Romania (31.3%), Bulgaria (26.4%) and Spain (25.3%). In 2011, 24.2% of Europeans were at risk of poverty, this is an increase of 0.6% since 2010 (Eurostat 2012). Child poverty rates also rose from 20.2% in 2010 to 27% in 2011 (Eurostat 2012). The UK child poverty rate in 2011 was 26.9%, while Ireland had a higher rate of 34.1%. The highest rate of child poverty was observed in Bulgaria with 51.1% and the lowest level of child poverty was found in Norway with a rate of 13% (Eurostat 2012).

2.2.4 Poverty in Ireland

In the year 2010, 15.8% (706,500) of people in the Republic of Ireland were found to be At Risk of Poverty (based on average income) and 22.5% (1,006,000) of people were found to be deprived of materials or resources. Based on the findings from the Consistent Poverty measure, 6.2 % (277, 000) of people were found to be poor (Department of Social Protection 2012). Using the At Risk of Poverty measure, in 2013, children aged between 0 and 17 years were the most at risk age group in Ireland with a rate of 17.9%. This remains unchanged from the 18.6% observed in 2009 (CSO 2013). The National Social Target for Poverty Reduction's aim is to reduce Consistent Poverty from 6.2% in 2010 to 2% in 2020. The targeted groups for reducing poverty are children and jobless households (DSP 2013).

According to the 2009 report Understanding Childhood Deprivation in Ireland, the child poverty rate was higher than that of adults and this is of concern due to its negative consequences, which may persist into adulthood. The Survey on Income and Living Conditions (SILC) dataset has been analysed to obtain the following findings for children under 18 years of age. Children rated higher on the At Risk of Poverty indicator than any other age groups from year 2004 until 2010. In 2009, 24% of children experienced basic household deprivation while 13% of children experienced child-specific deprivation (Watson *et al.* 2009). Child-specific deprivation consists of the following 13 items: clothes, shoes, fruit, meals, protein, books, equipment, games, activity, party, friends, trip, homework, outdoor, doctor, and dentist. Other findings suggested that 74% to 76% of children from a low income household who suffered from basic deprivation have high levels of economic stress (Watson *et al.* 2009).

2.2.5 The impact of poverty on children

Taking into account the increase of poverty rates in Ireland and specifically child poverty, it is important to evaluate the impact that poverty has on children. Research has consistently shown that the impact of poverty can be detrimental to the physical and mental health of children (Ratcliffe & McKernan 2012, Yoshikawa *et al.* 2012, Nikulina & Widom 2013). A recent report by Ratcliffe and colleagues on child poverty suggested that poverty has vital implications on the

future of children living in poverty (Ratcliffe & McKernan 2012). There are many ways in which poverty can affect a child and these can be behavioural problems (Duncan & Lamborghini 1994) as well as academic problems (Brooks-Gunn & Duncan 1997, Duncan *et al.* 1998). Such effects often lead to negative outcomes in adulthood (Ratcliffe & McKernan 2012).

Numerous studies have provided evidence to demonstrate that poverty can have a negative impact on overall physical and mental health outcomes (Gennetian *et al.* 2000, Akee *et al.* 2010). Recent studies suggested that children of lower socioeconomic status were more likely to have poorer health and developmental outcomes (Kaminski *et al.* 2013). Lower socioeconomic status has been associated with physical health problems such as high blood pressure, respiratory illnesses and active smoking (Chen *et al.* 2002). Other health risks included risky behaviours, lower school performance and obesity (Starfield *et al.* 2002, Power *et al.* 2003). Childhood obesity has been frequently associated with poverty in research (Peña & Bacalloa 2000, Bhattacharya *et al.* 2004, Hofferth & Curtin 2005, Phipps *et al.* 2006). Research has reported that although insufficient food consumption is generally associated with the poor, it is very important to note that obesity is becoming a major public health issue that is strongly associated with people from poorer backgrounds (Bhattacharya *et al.* 2004).

Studies have shown that poverty is linked not only to ill health, but also to learning, behavioural problems, and mental health issues such as depression (Duncan *et al.* 1998, Bradley & Corwyn 2002). According to Santiago *et al.* (2013), there is a strong correlation between poverty and mental health problem. The most common mental health problems associated with poverty are depression and anxiety (Hudson 2005). It has also been shown in research that persistent poverty often leads to depression in younger children (McLeod & Shanahan 1993, Duncan & Lamborghini 1994, Bolger *et al.* 1995, McLeod & Shanahan 1996). Children that suffer from depression at a young age are more likely to have other mental health problems in later life (Loeber 1988, Harrington *et al.* 1990, McLeod & Shanahan 1996). Hence it is vital to further study the impact of poverty on physical and mental health.

2.2.6 Summary

In conclusion, the definition of poverty and how it relates to disadvantage, has been described, the current measures used, the prevalence of poverty in Europe and Ireland, as well as the prevalence of child poverty, was presented. This segment presented two main terms; poverty and disadvantaged. As previously mentioned these terms overlap greatly and are used interchangeably. Poverty provides a way to quantify disadvantaged, however the term

disadvantaged itself is much broader as it incorporates the notion of a population which is denied of access to tools and services such as health, education, money, jobs and so on. Although this section began by discussing poverty, this study will use the term disadvantaged throughout as it accurately defines the population being studied. The implications of being from a disadvantaged population on children's overall health, including physical and mental health, were also outlined. Taking into account the negative consequences mentioned above, the segments below evaluate the three major factors that have been identified as contributors of poor physical and mental health in children.

2.3 Childhood depression

This section begins by discussing the origins of depression and the historical developments that led to the current understanding of depression. The origin of childhood depression is then discussed followed by a description of the difference between adult and child depression. Also discussed are the theories and prevalence of childhood depression, and measures of childhood depression.

2.3.1 Origins of depression

Melancholia was the earliest term given to what is currently known as depression. The exploration of the term melancholia traditionally began with Hippocrates, Aristotle and Galen (Wong & Licinio 2001). The traditional term of melancholia has very little influence on the 20th century psychiatric practice (Heiberg 1927, Drabkin 1955) and that ancient diagnosis is not considered to play a significant role in shaping the modern diagnosis of depression (Siegel 1973). The symptoms associated with the ancient term do not reflect the current understanding of depression, for example sadness was not part of the ancient melancholy symptomology (Berrios 1988). According to Tracy (1969), melancholy can only be understood in the context of humoural theory as it was originally derived from the ancient Greek, where it meant "black bile" (Reber & Reber 2001, Nemade *et al.* 2013). The humour theory proposed that the human body consisted of four basic elements called humours. When the humours are in balance, the person is considered healthy; however, an imbalance in any of the four humours leads to illness. The four humours are blood, phlegm, yellow bile, and black bile. An individual with a dominant black bile humour is said to be a melancholic (Nemade *et al.* 2013). In modern time humoural history holds insignificant importance and interest, yet, early modern period medical writings on melancholia are greatly derived from the Galenic tradition (Jackson 1969, Radden 2003). However, the term melancholia is still used in the DSM-IV as a subtype of major depression (Wong & Licinio 2001, APA 1994); this is further explained in the sections below (see section 3.5). Further amendments to the old category of melancholia occurred mostly during the 19th century with the rapid

emergence of psychological explanations for behaviours (Berrios 1988). The development of new psychological theories has gradually led to the formation of the term 'mental depression' and the beginning of the modern understanding of the phenomena (Berrios 1988).

2.3.2 Origins of the childhood depression concept

Less than three decades ago, childhood depression was believed to be non-existent (Maughan *et al.* 2013). Depressive symptoms in children were seen as a normal state of development rather than an indicator of potential mental illness (Kanner 1960, Lefkowitz & Burton 1978, Hammen & Rudolph 1996). According to psychoanalysts, children of neurotic parents who live in a hostile environment were more likely to become neurotic and experience depressive symptoms. However, some psychoanalysts suggested that the existence of depression in children is not likely to occur because of their underdeveloped 'superego' (Rochlin 1959). Most professionals believed the idea of childhood depression being non-existent for a long period. However, research in the area of childhood depression now suggests that is occurrence is widely recognised (Craighead *et al.* 1998).

2.3.3 Differences between adult and childhood depression

According to the fifth edition of the Diagnostic Statistical Manual of Mental Disorders (DSM-V), there are nine diagnostic criteria for major depression. This segment discusses the differences between adult and childhood depression based on the DSM V. There are various types of depressive disorders: disruptive mood dysregulation disorder, major depressive disorder, persistent depressive disorder (dysthymia), premenstrual dysphoric disorder, substance/medication-induced depressive disorder, depressive disorder due to another medical condition, other specified depressive disorder and unspecified depressive disorder (APA 2013). The most common symptoms of all of the depressive disorders are sadness, emptiness, irritable moods and somatic symptoms. The main difference between the disorders are duration, timing and cause (APA 2013). For the purpose of this study disruptive mood dysregulation disorder and major depressive disorder will be discussed as they are more relevant to the research questions of the current study.

There have been some changes in the categorisation of depressive disorders in the DSM-V; the main one is the separation of the "Depressive Disorders" and "Bipolar and Related Disorders" chapters. Children who suffered from symptoms of bipolar disorder are believed to have disruptive mood dysregulation disorder according to the DSM-V. This was introduced in order to limit the over-diagnosis of bipolar disorder in children. Children with disruptive mood dysregulation disorder suffer from persistent irritability and frequent episodes of extreme

behavioural dyscontrol. This disorder was added to the "Depressive Disorders" chapter for children up to 12 years of age (APA 2013). In total there are 11 diagnostic criteria of disruptive mood dysregulation disorder in the DSM-V (see table 2.3.1(a)).

Table 2.3.3(a): Diagnostic criteria for mood dysregulation disorder

Diagnostic criteria	
A.	Severe recurrent verbal and physical aggression towards people or property
B.	Inconsistent outbursts
C.	Occurrence of outbursts three or more times a week
D.	Observable irritable or angry moods between outbursts for the whole day and almost daily
E.	Criteria A to D present for at least 12 months consecutively
F.	Criteria A and D present in at least two or three environments and at least one of these are severe
G.	First diagnosis should between the ages of 6 and 18 years
H.	Based on observation, onset of criteria A to E are before 10 years of age
I.	Full symptom criteria have never lasted more than one day
J.	Behaviours do not occur during episodes of major depressive disorder and cannot be explained by any other mental disorder
K.	Symptoms are not due to substances or another medical or neurological disorder

Adapted from APA (2013)

Major depressive disorder is the most common disorder within this category. A person suffering from depressive symptoms for a duration of at least two weeks is diagnosed with major depressive disorder. DSM-V listed five main criteria and criteria A consists of nine sub criteria for major depressive disorder. The table 2.3.3(b) lists out the diagnostic criteria for both adult and children's depressive symptoms.

Table 2.3.3(b): Diagnostic criteria for major depressive disorder

Diagnostic criteria
A. At least five of the following symptoms have been present for two consecutive weeks and represent a change from previous function
a. Depressed mood most of the day: feels sad, empty, hopeless (subjective report) or appears tearful (observed by others). Children: Irritable mood
b. Diminished interest or pleasure in activities nearly everyday
c. Significant weight loss or weight gain i.e. a change of 5% of body weight within a month. Children: also consider failure to make expected weight gain.
d. Frequently experience insomnia or hypersomnia
e. Restlessness or being slow (observed by others as well as subjectively)
f. Frequently experience fatigue or loss of energy
g. Feelings of worthlessness or guilt
h. Reduced ability to think or concentrate
i. Frequent thoughts of dying and suicidal ideations
B. The symptoms cause clinical distress or impairment in important day to day functioning, e.g. social, occupational etc.
C. The symptoms are not due to chemical substance or medical condition
D. The occurrence of a major depressive episode is not explained by any form of schizophrenic spectrum disorders or any form of psychotic disorders
E. No previous episode of manic or hypomanic disorders
Adapted from APA (2013)

2.3.4 Psychological theories of depression

Depression theories took a major turn in the 20th century following the developments in the field of psychology. The psychodynamic theories dominated the field of psychology between 1850s and 1930s period by Sigmund Freud. According to Freud, depression manifests itself when anger is converted into self-hatred, that is when the anger turns inward (Freud 1917). The earliest reference to childhood depression was made by Freud and he suggested that neurotic parents who were inconsistent, cold in nature, inconsiderate, angry, and selfish, create a hostile environment for their children (Freud 1917). Children living in these environments were inclined to become either neurotic like their parents or experience anxiety and depressive symptoms. However, according to Freud, depressed children can only be treated for depression through the traditional psychodynamic therapy when they became adults (Rochlin 1959).

The psychodynamic theories went on to develop the modern psychodynamics which provided more complex theories of depression such as the object relation theory (Bowlby 1980), anaclitic theory and introjective theory of depression (Blatt 1974, Blatt & Shichman 1983). The object relation theory referred to the problematic development of healthy relationship representations. It suggested that depression is elicited by the constant struggle of sustaining emotional contact with the desired objects (Bowlby 1980). This theory is no longer used as a diagnostic tool (Diagnostic and Statistical Model - DSM) in the present field of psychology for

identifying the incidence of depression. The anaclitic theory of depression claimed that a person who experiences extreme fears of abandonment and who struggles to maintain direct physical contact with the need-gratifying object, is suffering from the anaclitic form of depression (Blatt 2004). The introjective theory proposed that a person who fails to meet their own standards (in terms of personal achievements) or standards of people they consider important, see themselves as failures (Blatt 2004). This form of depression in the modern psychodynamic field is called introjective depression (Blatt & Zuroff 1992).

In the early 1940s behaviourism became the most influential school of psychology and gained greater recognition for its scientific and empirical methodology. This school of thinking suggested that psychological investigations should solely be conducted through observable and measureable behaviours (Reber & Reber 2001). In relation to depression, Peter Lewinsohn concluded in the mid-1970s that the combination of stressors in the environment and a lack of personal skills led to depressive symptoms (Lewinsohn 1974). Lewinsohn also proposed that when people no longer receive positive reinforcements from their home or work life, they cannot cope and this again causes depression (Lewinsohn 1974). Behaviourism referred to childhood depression briefly, and suggested that children who lack social skills or those who are not receiving positive reinforcement from school were more likely to be depressed. This was a rather early reference to the existence of childhood depression (Nemade *et al.* 2013).

The school of cognitive psychology gained credibility in the 1950s as a response to behaviourism. Cognitivists criticised behaviourism for disregarding the concept of cognition from their theories (Reber & Reber 2001). Cognitive theorists proposed that depression resulted from maladaptive, faulty or irrational cognitions which lead to distorted thoughts or judgements. These distorted thoughts produce depressive symptoms (Lakdawalla *et al.* 2007). According to the cognitivists, children experience depression through a learning process where the child is affected by the depressive cognitions passed on through dysfunctional families (Nemade *et al.* 2013). Some of the most common cognitive theories of depression are described below.

Beck's cognitive theory of depression (Beck 1967, 1987) postulated that depression is caused by negative thoughts which are created from maladjusted beliefs (Lakdawalla *et al.* 2007). The more negative thoughts a person holds, the more depressed they are. There are three main dysfunctional belief themes which are proposed by Beck and these are: (1) I am defective (2) my experiences result in failure (3) the future is hopeless. Such thoughts are referred to as the

Negative Cognitive Triad which leads to depression (Nemade *et al.* 2013). Seligman's learned helplessness model of depression (1975) is one of the most recognised and accepted models of depression. This model suggested that people who are depressed learn to be helpless. According to Seligman, a person who is depressed, after having gone through a stressful life event, believes that whatever they do is inadequate as they have no control over their own environment (Abramson *et al*. 1978). However, this theory has been criticised for the lack of explanation for those who did not experience a stressful life event but suffer from depression (Abramson *et al*. 1978). Ellis stated that people, who create irrational beliefs that take the form of absolute statements, suffer from depression. He called this the cognitive theory of depression (Ellis 1987). Cognitive psychology also branches out to form social cognitive psychology, which was founded by Albert Bandura. Bandura found that the interactions between an individual's behaviours, thoughts and environmental experiences contribute to depression and he also associated self-recrimination and self-blame to depressive symptoms (Bandura *et al.* 1999). These mechanisms are also applicable to children as to adults.

2.3.5 Childhood depression prevalence

Depression was predominantly seen as an adult disorder due to the belief that children were too developmentally immature to experience depression (Sarkar *et al.* 2012). However, the emerging literature presented contradictory findings about the presence of depression in children, which proposed that depression does occur in children as well as adults (De Cuyper *et al.* 2004). To date, the etiology of childhood depression remains unclear (Du 2013). According to Ge *et al*, (2001), depressive symptoms contribute to both mental and physical health problems in adolescence. A study in the US found that between 2% and 3% of pre-pubertal children and between 5% and 8% of adolescents suffered from depression (Erford *et al.* 2011). A similar study in Finland found that the prevalence of depression was 8% in young children (Rønning *et al.* 2011). Lin *et al.* (2008) highlighted an increased rate of depression in Taiwan from 2.8% in children below 13 years of age to 5.6% in adolescents between 13 and 18 years.

Recent statistics of depression in the UK indicated that 80,000 (0.9%) children and young people suffered from severe depression, which included 8,700 (0.2%) children under the age of 10 (Young Minds 2013). There was more evidence which indicated that 1.4% of 11 to 16 year old children (67,000) were seriously depressed in Britain (Young Minds 2013). A study conducted with 723 children from an Irish population in Dublin (aged 12 to 15 years old) found that 4.5% of children were depressed (Lynch *et al*. 2006). Prior to the study by Lynch and colleagues in 2006, Houghton and colleagues provided normative data for the Children's Depression

Inventory (CDI-S) for secondary school children aged between 12 and 18 years (Houghton *et al.* 2003), however such data is only available for 10 to 13 year old children from a primary school population (Meehan *et al*. 2008). Houghton and colleagues in 2003 found that 9.6% of secondary school children scored above the cut-off point of seven for depressive symptoms, while Meehan and colleagues in 2008 reported that 7.4% of primary school children scored above the cut-off point of seven. The Healthy Schools Programme baseline data reported 6% of children between 7 to 12 years of age indicated a score of above seven (Comiskey *et al.* 2012).

Previous data from the Healthy School's Programme also reported some findings on depression. Findings from the parent proxy survey reported that 9% of children scored above the average depression scale at year one, which increased to 14% in the second year. However, the self-report data indicated that depression in children decreased from 17.1% in year one to 16.6% in year two (Comiskey *et al.* 2012). Despite the growing literature on the prevalence of depression in young children, Ireland has not produced further statistics or research on the impact of depression amongst primary school children in urban disadvantaged areas. Most research studies on depression have been conducted in communities with high socioeconomic status. Patel and Sumathipala (2001) stated that only 3% to 6% of mental health research has been conducted in low and middle class communities. However, it is important to note that this study is outdated and that there are now more recent studies conducted in lower socioeconomic communities. Research on childhood depression is very limited in Ireland and across Europe, specifically for the age group 8 to 12 years and there are further gaps in the literature looking at depression among disadvantaged children.

2.3.6 Factors associated with childhood depression

There are various factors associated with depression among child population, these include physical and mental health components. This section will provide brief examples of some of the factors that previous research has shown to be associated with depression. Research has shown that obesity is a significant predictor depression (Chau *et al.* 2013), however, the relationship between these two variables have been inconsistent in the literature (Sigfusdottir *et al.* 2007), and this will be discussed in more detail in chapter 3. Another associated factor is the psychosocial impact on depression, as measured by Health-Related Quality of Life (HRQoL). HRQoL is a method used to assess global psychosocial functioning (Zeller *et al.* 2006) and has been found to be strongly linked to depression (Zeller *et al.* 2006). Previous research has shown that depression is also impacted by bullying (Boivin *et al.* 1995, Fekkes *et al.* 2006). Socioeconomic status is strongly associated with depression, as previously mentioned in section

2.2.5 (McLeod & Shanahan 1993, Duncan & Lamborghini 1994, Bolger et al. 1995, McLeod & Shanahan 1996). There many other factors associated with depression, such as maternal health (Najman *et al.* 2005), anxiety (Ryan *et al.* 1987), stress (Huang 2013), age, disrupted sleep, self-esteem (Mehler-Wex *et al.* 2008), poor concentration (Owens *et al.* 2012), exercise (Reeves *et al.* 2008), poor school performance (Hammen 1998, Kovacs *et al*. 1991) and dietary patterns (Reeves *et al.* 2008).

2.3.7 Measuring childhood depression

There is no standard approach to measuring depression and there are numerous scales which have been devised to quantify human depression (Boyle 1985). Self-report measures of depression come in many configurations (Zimmerman *et al.* 2013), while some measures consist of 100 items, others might only have one or two items (Zimmerman *et al.* 2013). Some scales comprise of multiple statements referring to one symptom, while other scales consist of one statement relating to a symptom. Depression scales also differ in scoring system and not just in their construction (Zimmerman *et al.* 2013). For the majority of measures, a high score refers to more severe depressive symptoms, however this may vary for different measures as each has a unique scoring system. Each scoring system has a predetermined cut-off point at which depressive symptoms are deemed significant. These methods of scoring symptoms are based on the DSM-IV and DSM V (Zimmerman *et al.* 2013). Although the screening measures of depression are developed from the DSM-IV and V, they can only be used to indicate severity of symptoms within a given period of time and should not be used as a diagnostic tool (Sharp *et al.* 2002). The table 2.3.4 illustrate some of the main screening measures for depressive symptoms in children and adolescents. The screening tools for childhood depression mentioned below are generally used for research purposes and not in the clinical setting.

There are various versions of the Children's Depression Inventory (CDI) which was developed by Kovacs (1992). There are self-report versions, original and short form, as well as parent and teacher reports. The purpose of the scales is to measure the degree and severity of depression in children between the age of 7 and 17 years, to identify the presence of depression, which will in turn aid in the treatment process. However, it is not a diagnostic tool and should not be used as substitute for clinical diagnostic tools (Kovacs & Staff 2003). The CDI scale enables researchers to quantify depressive symptoms based on reports from children, adolescent, parents or caregivers, and teachers. For the purpose of this study, CDI-S self-report was used as the participants were between the ages 8 to 12 years. The self-report version of CDI was developed based on normative data from 1,266 respondents (Finch *et al.* 1985). The CDI-S has a strong

reliability with a Cronbach alpha score of .89 from a Canadian population (Kovacs 2003) indicating strong internal consistency and strong validity. It has been widely used both clinically and in research and has also been recommended for use as a screening tool in both settings by previous research (Kazdin *et al.* 1983).

Table 2.3.4: Screening measures for depression in children and adolescents

Measures	Age	Class Grade	Number of Items	Time to Complete
Children's Depression Inventory (CDI)	7 to 17	1st	27, 10 & 2	5 to 15
Center for Epidemiological Studies – Depression Scale for children (CES-DC)	12 to 18	6th	20	5 to 10
Center for Epidemiological Studies – Depression Scale (CES-D)	14 and older	6th	20	5 to 10
Reynolds Child Depression Scale	8 to 12	2nd	30	10 to 15
Reynolds Adolescent Depression Scale	13 to 18	3rd	30	10 to 15
Beck Depression Inventory (BDI)	14 and older	6th	21	5 to 10

Adapted from Sharp *et al.* (2002)

2.3.8 Summary

This section provided a review of our current understanding of depression and how it developed from the ancient term melancholia. This was followed by a discussion of the origin of childhood depression, the difference between adult and child depression based on the DSM, the prevalence of childhood depression and measures of childhood depression. Although depression has been shown to have detrimental effects on children, research in the field of childhood depression is still limited and this is due to the notion that children are too immature to suffer from depression. More specifically, the impact of depression on younger children and those from lower socioeconomic background are less researched. Therefore, it is important to evaluate the impact of childhood depression and further investigate interventions and treatments for this disorder. The next section discusses childhood obesity, as it is a growing health issue affecting a large proportion of children globally. From the review of childhood depression in this section, it is also evident that there are strong connections between depression and obesity. However, the exact relationships between the two variables remain unclear to date. Hence, a review of childhood obesity is below.

2.4 Childhood obesity

Obesity has significant negative health and wellbeing consequences both during childhood and in adulthood (Lakshman *et al.* 2012). Due to the worldwide increase of obesity, it has become a major concern for health professionals (Rooney *et al.* 2011). Childhood obesity is also increasing at an alarming rate which poses a key health challenge (Rooney *et al.* 2011). Research by Ogden and Carroll proposed that obesity in children and adolescents has tripled since the 1980's (2010). Whelton *et al.* (2007) concluded that there is an obesity epidemic among children in Ireland. Further studies have suggested that higher rates of childhood obesity are also prevalent in lower socioeconomic backgrounds (Lakshman *et al*. 2012). For example, research by He *et al.* has shown that family socioeconomic status is highly correlated with childhood overweight and obesity (He *et al.* 2014). Another study in the UK, National Child Measurement Programme (NCMP), has reported that childhood obesity is strongly associated with economic deprivation, which showed increased rates of childhood obesity between the years 2012 and 2013 (Falconer *et al.* 2014). There are many factors associated with overweight and obesity other than socioeconomic status, such as genetic, metabolic, behavioural, environmental, parental education and cultural factors (Rooney *et al.* 2011). Studies have shown that childhood obesity can lead to negative health consequences, both physical and psychological problems (Reilly *et al.* 2003). The most common physical health comorbidities include diabetes, hypertension and cardiovascular disease (Lakshman *et al.* 2012) and the most common psychological problems include lower self-esteem and depression (Afari *et al.* 2010; Dockray *et al.* 2009).

2.4.1 Defining and measuring obesity

Obesity is defined as "excess body fat that creates increased risk of morbidity and/or premature mortality" (Lakshman *et al.* 2012 p. 1772). A general definition of childhood obesity, provided by the WHO, is a Body Mass Index (BMI) score of above the 95th percentile by age and gender. The WHO definition of adult obesity is a BMI above or equal to $25kg/m^2$ (WHO 2014).

BMI is the most universally used index for measuring and also the most practical and inexpensive method of classifying overweight and obesity (Onis *et al.* 2010). It is an index for weight-for-height measurement defined as an individual's weight in kilograms divided by height in metres squared (kg/m^2) (WHO 2014). As mentioned above, adults with a BMI above or equal to $25kg/m^2$are considered overweight and a BMI above or equal to $30kg/m^2$is classified as obese (WHO 2014). Measuring childhood obesity is difficult, according to the WHO, as a child's body is still developing therefore different methods have to be used based on their age (2014). As a result, BMI-for-age in children and adolescents is used to measure and define obesity (Onis *et al.* 2010). A large sample of growth data is collected from children who demonstrate different BMIs for different ages and gender. This population reference is then used to compare individual children, from which degrees of variation is calculated to allow for classification of underweight, normal, overweight and obese. BMI scores are often referred to as z scores (standard deviations). If a child has a z score of 2, they are above the average weight for that particular age group and gender by a standard deviation of 2. Similarly, if the *z* score indicates -2, the child is said to be 2 standard deviations below the average BMI (Dinsdale *et al.* 2011). Another way of explaining it is a child with a BMI of ≥ 85th percentile is overweight and a BMI of ≥ 95th percentile is obese (Reilly 2007).

There are four main child growth references used to classify overweight and obesity: UK90, International Obesity Task Force (IOTF), United States Centres for Disease Control and Prevention (CDC) and WHO charts (Dinsdale *et al.* 2011). The UK90 is mainly used in the UK and it is applied to people between 0 to 23 years of age (Dinsdale *et al.* 2011). The IOTF was developed in 2005 and has mainly been used outside of the United States; however, its effectiveness is lower than the CDC and WHO charts, as the sensitivity of IOTF obesity criteria was only 48% for boys and 62% for girls, they failed to identify one half of the children who were obese (Fu *et al.* 2003, Zimmermann *et al.* 2004). The CDC chart was developed in 2000 and the WHO chart was developed in 2007. A previous study by Gonzalez-Casanova and colleagues have investigated the differences between the three measures of BMI, IOTF, CDC and WHO charts, and found that there are significant differences across the three classifications in estimating the prevalence of overweight and obesity (Gonzalez-Casanova *et al.* 2013). The study reported that the WHO system results in higher prevalence estimates while the IOTF system

results in lower prevalence estimates. The main reason for such differences in the three classification systems is due to the sample on which the charts are based. The WHO reference population is intended to be a non-obese sample, while CDC and IOTF is based on more recent samples of BMI distributions which have already shifted to a more realistic sample which takes into account the recent increase of overweight and obesity in children. The findings from this study suggest that there is a lack of consistency across these three main classification systems (Gonzalez-Casanova *et al*. 2013).

2.4.2 Prevalence of childhood obesity

A study in the US looked at the prevalence of childhood obesity between the year 2011 and 2012, the findings were of great concern as it indicated increased rates of childhood obesity (Ogden *et al.* 2014). Some of the findings found that overweight or obese prevalence among youth between 2011 and 2012 was 31.8% (overweight) and 16.9% (obese) (Ogden *et al.* 2014). Various studies within an Irish population have reported an increased rate of obesity among Irish children. Obesity findings from the Growing Up in Ireland (GUI) study in 2009 reported an increased rate of 19% in nine year old children who were overweight and 7% obese (Layte *et al.* 2011). The study by Whelton and colleagues reported that 23% of boys in Ireland and Northern Ireland were overweight or obese, as compared to 28% of girls being overweight or obese (Whelton *et al.* 2007). Other findings on obesity from the Irish Universities Nutrition Alliance (IUNA 2005; 2008) reported that 22% of Irish children between the age of five and 12 years are overweight or obese, moreover 11% of Irish children between the age of 13 and 17 years are overweight and 8% are obese. More recent findings from the Healthy Schools Programme (HSP) also reported high prevalence of 29.6% overweight and obesity among urban disadvantaged children in 2009, which has increased to 35.2% in 2011 (Comiskey *et al.* 2012). Another study in 2012 reported incidence rates of 25% of children at nine years of age being overweight (19.3%) or obese (6.6%) (Keane *et al.* 2012). However, a systematic review conducted by Keane and colleagues in 2014, found that although the obesity rates among primary school children remained high in Ireland, the prevalence of obesity appeared to be stabilising. This was based on 14 studies, published between the years 2002 and 2012, which were included in the review (Keane et al. 2014). More recent findings on obesity from the Irish Universities Nutrition Alliance (IUNA 2005; 2008) reported that 22% of Irish children between the age of five and 12 years are overweight or obese, moreover 11% of Irish children between the age of 13 and 17 years are overweight and 8% are obese. The Healthy Schools Programme (HSP) also reported high prevalence of 29.6 % overweight and obesity among urban disadvantaged children in 2009, which has increased to 35.2% in 2011 (Comiskey *et al.* 2012).

2.4.3 Factors associated with obesity

There are various predictors of obesity, for example, parental obesity, socioeconomic status, maternal education and one parent family (Keane *et al.* 2012, Shrewsbury *et al.* 2008). Predictors of obesity can be physical, social and psychological. However, the relationship between obesity and psychological factors such as depression remains uncertain (Incledon *et al.* 2011, Luppino *et al.* 2010): does obesity predict psychological problems or do psychological problems predict obesity? There are many studies that examined psychological factors as a predictor of obesity in adults; however, few studies have investigated psychological factors as a predictor of childhood obesity (Incledon *et al.* 2011). Some of these studies focussed on depression as a predictor of obesity and have also reported a strong correlation between the two factors (Blaine 2008, Liem *et al.* 2008). Other psychological factors investigated in relation to overweight and obesity were self-esteem and temperament (Parsons *et al.* 1999). An explanation for how psychological disorders, such as depression, lead to obesity was provided. According to Kalarchian *et al.* depressive symptoms such as excessive eating and inactivity could lead to obesity over time (2012). Other studies in 2002 found that depressed adolescents are at an increased risk of the onset of overweight and obesity (Goodman *et al.* 2002). Marks and colleagues reported a high level of 55% of obese and overweight adolescent with depression (Marks *et al.* 2009). Another interesting key factor which has been strongly associated with obesity is HRQoL. Studies have shown that obese children are more likely to experience low HRQoL compared to children of normal weight (Pratt *et al.* 2012, Zeller *et al.* 2006, Ravens-Sieberer *et al.* 2001, Schwimmer *et al.* 2003).

Obesity is associated with multiple factors as previously reported; biological, environmental and behavioural factors (Ciblis *et al.* 2012). It has been associated with numerous physical health consequences. As mentioned previously, the most common physical health disorders are cardiovascular disease, hypertension and diabetes (Reilly 2005). According to Reilly (2005) the following disorders are most common among people who are obese; psychological problems, cardiovascular risk factors, asthma and chronic inflammation, social and economic disadvantage, persistence of obesity, persistence of cardiovascular risk factors, morbidity, and increased risk of premature mortality (Reilly 2005). With regards to behavioural problems, according to Griffiths and colleagues, obese children encounter more behavioural problems (2013). Other variables strongly linked to obesity are breakfast intake and body weight perception (Arora *et al.* 2012). Arora and colleagues reported that daily breakfast intake was associated with less overweight and obesity (2012), this was also reported by Sandercock *et al.* (2010) and Croezen *et al.* (2009). In relation to body weight perception, research has found that body weight perceptions are not in agreement with actual weight of children and as a result weight control behaviours are not adopted appropriately (Wang *et*

al. 2009, Cheung *et al.* 2007). The inaccurate perception of body mass is reported to be common in all ethnic groups (Viner *et al*. 2006).

Psychological problems are highly correlated with childhood obesity, as mentioned previously, low self-esteem and behavioural problems are among the most common psychological illness observed in obese children (Reilly 2005). Another psychological disorder which is highly prevalent in obese children is depression (Gurley-Calvez *et al.* 2010, Reeves *et al.* 2008).

Cardiovascular risk factors which are strongly associated with adult obesity and childhood obesity are hypertension, dyslipidaemia, abnormalities in left ventricular mass, and abnormalities in endothelial function, and hyperinsulinaemia/insulin resistance (Reilly 2005). Increased prevalence of asthma has also been linked to obesity. There are studies that have reported on the development of asthma as a result of obesity (Figueroa-Muñoz *et al.* 2001, Lucas *et al.* 2005, Hampton 2014); however, the mechanism of the connection remains unclear (Papoutsakis 2013). According to Hannon *et al.* obesity is the most important risk factors of Type 2 Diabetes Mellitus among children (2005). Studies have found that the prevalence of overweight and obesity corresponds to the prevalence of diabetes in children (Rocchini 2002, Rosenbloom 2002). Another study by Young *et al.* suggested that it is important to tackle obesity at an earlier stage in order to avoid major health consequences, specifically diabetes (Young *et al.* 2000). More recent findings on the relationship between obesity and diabetes presented similar findings of increased prevalence in children (Ventura *et al.* 2009, DeBoer 2013).

An important consequence of obesity, which is often neglected, is the direct and indirect costs associated with increased BMI. In 2013, Keaver et al. reported that direct healthcare costs will amount to €5.4 billion in the Republic of Ireland by 2030. It was also reported that if the obesity rate was to drop by 5% by 2030, the government would save €495 million over 20 years (Keaver *et al.* 2013). A systematic review was conducted on obesity in an adult population between 2001 and 2011. Five studies were included in the review and the findings suggested that an increase in BMI leads to an increase in direct healthcare costs. Indirect costs also increase with BMI as a result of reduced productivity and premature mortality (Dee *et al*. 2014).

2.4.5 Summary

This section provided a detailed account of the definitions of childhood obesity and also the measures currently in use to detect overweight and obesity in children. The chapter also discussed the increased prevalence of childhood obesity, the predictors of obesity as well as its impact on the physical and mental health of children. The alarming increase of childhood obesity worldwide raises major concern

for health care professionals, researchers and the government. Many researches have investigated the impact of childhood obesity on physical and mental health. Physical health problems include cardiovascular disease, hypertension, asthma (Reilly 2005) and diabetes (DeBoer 2013). The most common psychosocial factors associated with childhood obesity are depression (Reeves *et al.* 2008), low self-esteem (Afari *et al.* 2010) and behavioural problems (Reilly 2005). Another major concern is the economic factor of increased obesity level. As reported earlier, increased BMI leads to both increased direct healthcare costs and indirect costs (Dee *et al.* 2014). Hence, it is important for health care professionals, researchers and government bodies to take further action in tackling this challenging issue of childhood obesity.

The next section presents a review on poor school performance among children and this relates back to chapter one. As previously mentioned, the major seminal studies conducted on children nationally and internationally provided evidence to show that children's school performance is affected by their physical and mental health. It is also evident that depression is connected to poorer school performance among children and we find that poverty is significantly associated with reduced school performance among children. This could potentially lead to negative consequences in future adulthood, therefore it is important to investigate this matter further in order to provide solutions for children from lower socioeconomic background to improve their academic performance.

2.5 School performance

This segment describes the concept of poor school performance and the current measures used in an educational setting. The predictors of poor school performance are then presented, broadly looking at the overall predictors. The predictors discussed include physical, mental and social factors that have an influence on children's performance in school.

2.5.1 Poor school performance

School performance is one of the most important goals of education in this competitive age. Performance itself depends on various factors such as age, sex, intelligence, personality, motivation, socioeconomic status, attitude, study habits and mental health (Yarriswamy *et al*. 2014).

Poor school performance has been associated with various factors such as low socioeconomic status (Ainsworth 2002), the family education of a child, the income within the household and the parents or guardians' occupation (Roos *et al.* 2006). However, research has shown that low socioeconomic status is the strongest predictor of poor school performance (Considine *et al.* 2002). It has also been postulated that the same factors, which predict low school performance, are also dominant predictors for school dropout, absenteeism and grade retention (Audas 2002, Haveman *et al.* 1994). Health factors have repeatedly been shown to be strongly associated with poor school performance among

children. Health factors can either be a chronic illness, a temporary illness, pain, fatigues, or any other physical discomfort (Winding *et al.* 2013). For example, a recent study reported that there is a statistically significant association (p<.01; multiple linear regression) between headaches and poor grades among school children (Rocha-Filho *et al.* 2014). However, health factors also include mental health and problem behaviours which have been significantly correlated with bad performance in school (Winding *et al.* 2013).

2.5.2 Measuring school performance

School performance is generally measured in the form of standardised tests. Standardised test has been defined as a test which has undergone thorough empirical analysis within an adequate norm and has also been tested for reliability and validity (Reber & Reber 2001). The use of standardised tests has increased enormously in the education setting (Coleman *et al.* 1970). These standardised tests are used in an effort to evaluate the school systems available, and they are mostly focused on testing verbal and mathematical abilities (Coleman *et al.* 1970).

The current method of measuring school performance in Ireland is through the Standardised Drumcondra English and Maths tests, and standardised Micra T and Sigma T tests. These tests can be converted from total raw scores to standard scores, STEN scores and percentile ranks. The total raw scores are the total number of correctly answered questions. All of the different types of scores are derived from the raw scores, i.e. the standard scores, STEN scores or percentile ranks cannot be calculated without the total raw scores. However, the conversion process of the raw scores is vital in order to allow for standardisation.

In order to obtain the standard scores, the total raw scores have to be converted into a set of score which can fit a normal distribution. The normal distribution of scores must have a mean of 100 with a standard deviation of 15. This allows for individual comparison of children's performance to the performance of other children who sat the test and these are presented in bands of scores. The standard score ranges are depicted in table 2.5.2(a).

Table 2.5.2(a): Standard score range

Standard Score Range	Descriptor	Coverage
115 and above	Well above average	Top one-sixth of pupils
108-114	High average	One-sixth of pupils
93-107	Average	Middle one-third of pupils
85-92	Low average	One-sixth of pupils
84 and below	Well below average	Bottom one-sixth of pupils

Adapted from ERC (2013)

The STEN scores range from one to ten (see table 2.5.2(b)) and it is in bands of scores rather than absolute scores, similar to the standard score bands. These bands are narrow enough to distinguish statistically significant differences between candidates, but wide enough not to over stress minor changes.

Table 2.5.2(b): STEN score range

STEN Score Range	Descriptor	Coverage
8-10	Well above average	Top one-sixth of pupils
7	High average	One-sixth of pupils
5-6	Average	Middle one-third of pupils
4	Low average	One-sixth of pupils
1-3	Well below average	Bottom one-sixth of pupils

Adapted from ERC (2013)

Percentile ranks allow for comparison between a child's test scores and other children in a norm group. If a child receives a percentile rank of 50, it means that the child performed equally or better than 50% of children from the norm group.

2.5.3 Factors associated with poor school performance

There are many factors which has a negative impact on school performance and these are: (1) medical problems, (2) neurobehavioural disorders, (3) emotional problems, (5) poor sociocultural home environment, (6) psychiatric disorders, and (7) environmental causes (Karande *et al.* 2005).

Some of the mental health factors, which have been associated with poor school performance, are low levels of self-esteem, inability to concentrate, depression (Hammen 1998, Kovacs *et al.* 1991), behavioural problems and emotional problems (Adams *et al.* 1992). Childhood depression has a significant negative influence on school performance; such negative impact often leads to unstable outcomes in further education and career (Fröjd *et al.* 2008). There are various medical and neurobehavioural factors associated with school performance and these are listed in the table 2.5.3.

Table 2.5.3: Specific medical problems and neurobehavioural disorders

Medical problem (Karande *et al.* 2005)	Preterm Birth, Low Birth Weight (LBW) Malnutrition and nutritional deficiencies Worm infestations Hearing impairment Visual impairment Asthma and allergic rhinitis Epilepsy Cerebral palsy Leukaemia and lymphoma Sickle cell anaemia Thallasemia major Hemophilia Type I diabetes mellitus Congenital Hypothyroidism (CH) Habitual snoring
Neurobehavioural disorders (Karande *et al.* 2005)	Specific Learning Disability Attention Deficit Hyperactivity Disorder (ADHD) Autism Tourette Syndrome (TS)

A number of studies have reported that poor school performance is an important factor in the development of children's behavioural conduct (Tremblay *et al.* 1992). Research has shown that poor school performance does predict problematic behavioural conduct (Schweinhart 1987). However, it has also been found that conduct problems predict poor school performance; the relationship between the two factors is unclear (Tremblay *et al.* 1992). Despite this unclear relationship between the two factors, poor school performance is most frequently referred to as the primary cause of problem behaviour by researchers (Finn *et al.* 1989). High rates of school dropouts have been correlated with poor school performance (Finn *et al.* 1989) and this association is believed to be due to behavioural problems that children exhibit (deJung *et al.* 1986). Studies have also shown that poor school performance can be due to a school's failure to provide the appropriate teaching environment and adequate emotional support (Finn *et al.* 1989).

As previously mentioned, research has shown that low socioeconomic status is one of the strongest predictors of poor school performance among children (Moffitt *et al.* 1981, Eckenrode *et al.* 1993). There are other studies which suggest that classroom behaviour is a good predictor of poor school performance (Alexander *et al.* 1993). Parental educational background is strongly correlated with children's school performance and subsequently this relates to the socioeconomic status of the child (Considine 2002). Research has claimed that there is a high rate of school problems, such as behavioural misconduct, among maltreated children (Salzinger *et al.* 1984, Christiansen 1980). A

recent study reported that breakfast intake is associated with academic achievement (Ptomey *et al.* 2016). Breakfast-skipping has also been associated with low-income urban children (Dysktra *et al.* 2016), indicating that there may be a connection between socioeconomic status and breakfast intake which is impacting on children's ability to succeed in school activities.

2.5.4 Summary

This segment provided an overview of poor school performance among children and the predictors associated with poor performance in schools. There are various predictors which have been identified as having a major influence on children's performance. Some of the factors which have been identified in this chapter were unexpected (e.g. asthma, malnutrition and nutrition deficiencies), while others were factors which have consistently been linked to poor school performance, for example, socioeconomic status. Based on the review provided in this chapter, it is evident that there are multiple factors which influence children's performance in school. These include biological, psychological and social factors. It is also evident that performance decline in children is multifactorial. This has also been observed in the previous sections on depression and obesity. The idea that such diverse disorders are impacted by a combination of factors was mainly influenced by the biopsychosocial model, this model is discussed as the conceptual framework in chapter 4.

2.7 Chapter summary

The aim of the current study is to identify what is the relationship between depression, obesity and school performance among urban disadvantaged children from an Irish population. A review of the key seminal studies on children's health and wellbeing revealed that there are major health issues associated with children from disadvantaged population. The main elements identified by the seminal studies were depression, increased BMI rates, and decline in school performance. Although depression, obesity and poor school performance have come up in both national and international seminal studies, research has failed to evaluate if there is a relationship between these three variables. Hence, this study aims to identify the relationship between the three factors. This chapter broadly discussed factors, which may be associated with depression, obesity, and poor school performance. The next chapter presents a narrative review on the relationship between depression, obesity and poor school performance.

Chapter 3: Narrative review on the relationship between depression, obesity and poor school performance

3.1 Introduction

This chapter presents a narrative review on the relationship between depression, obesity and poor school performance among school-aged children. As previously discussed in chapter two, the relationship between depression, obesity and poor school performance among disadvantaged children is inconsistent despite the links between the three variables. The review is presented using the IMRAD format (Introduction, Method, Results and Discussion), as it is the most commonly used structure of reporting narrative reviews (Ferrari 2015). The objective of this narrative review is to identify studies that investigates the relationship between depression, obesity and school performance.

3.1.1 Limits and scope

One limitation was added to the search and this was; school aged children. No further limits were applied, such as time range and types of study, as the researcher wanted to capture all relevant studies from across different period and different types of methodology. Essentially, to be included the studies must measure all three variables of interest, i.e., the studies must measure depression, obesity (either through BMI or other measurements of weight) and school performance (either test scores, or parent report or teacher report of children's performance in school), from a school aged child population.

3.2 Methodology

A comprehensive search of four selected computer databases, PsycINFO, CINAHL, Medline, and EMBASE, using the key search terms listed in the table 3.2, covering all years, was conducted. Studies which consisted all three variables of interest was included in the review. Only quantitative studies were included as the key inclusion criterion states that the studies must measure all three variables, see below. Grey literature has also been included in the search by including conference proceedings, dissertations and potential ongoing clinical trials. Other sources were also included, for example, searching the reference list of included studies and the clinical trials database (www.clinicaltrials.gov). No relevant trials were identified for inclusion. Articles were included for the current analysis if they met the following criteria:

1. Participants were children
2. Studies included all three variables; depression, obesity and school performance

3. Studies measured all three variables, depression, obesity and school performance, as an outcome

Table 3.2: Keywords

Database	Keywords
PsycINFO	(DE "Major Depression" OR TI (Depressive OR Depression) OR AB (Depressive OR Depression)) AND (DE "Overweight" OR DE "Obesity" OR DE "Body Mass Index" OR DE "Obesity (Attitudes Toward)" OR TI (Overweight OR Obesity OR Obese OR "Body Mass Index" OR "BMI") OR AB (Overweight OR Obesity OR Obese OR "Body Mass Index" OR "BMI")) AND (DE "Educational Measurement" OR DE "School Learning" OR DE "Test Performance" OR DE "Academic Achievement" OR DE "Standard Scores" OR DE "Scoring (Testing)" OR TI ("Educational Measurement" OR "School Learning" OR "Academic Achievement" OR "Academic Achievements" OR "School Achievement" OR "School Achievements" OR "Standard Scores" OR Assessment OR Assessments OR Attainment OR Test OR Tests OR Testing OR Examination OR Examinations) OR AB ("Educational Measurement" OR "School Learning" OR "Academic Achievement" OR "Academic Achievements" OR "School Achievement" OR "School Achievements" OR "Standard Scores" OR Assessment OR Assessments OR Attainment OR Test OR Tests OR Testing OR Examination OR Examinations)) Limit to school age (6-12 yrs)
CINAHL	(MH "Depression" OR TI (Depressive OR Depression) OR AB (Depressive OR Depression)) AND (MH "Obesity" OR MH "Pediatric Obesity" OR MH "Attitude to Obesity" OR MH "Obesity, Morbid" OR MH "Body Mass Index" OR TI (Overweight OR Obesity OR Obese OR "Body Mass Index" OR "BMI") OR AB (Overweight OR Obesity OR Obese OR "Body Mass Index" OR "BMI")) AND (MH "Educational Measurement" OR MH "Academic Performance" OR MH "Achievement Tests" OR TI ("Educational Measurement" OR "School Learning" OR "Academic Achievement" OR "Academic Achievements" OR "School Achievement" OR "School Achievements" OR "Standard Scores" OR Assessment OR Assessments OR Attainment OR Test OR Tests OR Testing OR Examination OR Examinations) OR AB ("Educational Measurement" OR "School Learning" OR "Academic Achievement" OR "Academic Achievements" OR "School Achievement" OR "School Achievements" OR "Standard Scores" OR Assessment OR Assessments OR Attainment OR Test OR Tests OR Testing OR Examination OR Examinations)) Limit to school age (6-12 yrs.)
MEDLINE	(MH "Depression" OR TI (Depressive OR Depression) OR AB (Depressive OR Depression)) AND (MH "Obesity" OR MH "Pediatric Obesity" OR MH "Obesity, Morbid" OR MH "Body Mass Index" OR TI (Overweight OR Obesity OR Obese OR "Body Mass Index" OR "BMI") OR AB (Overweight OR Obesity OR Obese OR "Body Mass Index" OR "BMI")) AND (MH "Educational Measurement" OR TI ("Educational Measurement" OR "School Learning" OR "Academic Achievement" OR "Academic Achievements" OR "School Achievement" OR "School Achievements" OR "Standard Scores" OR Assessment OR Assessments OR Attainment OR Test OR Tests OR Testing OR Examination OR Examinations) OR AB ("Educational Measurement" OR "School Learning" OR "Academic Achievement" OR "Academic Achievements" OR "School Achievement" OR "School Achievements" OR

	"Standard Scores" OR Assessment OR Assessments OR Attainment OR Test OR Tests OR Testing OR Examination OR Examinations)) Limit to school age (6-12 yrs.)
EMBASE	'depression'/exp OR 'major depression'/exp OR ('depressive' OR 'depression'):ab,ti AND 'obesity'/exp OR 'pediatric obesity'/exp OR 'body mass'/exp OR (Overweight OR Obesity OR Obese OR "Body Mass Index" OR "BMI"):ab,ti AND 'academic achievement'/exp OR ("Educational Measurement" OR "School Learning" OR "Academic Achievement" OR "Academic Achievements" OR "School Achievement" OR "School Achievements" OR "Standard Scores" OR Assessment OR Assessments OR Attainment OR Test OR Tests OR Testing OR Examination OR Examinations):ab,ti AND [embase]/lim AND [child]/lim

3.3 Results

Of the 1032 articles located, eight studies met the inclusion criteria, as indicated in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement figure 3.3 below. The PRISMA diagram is a search process widely used for Systematic Reviews and Meta-Analyses (Moher *et al.* 2009). After the removal of duplicates, the exclusion process started with the 741 studies. The records were then screened based on title and abstract and 731 articles did not meet the eligibility criteria. The selection was made based on the three inclusion criteria and mostly, the studies were not included because it did not measure all three key outcome variables, while other studies were excluded because the participants were not children. The full-text of the remaining 10 records were examined and two were removed as it did not meet the inclusion criteria, one study did not measure child depression and focused on maternal depression, and the other study was a methodological paper. Data extraction was then conducted on the studies as shown in the table 3.3.1 below.

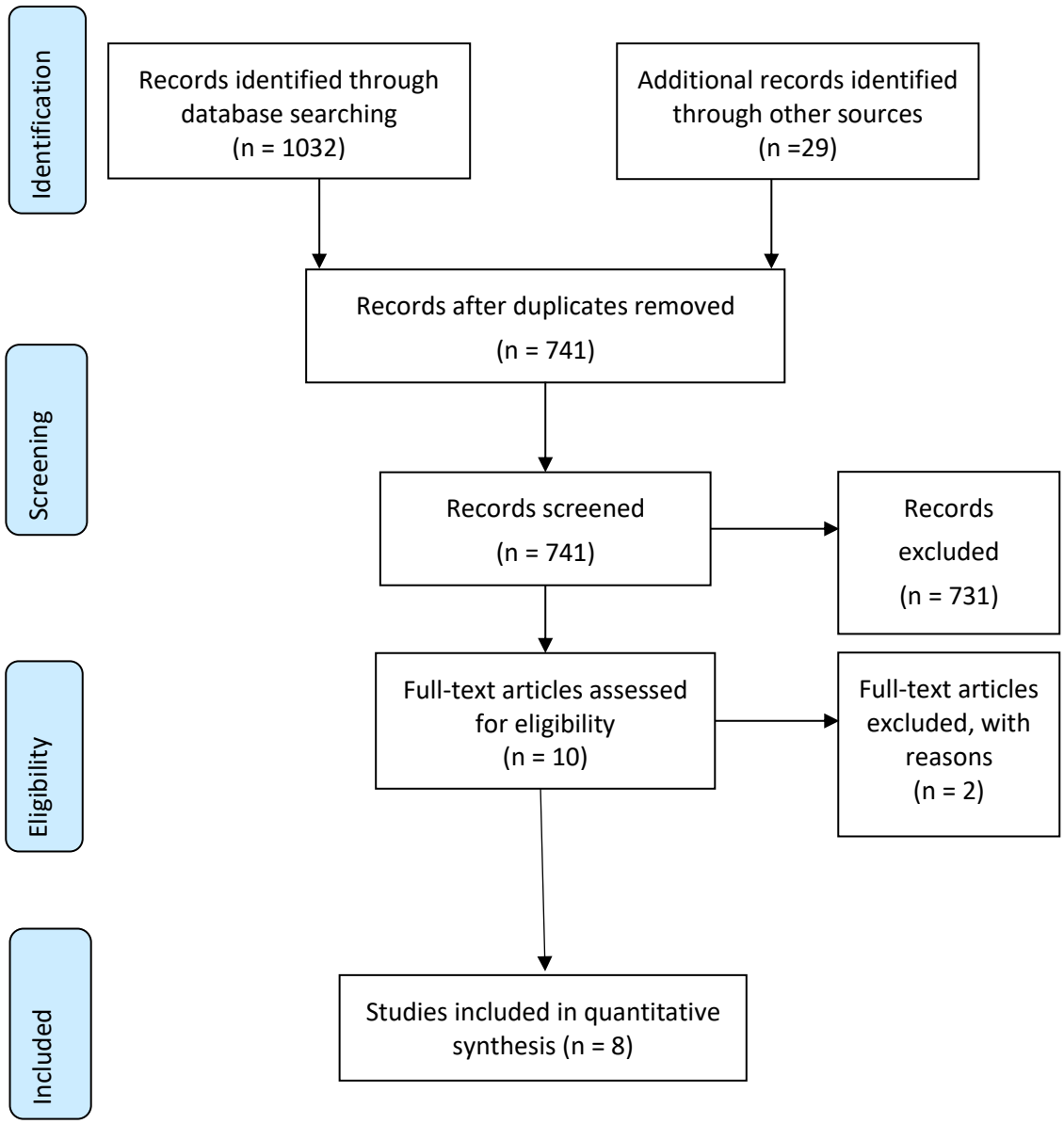


Figure 3.3: Study selection process using PRISMA

Table 3.3.1: Summary of eligible studies

Author (Year), Country	*Design*	*Participants*	*Methods*	*Key significant findings on depression, obesity and school performance*
1. Gunnarsdottir et al (2012), Iceland	Cross-sectional survey design	91 families of obese children aged between 8 to 12 years.	Screening interviews and background information questionnaires. Survey-based data collection Frequencies, percentages, means and SDs, Confidence Intervals. T-tests and chi-square tests to compare groups, correlations, linear, logistic and multiple regressions. The main objective was to explore the prevalence of psychological maladjustments, academic performance and teasing among obese children using child reports. The second objective was to assess if teasing contributed to significant variance in children's psychological adjustment and academic competence of obese children. The psychological aspects consisted of depression, self-concept and anxiety as main outcomes.	This study does not focus on the relationship between depression, obesity and poor school performance; however, it was included as it met the eligibility criteria. The results did inform the researcher on some aspect of the relationship between depression, obesity and poor school performance, indicating that there were no correlations between the three variables. However, gender (weak positive correlation) and age (medium negative correlation) were reported as significant variables in relation to BMI.

2.	Gunnarsdottir et al (2012), Iceland	Longitudinal survey design	91 families of obese children aged between 8 to 12 years. 84 families enrolled in the programme.	Screening interviews and background information questionnaires. Survey-based data collection Frequencies, percentages, means and SD's, Confidence Intervals. T-tests and chi-square tests to compare groups, ANOVA and multiple regressions. The focus was to explore the effect of the Epstein family-based behavioural programme on psychological maladjustments, academic performance and teasing among obese children using child reports. The second outcome was to assess if teasing contributed to significant variance in children's psychological adjustment and academic competence of obese children. The psychological aspect consisted of depression, self-concept and anxiety as main outcomes.	This study is not directly relevant to the current study; however, it was included as it met the eligibility criteria. The results did not help inform the researcher on the relationship between depression, obesity and poor school performance as this was not the aim of the article. However, it was interesting to see that the Epstein's family-based behavioural programme did not have an impact on obese children's depression scores or academic competencies.
3.	Sigfusdottir et al. (2007), Iceland	Cross-sectional survey design	6346 Icelandic secondary school students. Aged between 14 and 15.	Self-administered surveys given to children in school settings, and supervised by teachers. BMI were calculated from self-reported height and weight.	In relation to the key variables, the study reported that children with higher BMI scores had lower grades and higher depressed moods compared to children with a BMI less

				Pearson's r correlation. Independent samples *t*-tests. Ordinary Least Squares (OLS) Regression analyses. Key Variables: BMI, diet, physical activity, academic performance, depressed mood and self-esteem.	than 85th percentile, which suggests that there is a link between BMI and grades, and BMI and depressed moods. Statistically significant correlations were reported between BMI and depressed moods (low positive correlation), BMI and grades (low negative correlation), and depressed moods and grades (low negative correlation). Gender, BMI and depressed moods were reported as significant predictors of grades.
4.	Lim et al (2016), Korea	A three-wave prospective cohort study.	759 children from elementary school (grades 4-6) in 2006. The children -were followed up in 2009 when they reached middle school (grades 7-9, n= 609) and in 2012 when they reached high school (grades 10-12, n= 496)	Data were collected by an existing study - the CSS-KoWePs prospective cohort study. Survey-based Chi-square tests, independent samples t test, and logistic regression was used. Key variables: gender, family structure, SES, stressful life events, health problems, obesity, self-esteem, depressive symptoms, peer attachment, discussion of personal issues, grade, academic performance and school adaptability	Overall, the study reported that there were gender differences among older children on their levels of depressive symptoms. There were no significant differences in BMI and grades among depressed and non-depressed groups across different ages. However, self-reported school performance was significantly different for non-depressed students with higher percentages of students within the 'below average', 'average' and 'above average' categories. It is evident that gender and age also plays significant role, however the correlational relationship between depression, obesity and school

					performance were not assessed and therefore does not help inform the researcher about the nature of the relationship between the variables.
5.	Chau et al (2013), France	Cross-sectional survey design	1559 adolescents from middle school in France, aged between 12 and 14+	Survey based data collection and a trained physician measured BMI. Logistic regression models Socioeconomic characteristics measured by profile questionnaire. A trained physician on the team measured BMI. Depressive symptoms were measured using Kandel scale. 1 question on suicide was asked and an 11-item scale on violence was used. School performance was measured based on grade repetition and school mark out of 20. Questions on substance use were gathered using questions about use in the last 30 days.	The study by Chau and colleagues reported two key findings that are relevant for the current study. They reported that boys had a higher risk of experiencing depressive symptoms, and a higher risk of being obese, both of which were associated with increasing age. According to the study, gender and age are relevant risk factors for both depressive symptoms and obesity. This also presents with contradictory findings on gender since most studies have reported that girls are generally at higher risk of experiencing depressive symptoms and obesity. Chau's study did not assess the relationship between depression, obesity and poor school performance, and therefore the nature of the relationship between these variables remain unclear.
6.	Booth et al (2014), UK	Longitudinal		Data were collected by an existing study the ALSPAC Study in the UK. It is an ongoing	Once again, gender differences were highlighted, indicating that overweight and

		survey design	ALSPAC data: 5966 participants aged between 11 - 16 years.	population-based study on children's health and development. Survey based data collection and also BMI measurements. Linear regressions with dummy variables. A series of 10 regression was used models and a series of mediation models were used. Main outcomes - BMI, Academic achievement, Confounding variables - Child's Depressive symptoms and mother's health/occupation/education	obese girls had lower school performance compared to overweight and obese boys. These differences remained with increasing age. The mediation analyses, with depression as the mediating factor between the independent variable obesity, and the dependent variable school performance, reported that depression did not have a mediating effect. It was also reported that obesity did not affect school performance.
7.	Smith (2013), US	Longitudinal survey design	397 males and 402 females aged 15 years. From a longitudinal sample of 1,364 children in phase I and 1,009 in phase IV. The data came from the National Institute of Child Health and Development.	The NICHD Longitudinal study collected survey data on various variables. Correlation, multiple regression, and moderation analyses. BMI - Height/weight measurement. Physical self-concept - Physical appearance profile for adolescents. Depression - using Children's Depression Inventory (10). Anxiety/Depression - Child Behaviour Checklist (CBCL). Academic achievement Maths and Reading - Woodcock Johnson Psycho-Educational Battery - Revised Tests of Achievement (WJ-R ACH). TV watching - Media use questionnaire. SES - Income to	The study By Smith reported two key findings relevant to the current study. Firstly, gender differences were found when looking at the correlation between BMI and school performance. A negative relationship was reported between BMI and maths performance among girls, while a negative correlation was reported between BMI and English performance among males. Secondly, the association between BMI and depressive symptoms were found among girls, however, among boys, there were no relationship between BMI and depressive symptoms.

				Needs Ratio. Attendance - Year End Questionnaire.	
8.	Orenstein (2007), US	Cross-sectional survey design	A convenience sample of 100 obese children, only Hispanic and African American children were recruited. Of which, 8 did not meet the criteria, hence 92 obese children took part. A similar sample (140) of non-obese were approached from the same demographic for the control group. Of the 140, 93 took part and both groups were aged between 7 to 14 years.	Survey based data collection and BMI was measured by a trained physician. ANOVA & MANOVA BMI - Height/weight measurement. Depression/ Anxiety measured by Beck Youth Inventories. Academic achievement Maths and Reading - The Wide Range Achievement Test, 3rd Edition (WRAT3, Wilkinson, 1993).	To summarise, the study by Orenstein found that there were no significant differences between obese and non-obese children on reading and maths performance. Obese children reported higher levels of depression, and gender differences were also reported, indicating that obese girls had higher levels of depression compared to boys. The study also reported that depression was related to obesity, specifically among girls. Finally, age was reported as a significant factor in maths performance with younger children (both obese and non-obese groups) performing better in maths.

3.3.1 Critical analysis of eligible studies

This section provides a critical analysis of the eligible studies. The studies are reported based on study design, methodology, key findings and limitations. The findings of the overall study are provided followed by a focus on the key variables for the current study and the two factors of age and gender. As previously discussed, the studies are eligible for inclusion because they include and measure all of the three key variables, and they are from a child population. Body Mass Index (BMI) was not always measured by a trained professional in the studies discussed below. Some of them used self-reported height and weight of the children, which is a limitation, and this is discussed at a later stage. Various measures have been used for depression and the measures are discussed for each study below. School performance was measured differently in each country, most of studies measured reading and maths performance. Performance in reading is measured differently for each country based on languages and some studies reported performance for reading and maths together as a pass/fail grade. These are discussed for each study individually.

1. Gunnarsdottir et al (2012) – Iceland

The study conducted by Gunnarsdottir and colleagues (2012) was a cross-sectional study design with 91 families of obese children and 84 families of non-obese children between the ages of eight to 12 years. The participants were enrolled to a programme called the Epstein family-based behavioural programme. The aim of the study was to determine the prevalence of psychological maladjustment (emotional and behavioural problems), low academic competencies and teasing/social rejection among obese Icelandic children. And, to explore the degree to which teasing/social rejection specifically contributes to children's physical activity, parental depression and life-stress.

Data were gathered through screening interviews and background information surveys were administered to gather demographic and socioeconomic status information. The main outcomes measured included Body Mass Index (BMI) measured by a qualified nurse, physical activity outside of school, depression, anxiety, self-concept, teasing, socioemotional and behavioural conduct, parent's depressive symptoms, stressful-live events, children's academic abilities in maths and reading, and school behaviours. A combination of child self-report, parent and teaching report measures were used to gather data on the key outcomes above. Nurses using BMI reference for Swedish population measured the BMI of the children. Parents recorded self-monitoring of physical activity outside of school. Child report measures – Children's

Depression Inventory (10 items, Kovacs 1985) was used to measure depression, and the Mulitdimensional Anxiety Scale for Children (MASC) was used to measure anxiety (March 1999). The general academic ability of children in maths and reading were based on teacher reports as well as school behaviours. Parents also rated academic competencies. Data were analysed using descriptive analyses; frequencies, percentages, means and SD's, and Confidence Intervals, and inferential analyses; T-tests and chi-square tests to compare groups, Correlations, linear, logistic and multiple regressions. Please note that the findings reported in this article only represents the clinical-based sample of obese children.

The main findings from the study were that obese children reported high prevalence of teasing/social rejection and this was associated with poorer psychological adjustment as well as lower academic competencies. Parents reported significant peer difficulties, which the study concluded that there is a need to address peer relations among overweight children. The study reported 44% of children exceeded the cut-off point for emotional concern, while 34.5% of children exceeded the cut-off point for behavioural concern. Approximately 25% of children were reported having the lowest score of 30% for general academic abilities, and 45% of children reported not being popular in school. Interestingly, 90% of children were rated as having peer problems by their parents, examples of peer problems include teasing, social rejection, and difficulty making friends. Another interesting finding indicated that teasing/social rejection among obese children is a significant risk factor for psychological maladjustment and low academic performance. In relation to children's depressive symptoms, gender and teasing/social rejection were significant predictors from the linear regression. Girls (M= 51.52) reported higher levels of depressive symptoms than boys (M= 45.72). Parental education and teasing/social rejection were significant predictors of general academic performance. BMI did not correlate with psychological adjustment and academic performance, however, a medium negative correlation with age and a weak positive correlation with gender was reported.

The study is limited in various ways, for example, the study reported that not all the measures used have been validated within the Icelandic population. This limits the comparison to other studies and the general population in the world. Self-monitoring of physical activity also presents as a limitation for the study. The sample is a clinical sample of obese children and therefore the findings could not be generalised to the broader community. The study based SES on parental education only, and this is not sufficient as an indicator for SES. The data is also limited based on the cross-sectional nature of the study.

This study does not focus on the relationship between depression, obesity and poor school performance; however, it was included as it met the eligibility criteria. The results did inform the researcher on some aspect of the relationship between depression, obesity and poor school performance, indicating that there were no correlations between the three variables. However, gender (weak positive correlation) and age (medium negative correlation) were reported as significant variables in relation to BMI.

2. Gunnarsdottir et al (2012) – Iceland

This paper is by the same researchers as the previous study and is based on the same data as reported on in the above. However, the aim of this article is different and therefore the findings of the study present new evidence on depression, obesity and poor school performance. The aim of this study is to assess the effects of Epstein's family-based behavioural treatment in a clinical sample of obese children. And, to explore whether co-morbid concerns affect treatment outcome.

The study design is a longitudinal in nature with a baseline and a follow-up at one year. The outcome measures and scales used are the same as reported in the 2012 article; however, the data analyses were different. Frequencies, percentages, means and SD's, Confidence Intervals. T-tests and chi-square tests to compare groups, ANOVA and multiple regressions. The 12-week treatment was delivered over 18 weeks at Medical Centre in Iceland between 2007–2008. The intervention was Epstein's family-based behavioural treatment that had been previously translated and adapted to Icelandic. The treatment sessions consisted of a 20 minutes individual counselling session (parent and child) and a group meeting of 60 to 90 minutes (parent and child attend separate concurrent sessions). The treatment team consisted of various member from a multidisciplinary background e.g. psychologist, nutritionist, sports educator and a paediatrician.

The main findings were that psychological wellbeing improved, and the treatment effects were maintained at year one follow-up. Approximately 69% of the children at baseline presented with co-morbid concerns. BMI was reduced during treatment for children who scored above cut-off for concern on hyperactivity compared to children with lower hyperactivity scores, this effect was not present at year one follow-up, concluding that over time hyperactivity scores does not have an influence on children's BMI. Children who scored high for social anxiety had significantly reduced BMI compared to children with lower social anxiety levels, and this effect was found at

year one follow-up. There were no differences for children who reported higher depression scores, lower self-concept or low academic competencies.

This study is not directly relevant to the current study; however, it was included as it met the eligibility criteria. The results did not help inform the researcher on the relationship between depression, obesity and poor school performance as this was not the aim of the article. However, it was interesting to see that the Epstein's family-based behavioural programme did not have an impact on obese children's depression scores or academic competencies.

3. Sigfusdottir et al (2007), Iceland

This earlier study by Sigfusdottir and colleagues (2007) is a cross-sectional survey design with data from 6346 Icelandic secondary school students aged between 14 and 15 years. Self-report surveys were administered to children in a school-setting and were supervised by the teachers. A proxy measure of socioeconomic status, gender, family structure, absenteeism, and parental education was used. School performance were measured based on the self-reported average scores of children in Icelandic, maths, English and Danish. The BMI were calculated from self-reported height and weight. Depression was measured using the 10-item Symptom Distress Checklist (Derogatis *et al.* 1974). The data were analysed using descriptive analyses and inferential analyses. The inferential analyses included; Pearson's r correlation, Independent samples *t*-tests and Ordinary Least Squares (OLS) Regression analyses.

Overall, BMI, dietary patterns and physical activity explained 24% ($p < .01$) of the variance in academic performance, while controlling for general demographic variables. The variance increased to 27% when depressed mood and self-esteem were added to the regression model. Independent sample *t*-tests reported statistically significant differences between overweight/obese and normal weight children on grades, and depressed mood. Children with a BMI of greater than 85th percentile had lower grades and higher depressed moods compared to children with a BMI of less than 85th percentile. A statistically significant low positive correlation ($r = 0.19$, $p < .01$) was reported between BMI and depressed mood. A low negative correlation was reported between BMI and grades ($r = -0.12$, $p < .01$), and depressed moods and grades ($r = -0.11$, $p < .01$). The OLS regression models showed the significant predictors of school performance when controlling for gender, parental education, family structure, absenteeism and any interaction effects with the dependent variable.

The OLS models reported gender as being a statistically significant predictor for grades (Icelandic, Maths, English and Danish) in all five models. BMI was reported as being a significant predictor of grades since it was added to the model (model 2) through to model five. Depressed mood was added in model four and five, and remained as a significant predictor, however, the beta coefficient changed from -0.06 to 0.03 when self-esteem was added to the last model. Similarly, BMI beta coefficients remained the same until self-esteem was added to the model (from -0.08 to -0.07). In model five, all variables included in the model were significant predictors of grades, except physical activity.

There were various limitations in the study, firstly, the data are cross-sectional in nature. The study used only self-report measures including the measures on school performance, height and weight to calculate BMI, and therefore may not be reliable. These are substantial limitations, especially the self-reported grades and, height and weight. As for the BMI, there could be various inaccuracies in the height and weight and therefore misclassifying children into the wrong BMI categories. In relation to the grades, this is the key outcome variable of the study and due to the self-reported nature, this variable is not reliable enough. Another disadvantage of this study is the missing link between the key outcome variables and SES. Parental education is not sufficient as an indicator of SES.

In relation to the key variables, the study reported that children with higher BMI scores had lower grades and higher depressed moods compared to children with a BMI less than 85th percentile, which suggests that there is a link between BMI and grades, and BMI and depressed moods. Statistically significant correlations were reported between BMI and depressed moods (low positive correlation), BMI and grades (low negative correlation), and depressed moods and grades (low negative correlation). Gender, BMI and depressed moods were reported as significant predictors of grades.

4. Lim et al (2016), Korea

The study conducted by Lim and colleagues is a three-wave prospective cohort study with 759 children from elementary school (grades 4-6) in 2006. The children were followed up in 2009 when they reached middle school (grades 7-9, n= 609) and in 2012 when they reached high school (grades 10-12, n= 496). Data were collected using survey design by an existing study, the Children Supplementary Survey of Korean Welfare Panel Study (CSS-KoWePS) prospective cohort study. The aim of the study is to describe the associated factors of depressive symptoms.

Data were collected on various aspects of children's physical and mental health; gender, family structure, SES, stressful life events, health problems, obesity, self-esteem, depressive symptoms, peer attachment, discussion of personal issues, grade, academic performance and school adaptability. Ten questions on depression was created by Korean Welfare Panel Study (2013) based on the symptoms from the Diagnostic and Statistical Manual of Mental Disorders (DSM). The Korean form of Kovacs' Children's Depression Inventory was also used. School performance was measured based on school grades and self-reported performance categorised as; failing, below average, average, above average, or excellent. Based on the reported weight and height, body mass index (BMI) was calculated. Inferential data analyses conducted included; Chi-square tests, independent sample *t*-tests, and logistic regression models to answer the research questions.

Overall, the findings reported that children or adolescents with depressed symptoms reported lower self-esteem, higher peer attachment issues, low academic performance, and low adaptability in school. Other risk factors for depressive symptoms included gender, obesity, family conflict, and with whom they discussed personal issues, showed different patterns from the elementary school years to high school years. A sex difference of depressive symptoms was evident only among high school students. Influences including individuals, family, friends, and school factors for adolescents varied depending upon school years.

As previously mentioned, gender differences were not reported for elementary and middle school children on depressive symptoms. However, statistically significant differences were found between boys and girls on depressive symptoms among high school students, with higher percentages of girls being in the depressed groups than boys. Self-esteem remained as a statistically significant variable among children and adolescents in elementary, middle and high school, with lower levels of self-esteem in the depressed group. Family conflict was a significant variable among high school students, with higher mean scores in depressed group. Interestingly, there were no statistically significant differences between depressed and non-depressed groups on obesity and grades across the different schooling ages. However, self-reported academic performance (below average, average, and above average) was significantly different among depressed and non-depressed groups with non-depressed students reported higher percentages in all three performance categories across elementary, middle and high school. This is due to the low number of children classified under the depressed categories.

There are limitations of the study that were reported by the authors. Firstly, the characteristics of the students who dropped out at the two follow ups were not analysed, and secondly, the biological markers were not measured to control for hormonal changes among adolescents. The cohort design is good strength of the study; however, obesity was calculated based on self-reported measures of height and weight. This is a limitation that the authors failed to discuss.

Overall, the study reported that there were gender differences among older children on their levels of depressive symptoms. There were no significant differences in BMI and grades among depressed and non-depressed groups across different ages. However, self-reported school performance was significantly different for non-depressed students with higher percentages of students within the 'below average', 'average' and 'above average' categories. It is evident that gender and age also plays a significant role, however the correlational relationship between depression, obesity and school performance were not assessed and therefore does not help inform the researcher about the nature of the relationship between the variables.

5. Chau et al (2013), France

Chau and colleagues conducted a cross-sectional study using survey design among 1559 adolescents from middle school in France (aged between 12 and under 16 years), to assess the associations between key socioeconomic factors with multi-morbidity, which includes mental health, physical health, behavioural and school difficulties.

As previously mentioned, data were collected using self-report surveys and on various aspects of the adolescent's life; socioeconomic factors (gender, age, being immigrant, family structure, parents' education, father' occupation, and income), depression, obesity, consumptions of alcohol, tobacco, cannabis, and hard drugs, suicide attempts, involvement in violence, and low school performance. Height and weight was measured by a trained physician to obtain the BMI scores. Socioeconomic characteristics measured by profile questionnaire. Depressive symptoms were measured using the Kandel depressive mood scale (Kandel *et al.* 1982). School performance was measured based on grade repetition and school mark out of 20. Descriptive findings were reported in percentages, means and standard deviations where relevant. Inferential analyses included logistic regressions, and polynomial logistic models to assess the cumulating difficulties (mental health, behavioural issues and school difficulties).

Overall, the study reported that boys had a higher risk of experiencing depressive symptoms and this risk strongly increased with age. Adolescents from divorced/separated families also had higher levels of depression, however, depression was not found to be a high risk among single parent families. While low parent education was also associated with higher risk of depression. In relation to obesity, boys were once again at a higher risk of being obese, which was also associated with increasing age. Insufficient income was associated with obesity and so was being the child of a manual-worker. Results on school performance/grade repetition reported that European immigrants had higher risk of grade repetition, while non-European also had a high risk of grade repetition and low school performance, compared to French adolescents. Children from divorced and separated families were more likely to have a higher risk of grade repetition and low school performance, as well as single parent families.

When socioeconomic factors were adjusted in the logistic regression models, the findings were different for certain variables, but not all. Depression remained as a significant variable among divorced/separated families as well as low parent's education. Interestingly, depression was identified as a significant variable associated with insufficient income when socioeconomic factors were adjusted. As for obesity, the association with manual worker remained the same. When looking at low school performance/grade repetition, more risk factors were identified as statistically significant in the model; non-EU families, divorced/separated families, single parenthood, low parental education, manual worker, and inactive parents.

Some of the limitations of the study as reported by the author include; the cross-sectional nature of the study does not allow for causal relationship interpretation, and certain factors such as genetic and personality features were not measured. It was also reported that due to the number of statistical tests conducted, Type I errors could have occurred.

The study by Chau and colleagues reported two key findings that are relevant for the current study. They reported that boys had a higher risk of experiencing depressive symptoms, and a higher risk of being obese, both of which were associated with increasing age. According to the study, gender and age are relevant risk factors for both depressive symptoms and obesity. This also presents with contradictory findings on gender since most studies have reported that girls are generally at higher risk of experiencing depressive symptoms and obesity. Chau's study did not assess the relationship between depression, obesity and poor school performance, and therefore the nature of the relationship between these variables remain unclear.

6. Booth et al (2014), UK

The aim of the study conducted by Booth and colleagues (2014) was to test the hypothesis that obesity among adolescents influenced school performance. The study was conducted using a longitudinal data set from a UK study known as the Avon Longitudinal Study of Parents and Children (ALSPAC) cohort study. The aim of the study was also to examine the underlying mechanisms of the relationship between obesity and school performance.

The ALSPAC data consists of 5966 participants aged between 11 and 16 years. It is an ongoing population-based study on children's health and development. Data were collected using self-reported surveys and BMI was measured using research clinic measures of height and weight. Descriptive findings were reported in percentages, means and standard deviations as appropriate. Further inferential analyses include; linear regressions with dummy variables, and mediation models. Demographic variables were collated on mothers of the participating children and the children themselves. The main outcome variables are BMI, and academic performance (English, Maths and Science). Academic attainment was measured through compulsory national achievement tests provided by the National Pupil Database England on Maths, English and Science. Various confounders were measured, such as ethnicity, SES, maternal occupation, health, smoking habits, and gestation. Children's depressive symptoms were also measured using the parent proxy short form of the Moods and Feelings Questionnaires (MFQ, Angold *et al.* 1987). The confounding variables are depressive symptoms, mother's health, occupation and education.

Overall, the study reported that girls who were obese at 11, remained obese until 16, and they also had lower academic attainment compared to girls who are healthy at 11, 13, and 16 years of age. Similar trends were found for overweight children compared to healthy weight children, however, when confounders were controlled for, there no differences on school performance among overweight and healthy weight children. This association was less clear for boys. The study looked at the mediating effect of depression, age of menarche and IQ on the association between obesity and school performance, but no significant mediating effects were found.

One of the main limitation of the study is that not enough potential confounders were measured in the study to examine its impact on the key variables, for example, role of the teacher, and

school environment. The other limitation of the study is the data loss that occurred during the adjustment of the confounders in the regression models.

Once again, gender differences were highlighted, indicating that overweight and obese girls had lower school performance compared to overweight and obese boys. These differences remained with increasing age. The mediation analyses, with depression as the mediating factor between the independent variable obesity, and the dependent variable school performance, reported that depression did not have a mediating effect. It was also reported that obesity did not affect school performance.

7. Smith (2013), USA

The study by Smith is a PhD thesis which investigated the significance of English, math, and physical self-concept as moderators of the relationship between BMI, academic achievement, and psycho-social outcomes of depression and anxiety. The study is a longitudinal survey design with 397 males and 402 females aged 15 years. The data came from the longitudinal study by the National Institute of Child Health and Development (NICHD). It consisted of a sample of 1,364 children in phase I and 1,009 in phase IV. The NICHD Longitudinal study collected survey data on various variables; BMI, academic self-concept (English and Maths), physical self-concept, depressive symptoms, anxiety and depression, academic achievement in Maths and reading, TV watching, SES and attendance. The author did not clarify who measured the BMI, i.e., was it based on self-reported height and weight or was it measured by a qualified person? School performance was measured using standardised Maths and reading tests (Woodcock Johnson Psycho-Educational Battery - Revised Tests of Achievement (WJ-R ACH)). Depression was measured using the 10-item CDI (Kovacs 1985). Descriptive findings were reported using percentages, frequencies, means and standard deviations as appropriate. Inferential analyses conducted were Pearson's Correlation, hierarchical multiple regression, and moderation analyses.

The study reported that 13.2% of females were overweight and 12.7% of females were obese. Of the males, 17.9% were overweight and 18.4% were obese. Overall findings suggest that among females BMI was significantly related to each of the outcome variables with the exception of English test. There was a negative relationship between BMI and achievement in Maths. Positive relationship between BMI and depression and anxiety among females. Among males, there was a statistically significant negative relationship between BMI and English test.

BMI was not correlated with negative socio-emotional outcomes of depression and anxiety nor Maths in males. Among females, BMI was found to be statistically negatively correlated with negative socio-emotional outcomes and school performance. The study reported that self-concept in Math interacted with BMI and this influenced actual achievement in Maths. For males, physical self-concept interacted with BMI in its effects on depression.

The study limitations included the lack of geographical, ethnical and economical variability. This hindered the generalisability of the findings. Due to the correlational analyses, causal inferences could not be drawn. The self-report aspect of the surveys and the school performance measure was reported as a limitation by the other. Smith indicated that there could have been inaccuracies in responses due to the self-reported nature of the data and also reported that the school performance measure was not adequately reliable, however, due to the use of existing database, these outcome measures could not be changed.

The study By Smith reported two key findings relevant to the current study. Firstly, gender differences were found when looking at the correlation between BMI and school performance. A negative relationship was reported between BMI and maths performance among girls, while a negative correlation was reported between BMI and English performance among males. Secondly, the association between BMI and depressive symptoms were found among girls, however, among boys, there were no relationship between BMI and depressive symptoms.

8. Orenstein (2007), USA

The study by Orenstein was conducted in 2007 as part of a doctoral thesis. The study is a cross-sectional survey with a convenience sample of 100 obese children. The children who took part in the study were only Hispanic and African American. Of the 100 children, 8 did not meet the eligibility criteria, hence 92 obese children took part. A similar sample of 140 non-obese children were approached from the same demographic background for the control group. Of the 140 non-obese children, 93 took part and both groups were aged between 7 to 14 years. Data collection method was survey based and the BMI was measured by a trained physician. Descriptive findings were reported as frequencies, percentages, means and standard deviations as appropriate. The inferential analyses conducted were ANOVA and MANOVA. Key variables measured were BMI, self-concept, Depression and Anxiety measured by Beck Youth Inventories, and academic achievement in Maths and reading using the Wide Range Achievement Test, 3rd Edition (WRAT3, Wilkinson, 1993).

Overall, no significant differences between obese and non-obese on reading and maths from the ANOVA. Obese children had higher levels of depression and anxiety, and obese girls had significantly lower levels of self-concept and higher levels of depression compared to boys. Social emotional functioning (depression/anxiety/self-concept) was found to be related to obesity, specifically for females regardless of cognitive functioning (Maths and reading scores), SES and ethnicity. In the MANOVA analysis, it was reported that younger obese children performed better in Maths compared to older obese children. Similar trend was among non-obese children, indicating that age is a significant factor in Maths performance.

The author reported the cognitive measure as a limitation of the study and suggested that a more in-depth measure of cognitive functioning is required. Another limitation of the study is the SES of the participants. The author focused on Hispanic and African American participants and failed to consider other disadvantaged populations. The cross-sectional nature of the study is also a major limitation of the study. The study did not conduct any correlations between the variables to investigate the relationships in more detail prior to conducting ANOVAs and MANOVAs to assess the interactions.

To summarise, the study by Orenstein found that there were no significant differences between obese and non-obese children on reading and maths performance. Obese children reported higher levels of depression, and gender differences were also reported, indicating that obese girls had higher levels of depression compared to boys. The study also reported that depression was related to obesity, specifically among girls. Finally, age was reported as a significant factor in maths performance with younger children (both obese and non-obese groups) performing better in maths.

3.4 Discussion

The eight studies discussed above provided contradictory evidence on the relationship between depression, obesity and poor school performance, in particular regarding the influence of gender and age on the key outcome variables. Throughout the review, the gaps in research was identified and these will be discussed in light with how the current study will address these gaps.

There were contradictory findings in relation to the gender differences on depression, obesity and school performance. While most of studies reported that girls were more likely to have higher levels of depressive symptoms and were more likely to be obese compared to boys, the

study by Chau *et al.* (2013), reported that boys had higher risk of experiencing depressive symptoms and of being obese. Chau and colleagues also reported that this association strongly increased with age. In relation to school performance, a negative relationship between BMI and Maths performance was observed among girls, however, for boys a negative relationship between BMI and reading performance was observed. Age was also reported as a significant factor for Maths performance. Younger obese and non-obese children performed better in Maths compared to older children.

Various risk factors were associated with depressive symptoms; self-esteem, low academic performance, adaptability in school, gender, obesity, family conflict, family structure and SES (Chau *et al.* 2013). Contradictory findings were also reported in relation to depression with studies reporting that there is a significant association between depression and school performance (Chau *et al.* 2013), and depression and obesity (Sigfusdottir *et al.* 2007), while other studies reported no associations (Lim *et al.* 2016). Similar contradictory findings were reported when BMI was measured as an outcome, studies reported that being obese did not have an impact on depression and academic performance of children. Interestingly, Orenstein did not find any significant differences in children's school performance among obese and non-obese children (2007), while Sigfusdottir and colleagues (2007) found very different result from an Icelandic population. These contradictory findings may be due to the different methodologies employed, the different measures and most importantly the different populations.

As previously mentioned in section 3.3.1, all of the studies discussed have their limitations. For example, not all of the studies measured BMI scores of the children by a trained professional. Instead, BMI was calculated using self-reported height and weight. This has an impact on the validity of the BMI scores. Other studies measured school performance based on self-reports from the children and not the actual grades. The population used in each study were all children but were very different samples. While some studies focused on clinically obese samples, other studies focused on children from the general population. Another study chose to focus on children from African American and Hispanic backgrounds. None of the studies focused on a designated disadvantaged population despite recent studies reporting the association between disadvantaged families and poor health and performance. Although SES factors were measured in all the studies, and was analysed to some extent, they did not investigate the relationship between depression, obesity and school performance among a designated disadvantaged

population. The indicators used for SES was also inadequate in some of the studies. This is a key point for the current study as it focuses on children from a designated urban disadvantaged setting. It is also important to note that the variability within the variables in each study were not sufficient to expect clear correlational findings. Because of different methodologies and limitations of the studies, the findings were contradictory and this has implications on how these findings are translated into future interventions.

The current study focuses on a designated disadvantaged population. The aim is to address the contradictory findings on age and gender, and to address the contradictory findings on the relationship between depression, obesity and poor school performance. The specific research questions, which the study aims to answer, are:

1. What is the relationship between depression, obesity and poor school performance among urban disadvantaged children?
2. What are the predictors of depression, obesity and poor school performance?
3. Are there gender and age differences in depression, obesity and poor school performance of children?

The next chapter provides a detailed description on the methodological approach used to answer these specific research questions.

Chapter 4: Methodological and ontological approaches

4.1 Introduction

The previous chapter provided a detailed description of the literature, and the gaps in research. In this chapter, the philosophical paradigm, the theoretical framework, research design, and the study methodology are discussed. The positivism paradigm is used as the underlying philosophical approach of the current study; hence this chapter discusses positivism, its origin, ideology, advantages and disadvantages. The reasons for applying this paradigm to the current study will also be considered. Every aspect of the methodology is discussed in detail: ethics, study design, data analysis, data collection process and role of the researcher, database management, fieldwork, security and quality control. It begins by presenting the aims and objectives of the study, followed by the philosophical approach, and the theoretical framework used to inform the current study. An in-depth discussion of the Statistical Analysis Plan (SAP) is presented.

4.2 Aims and research questions

The aim of this study is to investigate the relationship between depression, obesity and poor school performance among urban disadvantaged children. This will be explored in an Irish context. There has been previous research which attempted to investigate the relationship between depression, obesity and poor school performance, however, few studies are from a child population and even fewer from urban disadvantaged settings. The relationship between these three factors may be different in affluent areas, however the focus of the current study is on disadvantaged areas. The specific research questions which the study aims to answer are:

4. What is the relationship between depression, obesity and poor school performance among urban disadvantaged children?
5. What are the predictors of depression, obesity and poor school performance?
6. Are there gender and age differences in depression, obesity and poor school performance of children?

4.3 Philosophical and theoretical approach

The overall purpose of research is to investigate an event of interest or to answer question(s) based on that event. There are three aspects of research which allows the researcher to investigate the occurrence of interest: ontology, epistemology and methodology. Ontology is defined as making assumptions to understand the world; it is the philosophical study of existence (Benton *et al.* 2001). Epistemology is defined as the theory of knowledge, which allows us to determine how we know what we know and finally methodology is the method or

approach to gaining knowledge (Marshall 1998). These facets are linked together and lead to establishing a paradigm. A paradigm, as Kuhn defined it, is a model which consists of shared theories, research methods and thoughts. According to Kuhn, it is necessary to have paradigms for science to come into existence (Benton *et al.* 2001). The current study adopted the positivism philosophical framework, which is discussed in section 4.3.1.

4.3.1 Positivism

The main aim of the current study is to investigate the relationship between depression, obesity and poor school performance among urban disadvantaged areas. In order to address the research aim, knowledge on children's physical and mental health, and school performance is required. The variables of interest in the current study are measurable and therefore is influenced by the positivist philosophical approach which considers measurable observations as the foundation of gathering knowledge on the real world. Often mental health factors are considered unmeasurable, however, with the development of robust psychometric measures, various aspects of mental health are measurable in a reliable manner, for example, there are various psychometrically robust measures of depression which has shown to be reliable in accurately identifying people with depressive symptoms. Collecting such knowledge also requires objectivity in the method of data collection. These are addressed by the positivist approach to research.

Hacking (1991) defined positivism as the approach to scientific investigation which is "based on realism, an attempt to find out about the one real world" (p. 1-2). According to Walliman (2015), positivism is "an objective approach that can test theories and establish scientific laws" (Walliman 2015, p. 239). The characteristics of positivism are often depicted with terms such as objectivity, replicability and causality (Bryman 1984). Survey instruments are the most preferred method of gathering data in the positivist approach, as the observable concepts can be operationalised, and is objective by maintaining distance between the observer and the observed. Survey instruments are ideal for collecting data on children's physical and mental health, and performance in school. Replication in this case is easily achieved by administering the same concepts in the survey instrument (Bryman 1984). Positivist's approach to research is achieved through replication of observations of factors or variables that are directly observable (Clark 1998). Unobservable concepts were included in positivism as factors that can be calculated to provide an understanding of observable phenomena, however they were not perceived as concepts that can be used to explain observable occurrences as they did not exist (Clark 1998). Precision, logic and reason is the foundation of science and positivists advocated

the notion of absolute law of science (Clark 1998). According to the positivists, researchers are neutral observers of naturally occurring phenomena and they are completely detached from any biases throughout all stages of the research (Clark 1998). This is one of the main criticisms for positivism; their statement on the role of the researcher on the outcome and stages of research processes.

Due to the nature of the current study, positivism approach has been chosen as the philosophical framework, which has guided the methodology. The current study aims to investigate the relationship between three observable and measurable variables, and these are depression, obesity, and poor school performance. In order to investigate the relationship between these variables, the knowledge must be gathered in a reliable manner, keeping in mind the characteristics of objectivity and replicability. Observations were gathered quantitatively through survey instruments. The role of the researcher was that of a neutral observer and this reduces the researcher bias. The role of the researcher in the data collection process will be discussed at a later stage together with the ethical considerations.

The next section discusses the theoretical approach to the current study. The biopsychosocial model is presented as the key theoretical approach.

4.3.2 Biopsychosocial model

The biopsychosocial model is broad approach to understanding human behaviour and diseases (Dogar 2007). Engel defines the biopsychosocial model as the combination of physical, psychological and cultural factors which produces illness (Engel 1977). It was developed by Engel in 1977 and it is a combination of the biomedical model and the psychosocial model. The biomedical model only relates to physical health, while the psychosocial model only considers mental health factors and social functioning (Engel 1980). Borrell-Carrio (2004) described that biopsychosocial model as a philosophical and practical guide in care. The philosophical aspect allows health professionals to understand how suffering, and illness is affected by various levels, from physical to societal. At a practical level, the model allows for a better understanding of the patients' subjective experience of their illness (Borrell-Carrio 2004). The model is widely used in research to design healthcare interventions and the World Health Organisation (WHO) uses the model to structure their clinical guidelines (Wade *et al.* 2017). Some examples of recent research studies using the biopsychosocial model include studies on pain in multiple sclerosis patients (Day *et al.* 2016), dietary restraint in adolescent boys (Mitchell *et al.* 2017), and risk and resilience on behaviour in children (Agnafors *et al.* 2016).

The use of the biomedical model has been criticised since the early 1970s, however this approach remained dominant (Marks *et al.* 2015). The medical model failed to meet the psychosocial needs of patients and, along with the increasing awareness of the psychosocial influences on health, the biopsychosocial model was developed by combining the two models, allowing for a broader understanding of diseases (Marks *et al.* 2015). The biological factor refers to physical health (i.e. peripheral organs, autonomic, neuroendocrine and the central nervous system); psychological factor refers to the mind and mental health. Finally, the social factor refers to the individual's social relationships such as family, friends, community and authorities (Sperry 2008). The biopsychosocial model is comprehensive and allows for the integration of multiple factors (Sperry 2008). There is growing evidence supporting the biopsychosocial model in relation to children's overall health (Moffatt 2008). This model (see figure 2.7.1) has enabled the formation of the research questions for this study and will be used to explore the relationship between depression, obesity and poor school performance in urban disadvantaged children. It allows for an investigation of different elements combined, providing a better understanding of different disorders.

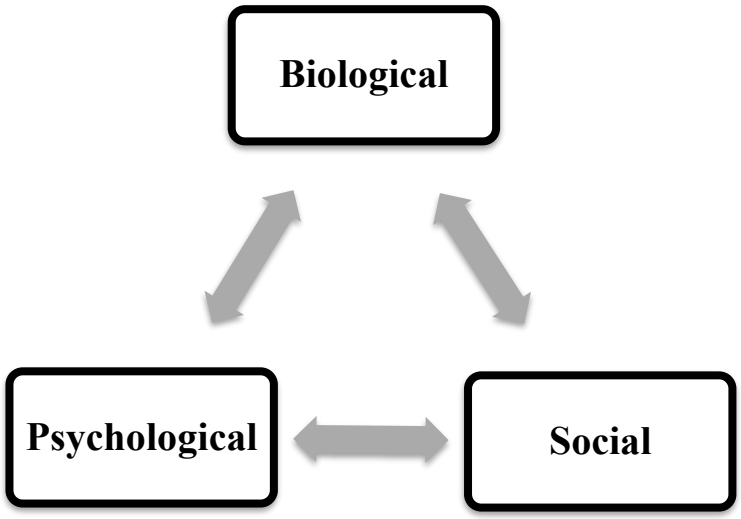


Figure 4.3.2: The Biopsychosocial Model

According to Dogar, the biopsychosocial model provided a conceptual framework that allows researchers to look beyond pure biological issues (Dogar 2007). In this study, the variables of interest are depression, obesity, poor school performance and socioeconomic status. As mentioned previously, this model indicates that biological, psychological and social factors are all related and it can explain the cause and prevention of diseases. For this PhD study, the aim is to identify the relationship between depression, obesity and poor school performance among a disadvantaged child population. Following on from the assumption of this model, it is

anticipated that there will be a relationship between the key variables. In relation to the philosophical framework, all of the aspects of the theoretical framework (i.e. the biological, psychological and cultural factors) can be observed directly with the positivists' approach, and by using survey instruments, this allows the gathering of knowledge in a reliable manner, objectively and it is also replicable.

4.4 Study design and methods

This study is a cross-sectional correlational quantitative study design. Quantitative cross-sectional observational data on children's physical and mental health wellbeing have been gathered among an urban disadvantaged child population to answer the research questions.

4.4.1 Settings

This research was conducted in five primary schools in an urban disadvantaged setting in Dublin. Dublin is the capital city of Ireland, with a population of 1,273,069 (CSO 2011). The schools were chosen by the Childhood Development Initiative (CDI) to be part of a health promoting intervention called the Healthy Schools Programme (HSP). This study accessed the participants from five schools which had previously taken part in the HSP. As previously discussed in chapter 1, the HSP is health promoting intervention which was implemented in 2009 with two follow ups in 2010 and 2011 (Comiskey *et al*. 2012). The schools were all DEIS (Delivering Equality of opportunity in Schools) Band 1 schools. DEIS is a policy instrument from the Department of Education and Skills, launched in 2005, to address educational disadvantage. The focus of the DEIS action plan is to address and prioritise the educational needs of disadvantaged children (three to eighteen years). A total of 849 schools are included in this programme of which 657 are primary schools and 192 are secondary schools (DoE 2005). There are four types of DEIS schools, and these are Band 1, Band 2, DEIS rural and DEIS post primary. Band 1 consists of schools where the level of disadvantage is greatest. The remaining primary schools are classified under band 2. Primary schools in rural communities, with a population below 1500, is classified under DEIS rural. There are no rural/urban classification for post-primary schools (Department of Education & Skills 2005).

4.4.2 Eligibility criteria

Children were recruited from five DEIS band 1 schools (N= 1077), and approximately 300 children were eligible for recruitment (aged between 8 to 12 years). Of the 300 children eligible to take part in the study, 285 children were recruited from 3rd to 5th class (see inclusion and exclusion criteria below).

4.4.2.1 Inclusion criteria

1. Children from third to fifth class in the 2012/2013 academic year were eligible;
2. Parents must agree to their child being included;
3. The child must be willing to take part in the research process and measurement on the day. The process was explained at an age appropriate level for the purpose of verbal consent.

4.4.2.2 Exclusion criteria

1. Parents who do not consent to their child taking part;
2. Children who express a wish not to take part;
3. Children who are not in third to fifth class in the 2012/2013 academic year were excluded.

4.4.3 Sample size estimation

A sample size for the observational cross-sectional design was calculated for a population of 300 children. Based on the sample size calculations for the prevalence study, a sample size of 170 was required to detect a medium effect (r=.50) using a two-tailed test, $\alpha = .05$ at 80% power (Cohen 1988). The sample available for the study was sufficient (n= 285).

4.4.4 Recruitment process

The participating schools were previously recruited to be part of a HSP and the recruitment was made through CDI, the funders of the original programme. For the current study, the same schools that had taken part in the HSP were contacted to access the participants. Principals of the five DEIS Band 1 schools were approached and they gave permission to recruit children from their schools to take part in this study. Note that all children were invited to take part in the current study, even those who did not take part in the original HSP evaluation (see appendices 1 to 5 for consent forms and recruitment process documents).

4.4.5 Data collection procedure

Following on from the positivist approach, knowledge that are observable were gathered in a reliable manner using psychometric measures. The children were given a battery of psychometrically robust measures to assess their physical and mental health wellbeing (see section 4.4.6 for details of the instruments administered). Data on the Body Mass Index (BMI) were measured by an experienced and registered children's nurse (Hollywood *et al.* 2013). Data were collected on various aspects of the children's physical and mental health, this also included the health-related quality of life of the children and the performance of children in school, which

provides a broader view of the children's health, school performance and environment. This approach is in line with the theoretical framework of the current study. The measures administered to the participants were self-report surveys completed by the children in a classroom setting. A maximum of eight children completed the survey at a time. There was plenty of space between each child to ensure confidentiality and to ensure that the children do not copy responses from or influence each other. Allowing for extra space between each child worked effectively in ensuring privacy. The BMI data were also collected in the school. All measures used in this study were validated and reliable tools used widely in research among children of this age group (eight to twelve years). The tools are discussed in the next section (4.4.6).

4.4.6 Instruments

The instruments of primary interests for this research study were self-reported health surveys of children and BMI measurements. Although the focus of the study was on depression, obesity and poor school performance, other variables relating to children's overall health, quality of life, and health related behaviours were also measured and included in the analyses.

Table 4.4.6: Summary of child health measures

	Child self-report	
Profile questionnaire	Demographic information	Self-report (ages 8 to 18)
Kidscreen 27	Health-Related Quality of Life (HRQoL)	Self-report (ages 8 to 18)
Child Depression Inventory (CDI)	Depressive symptoms	Self-report (ages 7 to 17)
Health Related Behaviour Questionnaire (HRBQ)	Health-Related Behaviours	Self-report (ages 8 to 12)
Test scores (Drumcondra, Micra and Sigma T)	Maths and Reading test scores	All ages
BMI	Body weight of children	All ages
All psychometric measures are included in the appendix 7		

4.4.6.1 Profile questionnaire: a measure of demographic information

The profile questionnaire was developed by the research team for children aged between eight to twelve years to obtain a short demographic background of the child.

4.4.6.2 Kidscreen 27: a measure of health-related quality of life (HRQoL)

The Kidscreen survey is a 27-item questionnaire on health-related quality of life (HRQoL), specifically designed for children (aged eight to eighteen), across five domains; physical wellbeing, psychological wellbeing, autonomy and parent relations, social support and peer

relations, and school environment (Kidscreen Group 2006). The Cronbach's alphas for the dimensions ranged from .80 to .84, and the test-retest reliability intra-class correlation coefficient (ICC) ranged from .61 to .74, indicating good reliability of the scale (Ravens-Sieberer *et al.* 2014). The convergent and discriminant validity was satisfactory based on comparisons with other appropriate measures, e.g. Child Health Questionnaire (Health Act CHQ, 2008), Paediatric Quality of Life Inventory (Varni *et al.* 2003, Kidscreen Group 2006). This measure was chosen as it has been validated by the literature; it is short, cost-effective, and child-friendly. It does not focus on medical illness and comparable data is available from Irish national study for the Kidscreen-52.

4.4.6.3 Child Depression Inventory (CDI-S): a measure of depressive symptoms

The Child Depression Inventory (CDI-S) is a ten-item child self-report scale used to measure depressive symptoms among children between seven and seventeen years of age. It is a screening measure which takes between five to 10 minutes to administer, hence being a rapid assessment of depressive symptoms (Kovacs 2003). The CDI-S consisted of four subscales 'anhedonia,' 'negative mood,' 'ineffectiveness,' and 'negative self-esteem.' The children were asked to complete the survey based on how they have felt in the last two weeks. Each ten items were scored on a three-point Likert scale, which can be converted from raw scores into t scores to allow for further statistical analyses. Higher total scores are of greater concern as it indicates higher levels of depressive symptoms. The CDI-S is a widely used measure that is psychometrically robust, with a Cronbach's alpha of 0.80 (Kovacs 2003). The short correlated with the full version r=.89. Two to six weeks' test retest reliability reported r values of .82 to .67 (Finch *et al.* 1987). This version was chosen as the questions were sufficiently detailed for the current study, less time consuming for the children to complete and, validity and reliability of the CDI short form matches those of the full form.

4.4.6.4 Health Related Behaviour Questionnaire (HRBQ): a measure of health behaviours

The Health-Related Behaviour Questionnaire (HRBQ) measures children's health behaviour across a broad range of health related topics (Balding 2002). The instrument is designed for children between the ages eight to twelve and consists of 50 questions within 12 short sections, which are: you and your home; your health; the food you eat; feelings; your money; hygiene; bullies; alcohol; smoking; stranger danger; leisure time; and growing up. This survey has been used in the UK to evaluate healthy schools' initiatives and other health behaviour studies (Balding 2002). The authors of the HRBQ has also highlighted that the reliability of the HRBQ is

maintained by the administrators of the survey by adhering to strict research protocols (Balding 2002).

Systematic errors and random errors were minimised during the data collection process by using the appropriate ratios of fieldworkers to children. A ratio of one fieldworker per four participants was used based on the fieldwork protocol designed by the Healthy Schools Programme. The language appropriateness of the questionnaire was tested during the Healthy Schools Programme pilot study and was adapted where necessary (Quirke *et al*. 2015). The children were also reminded that there is no right or wrong answer, only what is true for them. They were also reminded that their answers will not be seen by anyone else unless researchers were concerned about their safety. This was conducted to address issues of social desirability (Quirke *et al.* 2015).

4.4.6.5 Test scores: a measure of school performance

Children's test scores were measured through either the Drumcondra English and Maths tests or the Micra-T English and Sigma-T Maths tests; these were gathered through school records. These tests are administered once a year as a form of progressive update on children's mathematics and English skills. This was administered by the children's teachers in a class room setting. Most schools tend to use the Drumcondra tests; however, this is gradually changing as some schools are starting to administer the Micra and Sigma T tests. Nevertheless, both are standardised tests which can be converted into STEN scores using the same methods and giving the same results. All the children's raw English and mathematics scores were converted to obtain STEN scores to allow for better comparison with the rest of the children in Ireland (ERC 2013).

4.4.6.6 Body Mass Index (BMI): a measure of body weight

BMI (BMI = weight in kg ÷ height in m^2) is a screening tool used to identify individuals who are underweight, normal weight, overweight or obese; however, it is important to note that this is not a diagnostic tool. The measurement of all children's weights was conducted using a digital scale (SECA – model) in their stockings and all heavy outdoor clothing removed. The height was measured using a portable height measurer, with the children's outdoor shoes removed. The measurement of children's waist circumference was also taken, at the midpoint between the top of the iliac crest and the last rib. This measurement was recorded over very light clothing (e.g. School polo shirt or shirt only). The BMI scores were calculated to create categories, using

the Centres for Disease Control and Prevention approach (CDC 2015). Children's height, weight and waist circumference was measured to obtain BMI scores.

4.5 Role of the researcher

The researcher had to take on multiple roles to ensure a smooth data collection process. Once permissions were received from 1) Ethics committee, 2) School principals, and 3) Parents/guardians, the researcher recruited research fieldworkers and trained them on each survey instrument. Training were provided on child protection based on children first guidance. Organising the data collection schedules which suited the schools and the fieldworkers were vital. To abide by the children first guidance, a specific number of research fieldworkers were required to ensure no child was left alone with a fieldworker. To ensure the right number of fieldworkers were available, extra fieldworkers were assigned for each data collection session. This process was very time consuming and posed as a challenge to complete the data collection within the time frame provided by the school principals. Recruiting the right fieldworkers for the data collection enabled the researcher to complete the task before the deadline set by the principals.

Schools are very complex and busy environment. This was a big challenge for the researcher as the data had to be collected without disrupting the schools' routine. The researcher ensured that very minimal disruptions were caused during the process. One way to avoid disruptions, was by having a list of all participants, assigned with private and confidential identification numbers, before arriving at the school. All questionnaire booklets were ready and the classroom for data collection was set up prior to the arrival of any participants. Each fieldworker was assigned a specific role and the instructions of the data collection process were made very clear in the data collection manual. Depending on the size of the data collection room, a maximum of eight children were collected from their classes in one go. The eight children were given the surveys to complete and then sent to the nurse in a different room for the BMI measurement. The participants were then returned to their classes. This process was repeated until all children who consented were measured.

Once the data was collected, each survey were checked for missing data and unclear answers, while still in the school. They were then placed in sealed envelopes which would only be opened once the data has reached the university. Data management and security, and quality control is described in section 4.6. Once again, the data management and quality control process was time consuming as the researcher has very little help with those tasks. The fieldworkers were not

involved in this process as they were only recruited for collecting the data. However, while doing the quality control procedures, it allowed the researcher to have a better understanding of the data and familiarise themselves with the data. Throughout the study, the researcher evolved in many areas, for example, data collection in a complex environment.

4.6 Statistical analyses plan

This section provides a detailed description of all the statistical analyses conducted to answer the research questions. These included descriptive, inferential analyses and statistical modelling. The modelling analyses explored include binary logistic regressions with backward elimination and mediation modelling with bootstrapping. The aims of the statistical models are to investigate the relationship between depression, obesity and poor school performance, to identify the predictors of these key variables and to assess the mediating effect of BMI on depression and school performance.

4.6.1 Descriptive

The demographic information (age, and gender) was presented in percentages, frequencies and where applicable, the mean, standard deviation and median was provided. Physical and mental health variables measured through the Kidscreen-27 and Child Depression Inventory were presented in means using scores which were calculated from the manual guidelines provided by the instrument developers. Percentages of responses on health behaviours and perceptions questions were calculated. BMI scores (BMI = weight in kg ÷ height in m^2) were assessed in terms of age in months and gender of the child.

4.6.2 Inferential analyses

Some inferential analyses were conducted to measure the correlation between variables, and differences between groups. The aim of the inferential analyses is to provide an overview of the children's physical and mental health, and of their performance in school. The analyses also inform the statistical models presented in chapter 6. Correlation analyses were conducted for age, depression, BMI, test scores, and HRQoL scores using a Spearman's correlation. The non-parametric correlation was conducted as the data did not meet the assumptions for Pearson's correlations (further detail on the normality tests are provided in chapter 6). Mann Whitney U test was used to analyse the differences between gender and health survey questions which were ordinal categorical data or non-normally distributed. Fisher's exact and Chi-Squared tests were used to analyse the differences between gender and health survey questions which were nominal categorical data. All analyses were conducted in SPSS version 24 (IBM 2016).

4.6.3 Statistical models to assess the predictors of and the relationship between depression, obesity and poor school performance

The two procedures, binary logistic regression and mediation modelling, uses regression equations, however, the two approaches differ significantly. The statistical models have two different aims;

1. To assess the predictive relationship between depression, obesity and poor school performance, using binary logistic regression
2. To identify predictors of depression, obesity and poor school performance, using binary logistic regressions
3. To investigate the mediating effect of BMI on depression and school performance using mediation models

The relationship between depression, obesity and school performance was assessed using binary logistic regression models with backward elimination. The data did not meet the assumptions for conducting linear or multiple linear regressions (as reported in chapter 6), hence using the logistic regression modelling. The binary logistic regression model is the most commonly used model to analyse binary response data (Hilbe 2011). The binary response data takes the form of 0 and 1, typically 0 indicates failure and 1 indicates success, however, this can vary and is dependent on the study (Hilbe 2011). This procedure begins by placing all predictors in the model and then calculates the contribution of each based on the significance value from t-test. The significance values are compared, and the least statistically significant variable is removed from the model (Field 2013). The backward method is chosen as recommended by Field (2013), as forward method is more likely to make a Type II error (Field 2013). Forced entry method was not chosen as this method is believed to be suitable for theory testing (Studenmund et al. 1987).

In the current study, mediation analysis was explored for suitability of addressing the research questions. That is to understand the intervening relationship of BMI on depressive symptoms and test scores. This analysis reflects on the richness of data collected in health studies, which allows for more in-depth exploration of the influence of psychological factors on health (MacKinnon *et al.* 2008). As previously mentioned, mediation modelling uses regression equations to investigate the effect of an intervening or mediating variable on two other variables. The mediating variable, denoted as M, is an intermediate between the predictors, denoted as X and the outcome variable, denoted as Y (Preacher *et al.* 2004, Fairchild *et al.* 2009). The mediation analyses were conducted using bootstrapping as the data were not normally

distributed. The mediation model approach with bootstrapping is further discussed in chapter 6.

4.7 Data management and security

Each participant was assigned a unique ID code corresponding to the school and class they were from followed by a random two-digit number. The participant ID's can only be identified by the researcher. Information such as full name, address, phone numbers and email addresses were stored separately on an excel file for follow up purposes. This data was saved on a password protected server which can only be accessed on password protected computers in Trinity College Dublin. Further data security was in place for access, such as, only authorised researchers had access to the study files on the survey.

Data entry and analysis were conducted on IBM SPSS Statistics 24 (IBM 2016). Personal information was not stored on SPSS databases together with other data from the questionnaires. Hardcopy questionnaires with personal information were stored in a locked safe by the researcher.

4.7.1 Quality control and data auditing

Prior to any analyses on the data, a comprehensive audit of the data entry was conducted for accuracy and quality. This segment details the data entry and auditing procedures.

There were four main processes of ensuring high quality of data and these were; Screening, entering, checking and auditing. The data was firstly screened by the research fieldworkers on the day the data were collected, they were then entered, checked and audited by the researcher. To ensure the accuracy of the data the following steps were undertaken: every questionnaire entered was checked thoroughly, similar to a double entry. Once the data were checked, a random sample of 27 questionnaires was selected for audit, representing approximately 10% of questionnaires entered. The audit involved a complete check of each question in the 27 questionnaires. A total of 2860 data points was checked and found 13 errors, which were corrected. This is an error rate of 0.45% which less than the 5% error accounted for during statistically analyses.

4.8 Ethical procedures, consent, and risk

Ethical approval was granted by Faculty of Health Sciences Ethics Committee. Information leaflets explaining the research were distributed again and new consent was sought for this PhD study. Privacy and confidentiality, consent and assent, and child protection are the main ethical

issues which were addressed by obtaining informed consent and assent, strict data protection protocols and referral protocols (see appendix 6).

Informed consent was obtained in writing from the parents of participating children. However, the research was also explained to the children in age appropriate terms to ensure that the participants understood the nature and purpose of the project. The children who did not want to take part in the study were withdrawn regardless of the parent's issue of consent. Children were given the opportunity to tell their parents, researchers or their teachers on the day of assessment that they did not wish to participate. Parents were also given the opportunity to attend on the day the child was having their measurement taken. As previously mentioned in section 4.7, privacy and confidentiality issues were addressed in line with established data management guidelines.

The researcher recognised that she has a duty of care to children with whom she is in contact for research purposes. Due to the nature of this study, some child protection issues did emerge either directly or indirectly in the course of the study and these were dealt with sensitively, promptly and in line with established guidelines for the protection of children, Children First Guidelines (DoHC 2011), with referrals. The researcher was required to sign a declaration stating that they had no criminal convictions and that there was no reason why they should not work with young people (DoHC 2011). Police clearance was also sought as an additional precautionary measure.

4.8 Chapter summary

This chapter presented three main aspects, ontology, epistemology and methodology. Ontology refers to the philosophical approach of positivism, epistemology refers to the theoretical framework of biopsychosocial model and the methodology refers to the methodological approach. The influence of positivism is discussed, followed by the influence of the biopsychosocial model on the overall study. The methodological approach discussed included the design of the study, which is a cross-sectional correlational quantitative study design, the recruitment of participants, settings, eligibility criteria, sample size, tool selection, data collection procedures, role of the researcher, statistical analyses, data management and security, and ethical procedures.

The next chapter presents the findings on the children's demographic information, and their physical and mental health status, using descriptive and inferential analyses. These findings help

inform the logistic regression model and the mediation model to identify the relationship between depression, obesity and school performance.

Chapter 5: Findings I - Describing children's demographic background and health status

5.1 Introduction

The aim of this study was to investigate the relationship between childhood depression, obesity and poor school performance among urban disadvantaged children. This chapter provides a detailed description of the children who took part in the study, which informs the regression and mediation models in chapter 6. It also details the recruitment rate of participants, the demographic information, and the description of the children's health using descriptive and basic inferential statistics.

This chapter primarily focuses on the following:

1. Who are the children who took part in the study?
2. What is the health status of the children (i.e. how did they score on physical, emotional and social wellbeing outcomes)?
3. Are there gender differences in children's health status?

5.2 Description of the sample

A total number of 285 participants gave consent to take part in the study, of which 274 children from urban disadvantaged schools took part in the study. The study consisted of two main phases: (1) collection of survey data (n= 274) and (2) BMI data (n= 270)[1]. Of the 274 children, 119 (43.4%) were boys and 155 (56.6%) were girls (see table 5.2.1). The age of the children ranged from eight to twelve years and there were higher proportions of children in the groups of nine (n= 89, 32.5%), 10 (n= 60, 21.9%) and 11 (n= 71, 25.9%) years of age. The average age of the children was 10.11 years with a standard deviation of 1.16. The family dynamic, in which the children currently reside in, is also presented. Based on the frequencies presented in table 5.2.1, it is evident that most of children lived with their mother, father, brothers and sisters, and 3 children (1.1%) lived with foster parents.

The KIDSCREEN 27 questionnaire consisted of various Health-Related Quality of Life (HRQoL) questions. One of the questions asked children if they had a long-term illness, physical disability or medical condition that they were aware of. Slightly over a quarter of children (27%, n= 74) reported having a medical illness or disability and 16.8% of children reported that they were not

[1] Three of the children were absent on the day the BMI measurements were taken and one child did not give assent to taking part in the BMI measurement.

aware of any medical condition. The two most common medical conditions reported by the children were asthma and eczema.

Table 5.2.1 Demographic information of the children

(N = 274)	n	%
Participation rate		
Survey	274	100%
BMI	270	98.5%
Gender		
Male	119	43.4%
Female	155	56.6%
Age in years		
8	15	5.5%
9	89	32.5%
10	60	21.9%
11	71	25.9%
12	39	14.2%
Mean = 10.11, SD = 1.16		
Family dynamic (living with)		
Mother	265	96.7%
Father	181	66.1%
Stepmother	8	2.9%
Stepfather	27	9.9%
Foster parent	3	1.1%
Brother	196	71.5%
Step brother	10	3.6%
Sister	167	60.9%
Step sister	9	3.3%
Grandmother	16	5.8%
Grandfather	10	3.6%
Other adult relatives	4	1.5%

To assess the physical and mental health status of the children, the Kidscreen-27, the Child Depression Inventory (CDI-10), and the Health-Related Behaviour Question (HRBQ) were administered. As previously mentioned in chapter four, these questionnaires were administered to measure children's HRQoL, physical, emotional and social wellbeing, health behaviours, and depressive symptoms. The children's BMI scores were also measured by a qualified children's nurse.

5.3 Kidscreen-27

In total, there were five HRQoL dimensions and these were:

1. Physical wellbeing
2. Psychological wellbeing
3. Autonomy and parent relations

4. Social support and peer relations
5. School environment

As previously mentioned in chapter four, the physical wellbeing dimension consisted of five questions, psychological wellbeing had seven questions, autonomy and parent relations dimension also had seven questions, social support and peer relations consisted of four questions and the last dimension, school environment, consisted of five questions.

The children were asked the following question as part of the Kidscreen-27 survey which measured Health Related Quality of Life (HRQoL): "In general, how would you say your health is?" and they were given the following options to choose from (1) poor, (2) fair, (3) good, (4) very good and (5) excellent. The majority of children reported very good health status (n= 98, 36%), and excellent health status (n= 84, 30.9%). Overall the children had a positive perception of their health. HRQoL is included in the descriptive and inferential analyses (chapter 6) due to its relevance identified in previous research as reported in chapter 2. As previously discussed, research has shown that HRQoL is a significant factor with regards to depression, obesity and poor school performance.

Table 5.3.1 provides the mean scores[2] of the children's HRQoL. It was evident from the findings that the children's HRQoL were within the average European range on all of the dimensions. Therefore, the participants were doing as well as the other European children. This is based on the Kidscreen 52 reference scores as Kidscreen 27 Irish reference scores are not available.

Table 5.3.1: Mean scores for the children's HRQoL dimensions

Dimensions (n)	Mean	SD	Average
Physical wellbeing (n= 273)	53.2	10.5	48.74 - 58.7
Psychological wellbeing (n= 271)	53.8	10.9	48.07 – 58.01
Autonomy and parent relations (n= 271)	52.0	12.7	46.41 – 56.73
Social support and peer relations (n= 272)	54.4	10.7	45.98 – 56.02
School environment (n= 273)	56.1	10.7	45.85 – 59.21

As indicated in the table 5.3.2, higher proportions of children were in the average and above average category for all the HRQoL dimensions.

[2] A high score refers to better wellbeing, therefore the higher the score, the better.

Table 5.3.2: Frequencies of children in each Kidscreen-27 Category

Dimensions	Below Average n, %	Average n, %	Above Average n, %
Physical wellbeing	89, 32.6%	96, 35.2%	88, 32.2%
Psychological wellbeing	71, 26.2%	110, 40.6%	90, 33.2%
Autonomy and parent relations	91, 33.6%	98, 36.2%	82, 30.3%
Social support and peer relations	47, 17.3%	92, 33.8%	133, 48.9%
School environment	58, 21.2%	113, 41.4%	102, 37.4%

Since the data for the HRQoL dimensions were not normally distributed and violated the assumption of independent samples t test, non-parametric Mann Whitney U tests were conducted to investigate the gender differences on all five dimensions (table 5.3.3). Statistically significant differences were found for only one dimension, school environment, between males (Mean rank = 122.68) and females (Mean rank = 148.07, *p*= .008). This suggests that females performed better in the school environment dimension compared to males. A better score in the school environment dimension indicate that the females felt happier in school, they could pay attention and they got along well with the teachers compared to males.

Table 5.3.3: Gender differences on all 5 HRQoL dimensions

Dimensions	*U*	*Z*	*p*	Mean Rank	
				Male	Female
Physical wellbeing	9101	-.068	.945	136.63	137.28
Psychological wellbeing	8011	-1.595	.111	144.61	129.36
Autonomy and parent relations	8944	-.101	.919	136.55	135.58
Social support and peer relations	8166	-1.460	.144	128.71	14247
School environment	7458	-2.661	**.008***	122.68	148.07
**** Significant at p <.05***					

5.4 Child Depression Inventory (CDI)

Table 5.4.1 provides the mean interpretive t-score[3] for the CDI questionnaire and table 5.4.2 presents the findings on the children's depressive symptoms. The mean CDI scores for the children were 46.96 with a standard deviation of 8.86, which is within the average score range of 45 and 55. Although most of children were within the average range, it is interesting to note that 46 (17.2%) children were above average on the depression scale.

[3] In this case, a high score refers to a high level of depressive symptom; therefore, the children with higher scores have more severe symptoms of depression.

Table 5.4.1: Mean CDI guideline scores

Much Below Avg	Below Avg	Slightly Below Avg	Avg	Slightly Above Avg	Above Avg	Much above Avg	Very Much Above Avg
30 – 34	35 – 39	40 – 44	45 – 55	56 – 60	61 – 65	66 – 70	>70

** International reference data for self-report CDI females and males (age 7-17 years). The 1-8 category numbers can be found in the CDI tables below for reference. Source: Kovacs (2003)*

Table 5.4.2: Number of children in each category of CDI

CDI Categories	N	%	Mean, SD
Slight below average depressive symptoms	165	61.8%	Mean = 46.96 SD = 8.861
Average depressive symptoms	56	21%	
Slightly above average depressive symptoms	21	7.9%	
Above average depressive symptoms	11	4.1%	
Much above average depressive symptoms	4	1.5%	
Very much above average depressive symptoms	10	3.7%	

A Mann Whitney U test was conducted to examine the gender differences in depression scores. Mann Whitney U test was used as the depression t scores data were not normally distributed, hence violating the assumption for independent samples t test. Statistically significant differences were found between males (Mean rank = 109.53) and females (Mean rank = 152.23), indicating the females reported higher depressive symptoms compared to males (*U* = 5931*, Z* = -4.513*, p* <.001*)*

Table 5.4.3: Gender difference in depressive symptoms

Depression Categories	Male n, %	Female n, %
Slightly below average	75, 65.8%	90, 58.8%
Average	29, 25.4%	27, 17.6%
Slightly above average	5, 4.4%	16, 10.5%
Above Average	1, .9%	10, 6.5%
Much above average	1, .9%	3, 2.0%
Very much above average	3, 2.6%	7, 4.6%
Total	114, 100.0%	153, 100.0%

5.5 Health Related Behaviour Questionnaire (HRBQ)

The Health-Related Behaviour Questionnaire (HRBQ) is designed to analyse the health behaviours and wellbeing of children, examples of topics included in the HRBQ include breakfast intake, bullying, and weight perception. Although bullying is not a health-related behaviour, it is included because the HRBQ also measures the wellbeing of the child. This section provides an overview of the health habits of the participants. These three variables; body weight perception, bullying and breakfast intake has been included in the analysis, both descriptive and inferential analyses, due to its relevance identified in chapter 2 regarding their impact on depression, obesity and poor school performance.

Table 5.5.1 presents the findings from a Fisher's exact test which was conducted to analyse the differences in weight perception between males and females. It is interesting to note that higher proportions of females reported wanting to lose weight (39.9%) compared to males (35.3%), however this was not statistically significant (p= 0.707).

Table 5.5.1: Gender differences in body weight perception

	Male n, %	**Female n, %**	**Total n, %**	**Fisher's Exact**
Which sentence describes you best? (n = 269)				
I would like to put on weight	3, 2.6%	5, 3.3%	8, 3.0%	
I would like to lose weight	41, 35.3%	61, 39.9%	102, 37.9%	p = 0.707
I am happy with my weight as it is	72, 62.1%	87, 56.9%	159, 59.1%	
No significant differences between males and females at p<0.05				

Table 5.5.2 presents the findings on breakfast intake habits of the participants and specifically reports on the differences between males and females. A Fisher's exact test was conducted to analyse the differences between genders. There were no differences between males and females on breakfast intake (p= 0.689).

Table 5.5.2: Gender differences in breakfast intake

	Male n, %	Female n, %	Total n, %	Fisher's Exact Test
Did you eat or drink anything before school this morning? (n = 270)				
No	17, 14.5%	19, 12.4%	36, 13.3%	
Yes, at home	72, 61.5%	94, 61.4%	166, 61.5%	
Yes, on the way to school	3, 2.6%	10, 6.5%	13, 4.8%	
Yes, at school	8, 6.8%	8, 5.2%	16, 5.9%	
Yes, at home & on the way to school	4, 3.4%	2, 1.3%	6, 2.2%	*p*= .689
Yes, at home & at school	11, 9.4%	15, 9.8%	26, 9.6%	
Yes, on the way to & at school	0, 0%	1, 0.7%	1, 0.4%	
Yes, at home, on the way to & at school	2, 1.7%	4, 2.6%	6, 2.2%	
No significant differences between males and females at p<0.05				

Table 5.5.3 presents the findings on bullying incidences between males and females. This was analysed using a chi-squared test and no significant differences were observed between males and females on the incidences of bullying (*p*= .073).

Table 5.5.3: Gender differences in bullying incidences

	Male n, %	Female n, %	Total n, %	Chi-Squared Test
Have you been bullied at or near school in the last year? (n = 229)				
Yes	29, 29.9%	55, 41.7%	84, 36.7%	
No	68, 70.1%	77, 58.3%	145, 63.3%	*p= 0 .073*
No significant differences between males and females at p<0.05				

Overall, 59.1% (n= 159) of children were happy with their weight, however 40.9% (n= 110) of children reported that they were not happy with their weight. Of the 274 children, 36.7% (n = 84) reported having been bullied, however most of children did not experience bullying (n = 145, 63.3%). The majority of children reported having breakfast in the morning (n = 234, 86.7%) and 36 children reported not having breakfast in the morning (13.3%), as shown in table 5.5.4.

Table 5.5.4: Summary of body weight perception, breakfast intake and bullying incidences

		n	%
Happy with their weight	N= 269	159	59.1%
Not happy with their weight		110	40.9%
Had breakfast	N= 270	234	86.7%
Did not have breakfast		36	13.3%
Bullied	N= 229	84	36.7%
Not bullied		145	63.3%

5.6 Body Mass Index (BMI)

Table 5.6.1 represents children's BMI categories. Most of the children were in the healthy category (n= 188, 69.6%). However, it is of concern to see that 29.3% of children were either overweight (11.5%, n= 31) or obese (17.8%, n= 48). The Healthy Schools Programme (HSP) found that 31.4% of children were overweight or obese at baseline, 30.5% at year one and 29.4% at year two were overweight or obese (Comiskey *et al.* 2012). The Growing Up in Ireland (GUI) study found that 33% of children were either overweight or obese (Williams *et al.* 2009), while the Millennium Cohort Study (MCS) reported a rate of 21% of children being either overweight or obese (Griffiths *et al.* 2013).

Table 5.6.1: BMI category of the children

BMI Category (N = 270)	n	%
Underweight	3	1.1%
Healthy	188	69.6%
Overweight	31	11.5%
Obese	48	17.8%

Proportions of males and females within each BMI category were then analysed using a Mann Whitney U test. The findings indicated that there were no statistically significant differences between the genders (p =.065), however there were higher proportions of females in the overweight (15%) and obese categories (19%) compared to males (overweight: 6.8%, obese: 16.2%). In total 34% of females were either overweight or obese, while 23.1% of males either were overweight or obese. This is detailed in the table 5.6.2 below.

Table 5.6.2: BMI differences between males and females

BMI Category (N= 270)	Male n, %	Female n, %	Mann Whitney U test
Underweight	1, 0.9%	2, 1.3%	Male (median= 2) Female (median= 2) U = 8014, z = -1.846, p = .065
Healthy	89, 76.1%	99, 64.7%	
Overweight & Obese	27, 23.1%	52, 34.0%	
No significant differences between males and females			

5.7 School Performance

To answer the research questions of this study, data on children's school performance was also gathered. This data was gathered in the form of Drumcondra test scores, and Micra and Sigma T scores. For this study, the scores were converted from raw scores into STEN scores for standardising the results of the children (see Chapter two on STEN scores). The test scores ranged from one to ten with an average of 5.03 for reading and 5.12 for mathematics (see table 5.7).

Table 5.7: Summary of test scores

	Reading (n= 243)	Maths (n= 240)
Mean	5.03	5.12
Median	5	5
Mode	5	6
Std. Deviation	1.596	1.833
Minimum	1	1
Maximum	10	10

5.7.1 Reading and Maths test scores by gender

This section reports the differences between males and females on their reading test scores and mathematics test scores. Table 5.7.1(a) provides summary statistics of reading and mathematics test scores for males and females. It is interesting to note that within the sample, the average reading scores for males (4.95) are lower than for females (5.09); however, Maths mean scores remain the same for both genders (5.12).

Table 5.7.1(a): Summary of test scores by gender

	Reading		Maths	
	Male (n= 103)	**Female (n= 140)**	**Male (n= 104)**	**Female (n= 136)**
Mean	4.95	5.09	5.12	5.12
Median	5	5	5	5
Mode	4	5	4	6
Std. Deviation	1.694	1.524	1.992	1.709
Minimum	1	2	1	1
Maximum	10	10	10	10

A Mann Whitney U test was conducted to analyse the differences between males and females on their reading and maths test scores (findings reported in table 5.7.1(b)). The findings suggested that there were no significant differences between genders on reading ability (p= .362). Similar to the reading test scores, there were no significant differences between genders on mathematics ability (p= .659).

Table 5.7.1(b): Gender differences in test scores using Mann Whitney U tests

Dimensions	***U***	***Z***	***p***	**Mean Rank**	
				Male	**Female**
Reading scores	6726	-.912	.362	117.31	125.45
Maths scores	6840	-.441	.659	118.27	122.20

5.8 Conclusion

A total of 274 children took part in the survey and 270 had BMI measurements taken. There were more females (56.6%) than male participants and the age ranged between 8 to 12 years old with an average age of 10.11. Most children had a good perception of their health and their HRQoL scores were within the European average t-scores. Girls also reported high Quality of Life (QoL) in the school environment dimension compared to boys. The mean depression score was 46.96, which again was within the norm, however, it is important to note that 46 children presented with above average on the depressive scale, representing 17.2% of children. It was reported that girls exhibited higher levels of depressive symptoms compared to boys. There were 17.8% of children who were obese, while 11.5% of were overweight. Overall there were no major differences between genders on variables related to BMI, breakfast, bullying, and body weight perception. It is also important to note that the vast majority of children were within the International European average scores on overall health, therefore the majority of children who took part in this study were within the norm.

In summary, chapter five described the sample of children quantitatively under various conditions and these were; HRQoL, depression, BMI, school performance, and health-related behaviours. These findings informed the binary logistic regression model and the mediation model described in chapter six. The next chapter presents the findings of the binary logistic regression and the mediation models.

Chapter 6: Findings II - Regression and mediation modelling analyses

6.1 Introduction

This chapter begins by presenting the correlation between key variables using Spearman correlations, followed by a presentation of the four separate binary logistic regression models and the mediation model for the dependent outcome variables depression, obesity and school performance, as measured by mathematics and reading. The normal distribution assumption was violated hence a Spearman's correlation was used instead of the Pearson's correlation. Once again, due to the violation of the normality, simple or multiple linear regressions were not conducted, and binary logistic regression models were used. A total of four models were developed to assess the effects of 13 predictors on depression, obesity and poor school performance. As this is a binary logistic regression, the dependent (criterion) variables are converted into dichotomous variables, i.e. Obese/Non-obese, Depressed/Non-depressed, and Fail/Pass for both reading and maths tests. Binary logistic regression, its assumptions and findings are presented in sections 6.3 and 6.4. This is followed by the mediation model in section 6.5. The mediation modelling technique is described, and the findings are reported. These models aim to investigate the relationship between depression, obesity and poor school performance, identify significant predictors and identify the mediating effect of obesity on depression and school performance. As previously discussed in chapter 5, HRQoL, breakfast intake, bullying and body weight perception has been added to the analyses, both descriptive and inferential, based on previous research which states that these variables are significant factors which impact depression, obesity and school performance.

6.2 Normality tests for dependent variables

Prior to selecting the binary logistic regression model, the aim was to assess the relationship between depression, obesity and school performance, along with the 13 predictors identified from the literature, using multiple linear regression analyses. However, the assumption of normality was violated for the four dependent variables. The assumption of normality was assessed with skewness and kurtosis scores, and Shapiro-Wilk test. The normality tests are reported for BMI in section 6.2.1, and for the remaining dependent variables, the normality tests are reported in the appendix 8. The remaining three variables also violated the normal distribution assumption. Skewness measures by how much the data is lopsided, while kurtosis measures how flat or steep the data is when the bell curve is imposed on the histogram. The

Shapiro-Wilk test is a test of normality, if the *p-value* of the Shapiro-Wilk test is less than 0.05, it means that the data does not meet the normality assumption (Ghasemi *et al.* 2012).

6.2.1. BMI normality test

This section presents the normality tests conducted on BMI scores. The figure 6.2.1 below presents the histogram with BMI scores, which indicates that the BMI scores are not normally distributed.

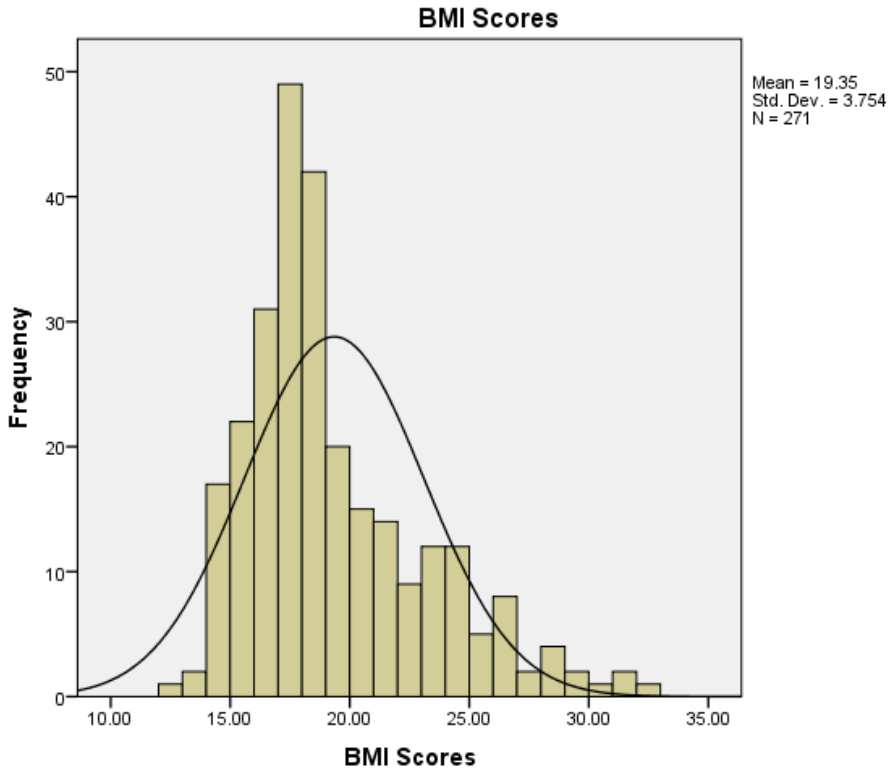


Figure 6.2.1: Histogram presenting the distribution of BMI Scores

As shown in the figure above (6.2.1), the data is not normally distributed. BMI data is positively skewed with a skewness of 1.090 (SE = .148) and kurtosis of .915 (SE = .295). The z scores for skewness (7.36) and kurtosis (3.08) were outside the range of ±2.58, i.e. exceeded a significance of 0.01. Normality was also assessed based on Shapiro-Wilk test, and a *p* value of less than .001 was reported, indicating a violation of the assumption.

6.3 Correlation between variables

Spearman's correlations were conducted for depression, physical wellbeing, psychological wellbeing, parent relationship, peer relationship, school environment, BMI, Maths, and reading

test scores, as these variables violated the assumptions of Pearson's correlation (see table 6.3.1).

6.3.1 Spearman's correlation

The findings from the Spearman's correlation showed statistically significant correlations between depression and the five Kidscreen dimensions, with $p<.01$. The *r* values for each were negative which suggests that as one variable increases the other decreases. According to Cohen (1988), a small correlation ranges between .1 and .2, a medium correlation ranges from .3 to .4 and anything above .5 is considered to be a large correlation (Cohen 1988). A small positive correlation was observed between age and parental relationship ($r= .187$) and a small negative correlation with reading performance ($r= -.156$). A small negative correlation was observed between peer relationship ($r= -.258$) and depression; a strong negative correlation was observed for psychological wellbeing ($r= -.533$) and depression; and a medium correlation for parent relationship, physical wellbeing and school environment (*r* ranging from -.300 and -.378) was observed. A small negative correlation was noted between depression and reading scores, indicating that high depressive symptoms were associated weakly with reading performance. No significant correlations were found between maths performance and depressive symptoms. There was no significant correlation between depression and age. Interestingly, a statistically significant relationship was reported for depression with BMI, however with a small correlation ($r= .160$, $p<.01$). This suggests that high BMI scores were associated weakly with higher depression scores, while lower BMI scores were associated with lower depression ratings. A small negative correlation was also reported for BMI, physical wellbeing and psychological wellbeing, $p<.01$ and a small positive correlation with age. BMI was not correlated with peer relationship, parental relationship, school environment, reading performance, and maths performance. Maths and reading test scores were strongly correlated ($r= .598$, $p<.01$). It was found that maths ($r= .187$, $p<.01$) test scores were correlated with school environment; however only a small correlation was observed. The five HRQoL dimensions were correlated with each other with *r* ranging between .293 and .579. A strong positive correlation was found between psychological wellbeing and parental relationship (.579), and with school environment (.507). The weakest correlation found was between physical wellbeing and peer relationship (.293), while medium correlations were found between the remaining dimensions (.387 to .412).

Table 6.3.1: Spearman's correlations between key study variables

	Variables	1	2	3	4	5	6	7	8	9	10
		Age	BMI	Depression	Physical Wellbeing	Psychological Wellbeing	Parental Relationship	Peer Relationship	School Environment	Reading	Maths
1	Age										
2	BMI	.241**									
3	Depression	-.001	.160**								
4	Physical Wellbeing	-.055	-.223**	-.300**							
5	Psychological Wellbeing	.045	-.170**	-.533**	.412**						
6	Parental Relationship	.187**	-.053	-.378**	.402**	.579**					
7	Peer Relationship	.026	-.079	-.258**	.293**	.455**	.453**				
8	School Environment	-.046	-.034	-.354**	.387**	.507**	.499**	.422**			
9	Reading	-.156*	-.096	-.129*	.066	.043	.092	.028	.103		
10	Maths	-.127	-.046	-.124	.112	.088	-.004	.068	.187**	.598**	

****. Correlation is significant at the 0.001 level (2-tailed).**

***. Correlation is significant at the 0.05 level (2-tailed).**

Effect size is small when r= +.10 to +.29; medium when r = +.30 to ±.49; and large when r= +.50 to +1.0 (Cohen 1988)

6.4 Binary Logistic Regression Model and Assumptions

Based on the normality tests presented above, it was evident that the dependent variables were not normally distributed and therefore violates the assumptions for conducting linear and multiple linear regressions. As a result, binary logistic regression models were explored for the suitability of addressing the research questions.

There are six assumptions which needs to be met to conduct the binary logistic regression (Tabachnick & Fidell, 2007). These are as follows:

1. Dichotomous dependent variable; and two or more independent variables, which can be either continuous variables (i.e., an interval or ratio variable) or nominal variables. This assumption has been met as all dependent variables are dichotomous in nature and the predictors are in continuous and nominal data form.
2. There should be independence of observations and the categories of the dichotomous dependent variable and all your nominal independent variables should be mutually exclusive and exhaustive. This assumption was met, as participants can only be in one category at a time, i.e., a participant cannot be in the obese and non-obese categories at the same time. This applies to all of the dependent variables.
3. There should be a bare minimum of 15 cases per independent variable. This assumption was met due to the adequate sample size of 274.
4. There needs to be a linear relationship between the continuous independent variables and the logit transformation of the dependent variable (Tabachnick & Fidell, 2007). This is tested using the Box-Tidwell procedure as recommended by Tabachnick and Fidell. The procedure is carried out by adding terms to the logistic regression model which consists of interactions between each continuous predictor and its log transformed continuous predictor (Tabachnick & Fidell, 2007). This assumption is met when all interactions are not statistically significant, and this was achieved for all four models conducted.
5. No multicollinearity, i.e., no strong correlation between predictor variables. This assumption was tested based on correlation coefficients and Tolerance/VIF values. This assumption was also met for each model and reported below.
6. No outliers, i.e., no cases with a standard deviation of 2 and above. This assumption was not met for all models, as some cases were identified as outliers with a standard deviation of 2.5+, a cut off recommended by Laerd Statistics (2015), however for all models, very few outliers were identified. To meet the assumption of outliers, the outliers were removed and details are provided in each of the analysis below. Previous research has

found that removing outliers from psychological studies do not lead to weaker evidence (Bakker *et al.* 2014).

The binary logistic regression models performed adopted a backward elimination procedure. This procedure begins by placing all predictors in the model and then calculates the contribution of each based on the significance value from t-test. The significance values are compared and the least statistically significant variable is then removed from the model (Field 2013). The backward method is chosen as recommended by Field (2013), as forward method is more likely to make a Type II error (Field 2013). Forced entry method was not chosen as this method is believed to be suitable for theory testing (Studenmund *et al.* 1987).

6.4.1 Data type for all variables included in the model

The table 6.4.1 provides a description of all the variables included in the four binary logistic regression models and the data types of each variable. This allows for a better understanding of categories which have positive or negative outcomes. For example, as shown in the table, obesity is dichotomised into 0 = not obese and 1 = obese. In this case, 0 is a positive outcome. All positive outcomes are assigned the value of 0.

Table 6.4.1: Dependent and independent variables with assigned values

	Variables	Categories and labels	Type of data
Dependent Variables	Depression	0 Not depressed 1 Depressed	Nominal
	Obesity	0 Not obese 1 Obese	Nominal
	Maths/English	0 Pass 1 Fail	Nominal
Independent Variables	Age	n/a	Scale
	Gender	0 Male 1 Female	Nominal
	Body weight perception	0 Happy 1 Not Happy	Nominal
	Bullying	0 Not bullied 1 Bullied	Nominal
	Breakfast	0 Had breakfast 1 Did not have breakfast	Nominal
	Depression score	n/a	Scale
	BMI score	n/a	Scale
	Reading score	n/a	Scale
	Maths score	n/a	Scale
	Psychological wellbeing	n/a	Scale
	Physical wellbeing	n/a	Scale
	School environment	n/a	Scale
	Peer relationship	n/a	Scale
	Parental relationship	n/a	Scale

6.4.2 Linearity assumptions

The linearity assumption was firstly assessed using the Box-Tidwell procedure, and this was conducted on all continuous predictor. As previously mentioned in section 6.4, in order to meet this assumption, none of the Log Natural (LN) variables should be statistically significant when regressed by the predictor variables not log transformed, and this was the case for all the variables, as indicated by the *p* values in the tables 6.4.2(a) to 6.4.2(d). The assumption of linearity was met for all four models. The table below states the continuous predictor variables regressed by the LN predictor variables. For example, age by LN age.

Table 6.4.2(a): Interactions between continuous predictors and logit transformed predictors, with BMI as the dependent variable

Obesity as the dependent variable					
	β	**S.E.**	**Wald**	***df***	***p* value**
Age by LN Age	-9.973	408.700	.001	1	.981
BMI by LN BMI	8.000	249.761	.001	1	.974
Depression by LN Depression	.036	18.828	.000	1	.998
Reading by LN Reading	.451	161.119	.000	1	.998
Maths by LN Maths	.724	180.459	.000	1	.997
Psychological wellbeing by LN Psychological wellbeing	-.071	19.135	.000	1	.997
Physical wellbeing by LN Physical wellbeing	.402	21.990	.000	1	.985
School environment by LN School environment	-.129	15.467	.000	1	.993
Peer relationship by LN Peer relationship	-.120	11.989	.000	1	.992
Parental relationship by LN Parental relationship	.101	16.077	.000	1	.995

Table 6.4.2(b): Interactions between continuous predictors and logit transformed predictors, with depression as the dependent variable

Depression as the dependent variable					
	β	S.E.	Wald	*df*	*p* value
Age by LN Age	1.826	660.775	.000	1	.998
BMI by LN BMI	-.042	116.463	.000	1	1.000
Depression by LN Depression	1.493	91.230	.000	1	.987
Reading by LN Reading	3.083	577.055	.000	1	.996
Maths by LN Maths	-2.600	523.388	.000	1	.996
Psychological wellbeing by LN Psychological wellbeing	-.108	72.252	.000	1	.999
Physical wellbeing by LN Physical wellbeing	-.041	70.389	.000	1	1.000
School environment by LN School environment	.221	55.941	.000	1	.997
Peer relationship by LN Peer relationship	.212	42.343	.000	1	.996
Parental relationship by LN Parental relationship	-.208	61.645	.000	1	.997

Table 6.4.2(c): Interactions between continuous predictors and logit transformed predictors, with reading as the dependent variable

Reading as the dependent variable					
	β	**S.E.**	**Wald**	***df***	***p* value**
Age by LN Age	-.007	326.972	.000	1	1.000
BMI by LN BMI	.005	82.883	.000	1	1.000
Depression by LN Depression	-.001	31.458	.000	1	1.000
Reading by LN Reading	-14.874	900.926	.000	1	.987
Maths by LN Maths	-.070	304.687	.000	1	1.000
Psychological wellbeing by LN Psychological wellbeing	.003	26.548	.000	1	1.000
Physical wellbeing by LN Physical wellbeing	-.001	30.455	.000	1	1.000
School environment by LN School environment	.002	28.393	.000	1	1.000
Peer relationship by LN Peer relationship	-.003	26.141	.000	1	1.000
Parental relationship by LN Parental relationship	.005	27.947	.000	1	1.000

Table 6.4.2(d): Interactions between continuous predictors and logit transformed predictors, with maths as the dependent variable

Maths as the dependent variable					
	β	**S.E.**	**Wald**	***df***	***p* value**
Age by LN Age	.000	305.938	.000	1	1.000
BMI by LN BMI	-.003	70.840	.000	1	1.000
Depression by LN Depression	.000	27.141	.000	1	1.000
Reading by LN Reading	-.097	377.318	.000	1	1.000
Maths by LN Maths	-14.440	794.323	.000	1	.985
Psychological wellbeing by LN Psychological wellbeing	-.003	22.440	.000	1	1.000
Physical wellbeing by LN Physical wellbeing	-.001	24.499	.000	1	1.000
School environment by LN School environment	.003	24.353	.000	1	1.000
Peer relationship by LN Peer relationship	.003	23.968	.000	1	1.000
Parental relationship by LN Parental relationship	.002	22.172	.000	1	1.000

6.4.3 Outlier transformation

For the first model with obesity as the dependent variable, four cases were identified as an outlier based on studentised residual of above 2.5. No outliers were found for the second model with depression as the dependent variable. The third model, with reading score as the dependent variable, four outliers were identified and removed from the model. And the final model, with maths score as the dependent variable, no outliers were identified. As previously mentioned, due to the very few outliers identified, and as found by previous research (Bakker *et al.* 2014) that the removal of outliers does not affect the strength of evidence in psychological research, the current study opted with the removal of the outliers.

6.5 Binary Logistic Regression Findings

The following subsections (6.5.1 to 6.5.4) presents the findings of the four binary logistic regressions, followed by a summary of the main findings in section 6.5.5.

6.5.1 Predictors of obesity

The first binary regression model with backward elimination was conducted with obesity as the dependent variable. The first step was to remove the four identified outliers, once this was completed, the analysis was conducted. The following variables were included as the predictors; gender, age, depression scores, reading scores, Maths scores, physical wellbeing, psychological wellbeing, parental relationship, peer relationship, school environment and breakfast intake, bullying and body weight perception. As previously discussed in section 6.4.2, linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box-Tidwell (1962) procedure. A Bonferroni correction was applied using all 24 terms in the model resulting in statistical significance being accepted when $p < .00208$ (Tabachnick & Fidell, 2007). Based on this assessment, all continuous independent variables were found to be linearly related to the logit of the dependent variable. The logistic regression model was statistically significant, $\chi^2(3) = 44.565$, $p < .001$. The model explained 37.4% (Nagelkerke R^2) of the variance in obesity and correctly classified 85.6% of cases. Sensitivity measures the true positives, i.e., it provides the percentage of cases that was correctly predicted as having the illness, e.g. yes for obesity (Laerd Statistics 2015). In this model, sensitivity was 24.1%. Specificity is the opposite of sensitivity, i.e., it measures the percentage of true negatives, therefore, providing the correctly predicted percentage of cases that did not have the illness (Laerd Statistics 2015). For this model, specificity was 97.4%. The positive predictive percentage is the correctly predicted cases with the illness compared to the total number of cases, in this model the value was 63.3%. The negative predictive percentage is the correctly predicted cases that did not have the illness

compared to the total number of cases, this yielded a value of 86.9% for the current model (Laerd Statistics 2015).

All 13 predictor variables were entered at step one of the model, and non-significant variables removed at each step until the last step (step 11). By the final step, only three statistically significant variables remained in the equation and these were physical wellbeing, school environment and body weight perception (as shown in Table 6.5.1). An increase in physical wellbeing was associated with a reduction of the likelihood of being obese. An increase in wellbeing in the school environment was associated with an increased likelihood of being obese. And, an increase in negative body weight perception was associated with an increased likelihood of being obese.

Table 6.5.1: Findings on the significant predictors of obesity

	β	SE	Wald	df	p	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Physical Wellbeing	-.117	.032	13.373	1	***p*<.001 ****	.889	.835	.947
School Environment	.063	.025	6.106	1	**.013***	1.065	1.013	1.119
Body Perception	2.778	.641	18.807	1	***p*<.001 ****	16.095	4.585	56.498
Significant at * p<.05 ** p<.001								

6.5.2 Predictors of depression

The second binary model with backward elimination was conducted with depression as the dependent variable. The predictor variables included in the model were as followed; gender, age, BMI scores, reading scores, Maths scores, physical wellbeing, psychological wellbeing, parental relationship, peer relationship, school environment and breakfast intake, bullying and body weight perception. Similar to the previous model, the linearity assumption was met, as shown in section 6.4.2. A Bonferroni correction was applied using all 24 terms in the model resulting in statistical significance being accepted when $p < .00208$ (Tabachnick & Fidell, 2007). The logistic regression model was statistically significant, $\chi^2(6) = 54.365$, $p < .001$. The model explained 43.7% (Nagelkerke R^2) of the variance in depression and correctly classified 86.3% of cases. Sensitivity was 43.3% specificity was 94.7%, positive predictive value was 61.9% and negative predictive value was 89.4%.

All 13 predictor variables were entered at step one of the model, and non-significant variables removed at each step until the last step (step 8). By the final step, six variables remained in the

equation, of which four predictor variables were statistically significant. The significant predictors were gender, psychological wellbeing, body weight perception and bullying (as shown in Table 6.5.2). Although, parental relationship and school environment was included in the model, they were not statistically significant predictors of depression. An increase in gender, i.e., being female, was associated with an increased likelihood of experiencing depressive symptoms. An increase in psychological wellbeing was associated with a reduction in the likelihood of experiencing depressive symptoms, with an odds ratio of .888. An increase in negative body weight perception is associated with an increased likelihood of experiencing depressive symptoms. As bullying increases, the likelihood of experiencing depressive symptoms increases.

Table 6.5.2: Findings on the significant predictors of depressive symptoms

	β	**SE**	**Wald**	**df**	**p**	**Odds Ratio**	**95% CI for Odds Ratio**	
							Lower	**Upper**
Gender	1.720	.624	7.595	1	**.006***	5.582	1.643	18.964
Psychological wellbeing	-.119	.038	9.592	1	**.002***	.888	.824	.957
Parental relationship	.053	.033	2.626	1	.105	1.055	.989	1.125
School environment	-.047	.027	2.908	1	.088	.954	.904	1.007
Body weight perception	1.509	.579	6.789	1	**.009***	4.521	1.453	14.064
Bullying	1.054	.514	4.206	1	**.040***	2.868	1.048	7.849
Significant at * p<.05								

6.5.3 Predictors of reading performance

The third binary model with backward elimination was conducted with reading scores as the dependent variable. The predictor variables included in the model were as followed; gender, age, BMI scores, depression scores, Maths scores, physical wellbeing, psychological wellbeing, parental relationship, peer relationship, school environment and breakfast intake, bullying and body weight perception. Four outlier cases were removed prior to conducting the analysis. Similar to the previous models, the linearity assumption was met, as shown in section 6.4.2. A Bonferroni correction was applied using all 24 terms in the model resulting in statistical significance being accepted when $p <$ .00208 (Tabachnick & Fidell, 2007). The logistic regression model was statistically significant, $\chi^2(6) =$ 94.189, $p <$ .001. The model explained 55.3% (Nagelkerke R^2) of the variance in reading scores and correctly classified 79.3% of cases. Sensitivity was 73.6% specificity was 83.2%, positive predictive value was 74.6% and negative predictive value was 82.4%.

All 13 predictor variables were entered at step one of the model, and non-significant variables removed at each step until the last step (step 8). By the final step, six variables remained in the equation, of which five predictor variables were statistically significant. The significant predictors were gender, BMI, Maths scores, Parental relationship and body weight perception (as shown in Table 6.5.3). Although, physical wellbeing was included in the model, it was not a statistically significant predictor of reading performance.

An increase in gender, i.e., being female, was associated with a decreased likelihood of failing reading tests (OR= .389). An increase in BMI was associated with an increased likelihood of failing reading tests. An increase in maths scores was associated with a reduced likelihood of failing reading tests. As wellbeing related to parental relationship increases, the likelihood of failing reading tests reduces. Interestingly, an increase in negative body weight perception was associated with a reduced likelihood of failing reading tests.

Table 6.5.3: Findings on the significant predictors of reading performance

	β	SE	Wald	df	p	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Gender	-.944	.419	5.065	1	**.024***	.389	.171	.885
BMI	.145	.061	5.557	1	**.018***	1.156	1.025	1.303
Maths scores	-1.212	.190	40.775	1	***p*<.001****	.298	.205	.432
Physical wellbeing	.039	.023	2.977	1	.084	1.040	.995	1.087
Parental relationship	-.057	.022	6.575	1	**.010***	.945	.905	.987
Body weight perception	-1.682	.550	9.354	1	**.002***	.186	.063	.546
Significant at * p<.05 ** p<.001								

6.5.4 Predictors of maths performance

The fourth binary model with backward elimination was conducted with maths scores as the dependent variable. The predictor variables included in the model were gender, age, BMI scores, depression scores, reading scores, physical wellbeing, psychological wellbeing, parental relationship, peer relationship, school environment and breakfast intake, bullying and body weight perception. No outliers were identified for this model. Similar to the previous models, the linearity assumption was met, as shown in section 6.4.2. A Bonferroni correction was applied using all 24 terms in the model resulting in statistical significance being accepted when $p < .00208$ (Tabachnick & Fidell, 2007). The logistic regression model was statistically significant, $\chi^2(3) = 75.681$, $p < .001$. The model explained

46.1% (Nagelkerke R^2) of the variance in maths scores and correctly classified 79.7% of cases. Sensitivity was 70.4% specificity was 85.6%, positive predictive value was 75.7% and negative predictive value was 81.8%.

All 13 predictor variables were entered at step one of the model, and non-significant variables removed at each step until the last step (step 11). By the final step, three variables remained in the equation, of which two predictor variables were statistically significant. The significant predictors were reading scores and physical wellbeing (as shown in Table 6.5.4). Although, parental relationship was included in the model, it was not a statistically significant predictor of maths performance. An increase in reading scores was associated with a reduced likelihood of failing maths tests. An increase in physical wellbeing was associated with a reduced likelihood of failing maths tests.

Table 6.5.4: Findings on the significant predictors of maths performance

	β	SE	Wald	df	p	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Reading scores	-1.201	.195	37.996	1	***p*<.01****	.301	.205	.441
Physical wellbeing	-.047	.020	5.352	1	**.021***	.954	.916	.993
Parental relationship	.034	.018	3.512	1	.061	1.035	.998	1.073
Significant at * p<.05 ** p<.01								

6.5.5 Binary Logistic Regression Models Summary

The four binary logistic regression models were conducted, using backward elimination procedure, for the outcome variables depression, obesity, reading performance and maths performance. Three predictors were identified from the first model, indicating that physical wellbeing, body weight perception and school environment were significant predictors of obesity. There were four predictors of depression identified, and these were gender, psychological wellbeing, body weight perception and bullying. As for the third model, five predictor variables were statistically significant in relation to its impact on reading scores, and these were gender, BMI, Maths scores, Parental relationship and body weight perception. Finally, in the fourth model, there were two significant predictors of maths performance and they were reading scores and physical wellbeing.

6.6 Mediation analyses

This section presents the mediation analyses, with depression as the predictor variable, school performance (measured through reading test scores and maths tests scores) as the dependent

variable and obesity as the mediator. This section begins by introducing mediation analysis and the difference between mediation and moderation analyses. Followed by the results from the mediation analyses.

6.6.1 Mediation VS Moderation Models

Mediation models analyses the effect of an intervening or mediating variable (M) on two other variables. It is hypothesised that the mediating variable, M, is an intermediate between a predictor (X) and an outcome variable (Y) (Preacher *et al.* 2004, Fairchild *et al.* 2009). For example, in the current study, X is depressive symptoms, Y is either Reading performance or Maths performance and M is BMI scores. In moderation models, the aim is to analyse the prediction of Y based on X and how it differs across levels of a third variable called moderator, Z. The Z variable has an effect on the strength and the direction of the relationship between X and Y. The effect can be either an enhancement, reduction or change in the influence of X (Fairchild *et al.* 2009).

In the current study, mediation analysis was explored for suitability of addressing the research questions. That is to understand the intervening relationship of obesity on depression and school performance. This analysis, including the moderation model, reflect on the richness of data collected in health studies, which allows for more in-depth exploration of the influence of psychological factors on health (MacKinnon *et al.* 2008).

6.6.2 Simple Mediation Analysis with Bootstrapping

According to Baron and Kenny (1986), a simple mediation analysis is tested through three regression equations:

1. A regression which predicts the outcome (Y) based on the predictor (X) variable. This pathway is given the name *c* and regression coefficient is provided for that pathway (as shown in the figure 6.6.1)
2. A regression which predicts the mediator (M) based on X. This pathway is given the name *a* and regression coefficient is provided for that pathway (see figure 6.6.1)
3. A regression which predicts Y based on both X and M. This pathway and the regression coefficient value is given the name *c'* and regression coefficient is also provided for path *b,* which is for M (see figure 6.6.1).

There are two main effects that are tested; the direct and the indirect effect. The direct effect is the effect between X and Y. The indirect effect is the effect of X on Y through M (see figure 6.6.1).

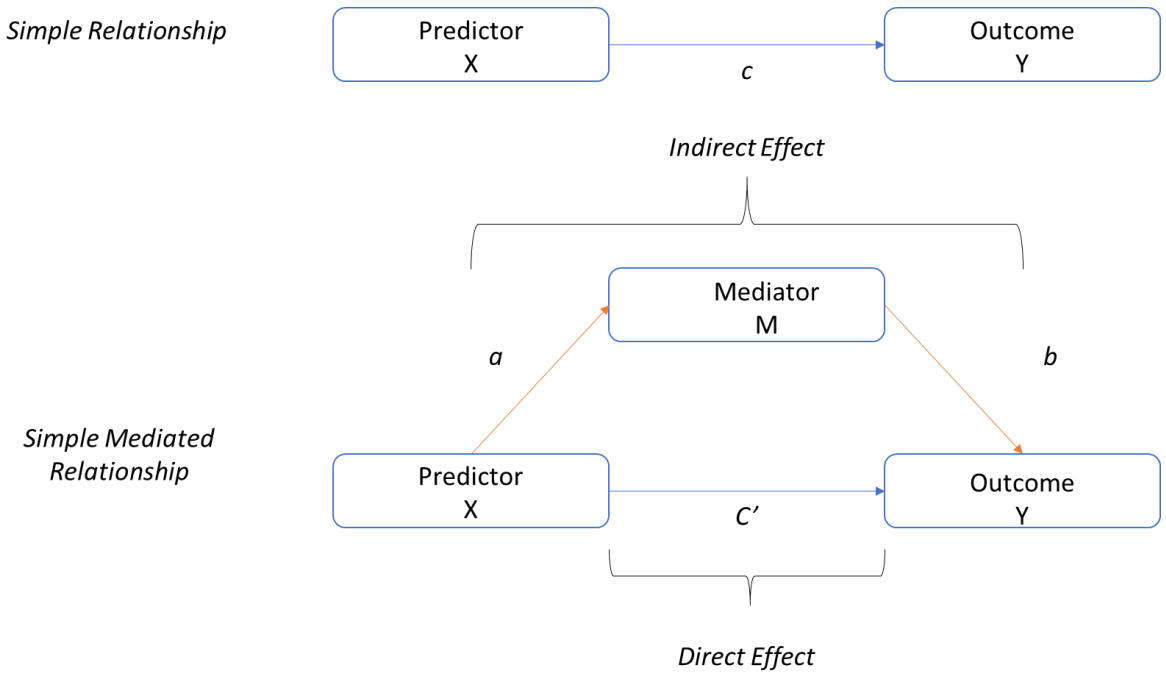


Figure 6.6.1: Diagram of a simple mediation model

As previously discussed in section 6.2, the key variables; BMI scores, depressive symptoms, and reading and maths scores, were not normally distributed. As a result, linear regressions could not be conducted, and binary logistic regression was explored instead. Similarly, the parametric mediation analysis could not be conducted due to the data being non-normally distributed. In this case, the non-parametric mediation analysis was conducted, i.e. using the bootstrapping method. The bootstrapping method takes the observations from the original dataset and randomly re-samples these observations before replacing them, and repeats this process numerous times to re-estimate the sampling distribution and to obtain a more normally distributed sample (Wynne *et al.* 2013). In the current study, bootstrapped sample of 1000 was used and this produced bias corrected and accelerated confidence intervals (Field 2013). According to MacKinnon *et al.* (2004), the bootstrapping method produces the most accurate confidence intervals as opposed to other methods, such as the parametric Sobel test.

6.6.3 Findings from the mediation analysis with bootstrapping

There was a significant effect of depression on BMI scores (β = .1082, t = 4.002, p <. 001, BCa CI [.0549, .1614]). However, the indirect effect of depression on reading scores, through BMI scores, was not statistically significant BCa CI [-.0027, .0087]. The direct effect of depression on reading scores was also not significant (p= .394), as indicated in the diagram below (6.6.3a). This indicates that BMI is not

a significant mediator between depression and reading performance, and depression does not have a significant effect on reading scores.

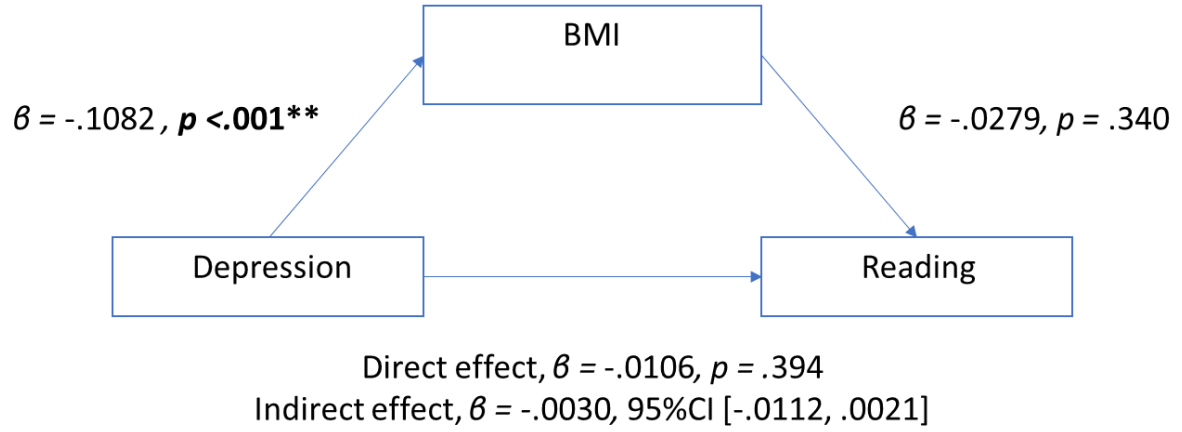


Figure 6.6.3(a): Mediation model of depressive symptoms, reading scores, and with BMI scores as the mediating variable

There was a significant effect of depression on BMI scores (β = .1168, t = 4.188, p <. 001, BCa CI [.0619, .1718]), similar to the previous model. Once again, the indirect effect of depression on maths scores, through BMI scores, was not statistically significant BCa CI [-.0087, .0057]. The direct effect of depression on maths scores was also not significant (p= .400), as indicated in the diagram below (6.6.3b). This indicates that BMI is not a significant mediator between depression and maths performance, and depression does not have a significant effect on maths scores.

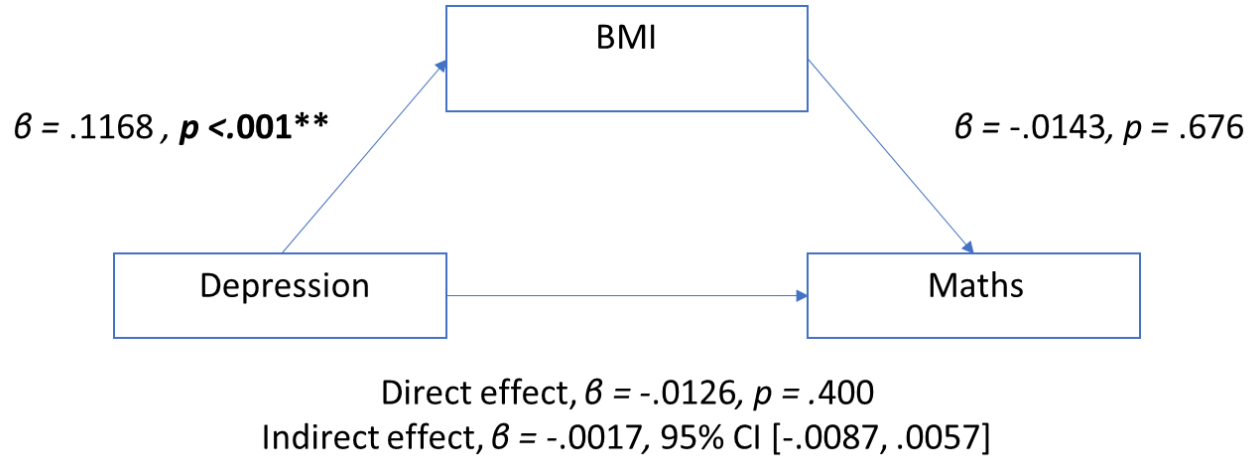


Figure 6.6.3(b): Mediation model of depressive symptoms, maths scores, and with BMI scores as the mediating variable

6.6.4 Summary of the mediation models

Two mediation models were conducted and presented in the section 6.6.3. The first model included depression as the predictor variable, BMI scores as the mediating variable and reading scores as the outcome variable. The findings from the first model indicated that there was a statistically significant direct effect between depressive symptoms and BMI scores, however, the indirect and direct effect was not significant, indicating that BMI did not have a mediating effect on depressive symptoms and reading scores, and depressive symptoms did not influence reading scores. The second model included depression as the predictor variable, BMI scores as the mediating variable and maths scores as the outcome variable. Similar to the first model, there was a statistically significant direct effect between depressive symptoms and BMI scores, however, the indirect and direct effect was not significant, and therefore, indicating that BMI did not have a mediating effect on depressive symptoms and maths scores, and depressive symptoms did not affect maths scores.

6.7 Chapter summary

To conclude, chapter 6 provided the correlation findings, binary logistic findings and mediation findings. The purpose of the correlation analyses was to identify the significant variables to include in the binary logistic regression models and to explore the relationship between the key variables. These findings informed the logistic regression models and the mediation models. The binary logistic regression reported contradictory findings compared to the mediational findings, specifically regarding the relationship between depression, obesity and poor school performance. The binary logistic regression did not identify depression as a significant predictor of obesity (when obesity was treated as the dependent variable) and it did not identify obesity as a predictor of depression (depression as the dependent variable). In relation to the school performance, BMI scores was reported a significant predictor of reading performance. This was not reported for maths performance and neither was depression reported as a significant predictor of either performance tests. These findings could be because of different methods of handling non-normally distributed data. The binary logistic regression dichotomised the key dependent variables because of the violation of the normal distribution assumption, while the mediation analysis used a method of bootstrapping to treat for non-normally distributed data, as mentioned in section 6.6.2. The next chapter will discuss these findings in light with previous literature; provide future policy recommendations and research recommendations, strengths and limitations and a conclusion of the study.

Chapter 7: Discussion and conclusion

This chapter provides a critical discussion of the findings within the context of previous research. This is followed by the strengths and limitations of the study, and the implications of findings for children, parents and teachers, health professionals and policy makers. The implications for depression and obesity interventions for children are also discussed. The chapter ends with recommendations, suggestions for future studies and a conclusion of the overall study.

7.1 Key findings discussed in light with previous research

This section presents the aims and research questions, and the key findings of the current study. These include the findings from the descriptive chapter, the regression models and the mediation models.

The aim of this study was to investigate the relationship between depression, obesity and poor school performance among urban disadvantaged children. This was explored in an Irish context. A narrative literature review was conducted to explore the relationship between depression, obesity and poor school performance among children. There has been previous research that attempted to investigate the relationship between depression, obesity and poor school performance, however, few studies are from a child population and even fewer from an urban disadvantaged setting. By understanding the relationship between these keys variables and 2identifying the predictors of depression, obesity and poor school performance, effective intervention programmes can be designed based on the findings. The relationship between these three factors may be different in affluent areas; however, the focus of the current study is on disadvantaged areas. The specific research questions, which the study aims to answer, are:

- What is the relationship between depression, obesity and poor school performance among urban disadvantaged children?
- What are the predictors of depression, obesity and poor school performance?
- Are there gender and age differences in depression, obesity and poor school performance of children?

7.1.1 Children's demographic information and their health status in context with previous literature

Approximately 300 children participated in the study with more females than males, a little over half, aged between 8 to 12 years. Most children had a positive perception of their health, and their Health-Related Quality of Life (HRQoL) scores were within the European average scores. Girls also reported higher Quality of Life (QoL) in the school environment dimension compared to boys. In relation to depressive symptoms, the majority of children were within the norm, however, it is important to note

that 17.2% of children presented with above average on the depressive scale. It was reported that girls exhibited higher levels of depressive symptoms compared to boys. This has been commonly reported in previous research that girls tend to exhibit higher levels of depressive symptoms. There were 17.8% of children who were obese, while 11.5% of were overweight. Overall, there were no major differences between genders on variables related to BMI, breakfast, bullying, and body weight perception. Interestingly, previous studies have reported that girls are more likely to be obese compared to boys, however, this was not the case in the current study. It is also important to note that the vast majority of children were within the international European average scores on overall health, therefore the majority of children who took part in this study were within the norm.

When comparing the descriptive findings on the children's overall health status, it is evident that the majority of children were within the European average. The HRQoL of the children was also within the European average indicating that the children from the current study had HRQoL comparable to other European children. This was also reported in the original Healthy Schools Programme study at baseline (Comiskey *et al.* 2012). In relation to depression scores, 9.1% of children scored above the cut-off point of seven, similar to the study conducted by Houghton and colleagues in 2003, 9.6% of Irish children scored above the cut-off point (Houghton *et al.* 2003). Another Irish study conducted in 2008 reported slightly lower proportions of 7.4% who scored above the cut-off point (Meehan *et al.* 2008).

The health-related behaviour findings were compared to the original Healthy Schools Programme data, the percentage of skipping breakfast was higher in the current study compared to the previous years in the original Healthy Schools findings for baseline to year 2 (Comiskey *et al.* 2012). As previously discussed in chapter 4, the data for the current study was gathered from the five schools, which have previously taken part in the Healthy Schools Programme. Body image findings indicated that 40.9% of children were not happy with their weight, when compared to the baseline findings of the HSP study, higher proportions of children were not happy with their weight at baseline and year 1 (approximately 43%). However, 38% of children at year 2 reported not being happy with their weight (Comiskey *et al.* 2012). Proportions of bullying rates were also higher in the current study, 36.7%, as compared to the previous years, which ranged from 28.5 to 34.9% (Comiskey *et al.* 2012). The Growing Up in Ireland (GUI) study reported bullying rates to be 36% among nine-year-old children (Cosgrove *et al.* 2014).

The proportion of overweight and obese children from the current study were similar to year 2 of the Healthy Schools Programme with approximately 30% of children being overweight/obese. Baseline

and year 1 had slightly higher proportions of overweight/obese children (Comiskey *et al.* 2015). The GUI study reported higher rates of obesity among nine-year-old children compared to the current study, while the Millennium Cohort Study reported much lower rates of obesity among five-year-old children (Griffiths *et al.* 2013). Similar to the GUI study, higher percentage of obesity was also reported in Scotland (Bradshaw 2013) and between 25 to 28.6% from the Growing Up in Australia (GUA) study (Daraganova *et al.* 2012).

To summarise, the children who took part in the current study are no different to other children in Ireland and Europe based on their physical and mental health status. Slightly lower rates for overweight/obese children were reported, however, the rates were not too different from other seminal work conducted in Ireland, UK or Australia. In relation to their mental health status, based on depression scores, the majority of children were within the normal range of depressive symptoms. However, the current did have slightly higher percentage of children who exceeded the cut-off point on the depression scale, and this could be due to the fact the children are from a disadvantaged background. Bullying rates were high in the current study as well as the GUI. The HRQoL of the children were within the European average scores, indicating that the majority of children in the current study had a good HRQoL, similar to the rest of the children in Europe. Overall, the majority of children who participated in this study had a normal health status.

7.1.2 Overview of correlational relationship between key variables

The correlational findings included various interesting links between the key variables. Age correlated with three variables: BMI and parental relationship (low positive correlation), and reading performance (low negative correlation). BMI correlated with age as previously mentioned, and with depression (low positive correlation), and with physical and psychological wellbeing (low negative relationship). Depression however, correlated with all variables included in the correlation model except age and maths performance. These were; psychological wellbeing (high negative correlation), physical wellbeing, parental relationship and school environment (medium negative correlation), and peer relationship and reading performance (low negative correlation). As previously mentioned, reading correlated with age and depression, and in both cases, a low negative correlation was reported. As anticipated, reading performance also correlated with maths performance, reporting a high positive correlation. Interestingly, maths performance only correlated reading, as mentioned previously, and school environment with a low positive relationship. These findings indicate that there is a negative relationship between depression and BMI scores, even though the correlation was low. Depression is related to reading performance, but not maths performance. This is an interesting finding, as generally it would be expected that mathematics is more difficult than reading

and therefore more likely to affect depressive symptoms. It is also interesting that BMI is related to reading performance and not maths. These results suggest children's reading performance is affected by depression and obesity, however, maths performance is not affected by neither depression nor obesity. Due to the cross-sectional nature of this study, the results could be different if data on school performance was measured longitudinally.

Similar to the current study, Sigfusdottir and colleagues (2007) also reported a significant low positive relationship between BMI and depressive symptoms. In relation to school performance, Sigfusdottir measured this variable as overall grades compared to the current PhD study, in which school performance is measured based on reading and maths performance. Reading performance was correlated with depressive symptoms indicating a low negative relationship, but this was not found for maths. Sigfusdottir also found that grades were negatively correlated with depression (low correlation); however, this correlation was also reported between grades and BMI scores, which was not reported in the current PhD study. This could be because Sigfusdottir merged different test performance together and reported them as one score for grades, while in this study reading and maths performance was reported separately. The study by Smith (2013) reported on test scores separately for English and Maths, similar to the current study. The correlational findings were different between genders, a negative correlation was reported between BMI and maths test among girls and a negative correlation was reported between BMI and English test among boys. Another interesting finding was that a positive correlation between depression and BMI was reported among girls but not for boys. While in the current study, a weak negative correlation was reported between BMI and depression. Gunnarsdottir (2012) reported no correlations between BMI, depression or school performance. However, they did report that BMI has a medium negative correlation with age, and the opposite was found in the current study with BMI having a low positive correlation with age. These were the only three studies, which reported on correlational findings, and both conducted Pearson's correlation while the current PhD study conducted Spearman's correlation due to the data being non-normally distributed.

7.1.3 Overview of key significant predictors of depression, obesity and school performance

To identify the key significant predictors, four binary logistic regression models were conducted, using backward elimination procedure. The following variables were identified as key predictors of obesity: physical wellbeing, body weight perception and school environment. There were four predictors of depression identified, and these were gender, psychological wellbeing, body weight perception and bullying. Five predictors were identified for reading scores, and these were gender, BMI, maths scores, parental relationship and body weight perception. Finally, there were two significant predictors of maths performance and they were reading scores and physical wellbeing. These findings suggests that

physical wellbeing, body weight perception and school environment affect children's BMI scores. It also indicates that there are gender differences in children's levels of depressive symptoms, with girls being more likely to experience depressive symptoms compared to boys. Overall, psychological wellbeing, body weight perception and bullying has an impact on children's levels of depressive symptoms. There are gender differences among children in reading performance, indicating that girls perform better than boys. Interestingly, BMI, maths scores, parental relationship and body weight perception predicts children's reading performance in school. School environment and body weight perception has an impact on children's maths performance in school. From this analysis, a different picture is provided on the relationship between depression and obesity compared to the correlational findings. According to regression model, neither obesity nor depression has a predictive influence on each other. It is also noted that depression does not predict reading performance, as would be expected since the correlational findings suggested that these two variables are correlated. However, BMI was reported as a predictor of reading scores.

In light of previous research, several studies which were discussed in chapter 3, conducted logistic/ordinary/multiple regression analyses. These study findings will be discussed as they are more relevant for comparison with the current study; Gunnarsdottir *et al.* (2012), Sigfusdottir *et al.* (2007), Lim *et al.* (2016), and Chau *et al.* (2013). The study by Gunnarsdottir and colleagues, reported that teasing and social rejection among obese children was a significant predictor of psychological maladjustment, including depression, and school performance. This variable was not measured by the current study; however, bullying was measured and was reported as a significant predictor of depression. Parental education was also reported as a significant predictor of academic performance by Gunnarsdottir' study, however, this variable was not measured in this PhD study. As a result, not all the findings are directly comparable to the current study. However, it is interesting to see that bullying, teasing and social rejection are significant predictors of depression. The study by Gunnarsdottir concluded that there was no relationship between depression, obesity and school performance. The regression findings from the current PhD study, on the other hand, reported that BMI significantly predicted reading performance of children, indicating that there is a relationship between BMI and reading scores, however, this was not identified for maths performance and the association between BMI and school performance was also not found in the mediation analysis. This will be discussed at a later stage. In relation to age and gender, age did not predict any of the key variables, while gender predicted read performance and depression, indicating that girls performed better in reading and had levels of depressive symptoms. From the Gunnarsdottir study, gender and age were only associated with BMI, and not depression or school performance.

The study by Sigfusdottir *et al.* (2007) combined the test scores of Icelandic, maths, English and Danish to create one overall grade for school performance. An OLS model was conducted to identify the key significant predictors of school performance among children. The significant predictors were; gender, BMI scores, depressive symptoms, self-esteem, and SES status. From the current PhD study, gender, BMI scores, parental relationship and body weight perception were reported as significant predictors

of reading performance, while physical wellbeing and school environment were significant predictors of maths performance. Gender and BMI are the only two variables which were identified by both studies as being significant predictors, however, the current PhD study found those variables only related to reading performance. This finding is not directly comparable with that of Sigfusdottir as they did not report on the test performance of different subjects separately. The differences between the findings could be attributed to the different regression models used, i.e., logistic regression and OLS regression models, and due to the different ways of reporting on school performance, i.e. separate performance or combined as an overall grade. Logistic regression uses dichotomous variables while OLS models use categorical ordinal data, which gives the model more data points to work with. Lim *et al.* (2016) reported the following variables as significant risk factors associated with depression; age, gender, obesity, family conflict, and with whom personal issues were discussed. Most of the findings reported in Lim's study focused on the results from the independent sample *t*-tests looking at differences between depressed and non-depressed groups and interestingly they found that there was no difference between groups on obesity and grades across different ages. This could be due to the low numbers of children grouped under the depressed category. The issue of low variability is also problematic for the current PhD study and not just Lim's study. This will be discussed in the limitations section. Due to the different statistical analyses used, the findings from Lim's study is not directly comparable with the current PhD. While Lim's study reports on the differences between depressed and non-depressed group, the findings from the current PhD study focuses on the relationship between the key variables. From which, we found that gender, body weight perception, psychological wellbeing and bullying were significant predictors of depression. However, obesity and school performance were not identified as significant predictors.

The main findings from Chau *et al*. study (2013) reported contradictory results in relation to gender compared to all previous research, as well as the current study. While the current PhD study found that girls were more likely to experience depressive symptoms, Chau *et al.* reported that boys were more likely to experience depressive symptoms and high BMI scores. The association between gender and BMI was not identified in the current PhD study. They also reported that age was a significant predictor for BMI and depressive symptoms, which was not found in the current study. In relation to school performance, the study reported that SES status and family structure were significant predictors, and these could not be measured and tested in the current study. Overall, mixed findings have been reported and this could be due to various methodological approaches adopted. For example, Chau's study was conducted on adolescents, while this PhD study was conducted school-aged children. Chau's study also had a bigger sample size and used different measures compared to the current study. Based on the different participant ages, it seems that adolescents experience depressive symptoms and obesity differently compared to school-aged children.

7.1.4 Mediational findings

Two mediation models were conducted, because school performance is measured and reported separately for maths and reading scores. The first model included depression as the predictor variable,

BMI scores as the mediating variable and reading scores as the outcome variable. The findings from the first model indicated that there was a statistically significant direct effect between depressive symptoms and BMI scores; however, the indirect and direct effect was not significant, indicating that BMI did not have a mediating effect on depressive symptoms and reading scores, and depressive symptoms did not influence reading scores. The second model included depression as the predictor variable, BMI scores as the mediating variable and maths scores as the outcome variable. Similar to the first model, there was a statistically significant direct effect between depressive symptoms and BMI scores, however, the indirect was not significant, and therefore, indicating that BMI did not have a mediating effect on depressive symptoms and maths scores, and depressive symptoms did not affect maths scores.

The study by Booth *et al.* (2014) used mediation analysis to establish the relationship between the depression, BMI and school performance. The mediation model analysed the relationship between BMI scores and school performance, with depression as the mediating factor. BMI was treated as the independent variable (IV) and school performance as the dependent variable (DV). Booth and colleagues reported that BMI did not have a direct or indirect effect on school performance. Depression did not have a mediating or direct effect on BMI and school performance. In relation to the findings from this PhD thesis, although the mediating factor was BMI, with depression as the IV and school performance as the DV, no direct or indirect effect was found between depression and school performance. However, there was a significant direct effect between depression and BMI. Therefore, Booth's study did not find any effect between the three variables, while the current PhD study found that depression affected BMI scores. Perhaps, if Booth had treated BMI as the mediator, the analysis would have led to different results on the relationship between depression and obesity. Another study, Smith (2013), conducted a moderation analyses, however this study is not directly comparable as the moderation analyses were conducted on variables not measured in this study.

The findings from the logistic regression did not identify depression as a predictor of BMI or BMI as a predictor of depression. However, the mediation analysis reported a significant direct effect between depression and BMI. Also, the logistic regression reported BMI as a predictor for reading performance, and once again from the mediation analysis, BMI did not any direct or indirect relationship on school performance, both reading and maths performance. The reason for such different results could be due to the methods used for treating non-normally distributed. As previously discussed in chapter 6, BMI, depression and school performance data were not normally distributed, and as a result, the data were dichotomised to conduct logistic regression models instead of linear regression models. By dichotomising data, there is a risk of losing data, which ultimately has an impact on the overall results.

The mediation models were able to use bootstrapping as a method of dealing with the non-normally distributed data as opposed to converting the scale data into dichotomous variables. Bootstrapping, as previously discussed in chapter 6, is a method of randomly re-sampling observations before replacing them, and this is repeated numerous times to re-estimate the sampling distribution and to

obtain a more normally distributed sample (Wynne et al. 2013), as a result data is not lost. The findings from the mediation analysis is not disadvantaged by the lost data points as the logistic regression models did. The re-sampled scale data for depression, BMI scores and school performance scores provided richer results. Therefore, from the current study, we can conclude that there is direct effect between depression and BMI scores with depression as the predictor and BMI as a mediator between depression and school performance. No links were reported between BMI and school performance, and depression and school performance. This indicates that BMI scores has no impact on children's performance in school and neither does depression.

7.1.5 Summary of findings in context

The evidence is clear that there are still contradictory findings across research. For example, the findings in relation to gender and its association with depression and obesity, not all studies found the same link between gender. These findings are summarised in section, highlighting the contradicting findings as well as the similarities found between the current studies and the previous literature discussed above and in chapter 3.

To summarise, the main findings from the current study were derived from two different statistical models; binary logistic regression and mediation analysis. The binary regression models were conducted to identify the key predictors of depression, obesity and school performance. The statistically significant predictors identified for depression were gender, psychological wellbeing, body weight perception and bullying. This indicates that there are gender differences in how children experience depressive symptoms. Based on the findings, girls are more likely to exhibit depressive symptoms compared to boys. The findings also indicate that psychological wellbeing, body weight perception and bullying affects depressive symptoms among children from a disadvantaged population. While most studies discussed previously reported that girls were more likely to exhibit depressive symptoms compared to boys, similar to the current PhD study, the study by Chau et al. (2013) found that boys were more likely to exhibit depressive symptoms compared to boys. Bullying was not measured in the previous studies discussed, however, Gunnarsdottir et al. (2012) measured social rejection and teasing, and they reported that both social rejection and teasing predicted depressive symptoms. Interestingly, BMI was not a significant predictor of depression, despite the correlational findings, which reported a low negative correlation between the two variables.

In relation to the findings for BMI, physical wellbeing, school environment, and body weight perception significantly predicted obesity among children. This suggests that children's BMI scores are affected by their physical wellbeing, their school environment and how they perceive their body weight. Interestingly, depression scores did not predict BMI scores, indicating that depression does not affect BMI scores in children. Surprisingly, the current study did not find gender as a predictor of children's BMI scores. Based on the findings from previous studies, one would expect that gender to have a significant association with BMI.

The key predictors for reading scores were gender, BMI, maths scores, parental relationship and body weight perception. Therefore, this suggests that children's BMI scores have an impact on children's reading performance. Their performance in reading is also affected based on their maths performance. Parental relationship has an influence on their reading test scores. Interestingly, body weight perception also influenced how children performed on their reading test. Gender differences were also reported, indicating that girls performed better than boys did. Depression was not identified as a predictor for performance in reading, indicating that depression did not affect children's reading performance. There were only two predictors for maths and these were reading scores and physical wellbeing. The findings suggest that children's performance in maths are dependent on their reading performance and their physical wellbeing. Interestingly, gender, parental relationship and BMI did not predict maths performance, unlike reading performance. However, similar to reading performance, depression did not predict maths performance.

From the mediational analysis, it was reported that depression does not affect school performance (both reading and maths performance) with BMI as a mediating factor. BMI does not have a direct effect on school performance and depression does not have a direct or indirect effect on school performance. Therefore, this suggests that the only link between these three variables lies between depression and obesity, indicating that depression affects BMI scores. Based on the previous findings from the logistic regression models, it was anticipated that depression would not influence school performance; however, it was anticipated that BMI would be a significant mediating variable between depression and obesity.

As previously mentioned during the discussion of the current findings in light with previous research, not all studies were directly comparable due to the different methodological approaches and due to the different populations. The current study is based on a designated urban disadvantaged Irish population of young children. In addition, from this study, it is evident that there is an association between depression and obesity. From the regression analyses, it is also evident that gender, bullying, body weight perception and psychological wellbeing play a significant role in how depressive symptoms are experienced among urban disadvantaged children. In relation to BMI, the variables physical wellbeing, school environment and body weight perception were identified as significant predictors. How do these findings inform the current treatment for depression and obesity? Seeing that they are linked, are there combined treatments for both comorbidity and how are the predictors mentioned above accounted for in treatment methods? The next section, 7.2, provides an overview of the current treatment methods and interventions for depression and obesity.

7.2 Prevention and intervention strategies for depression and obesity

Identifying that a child has a health concern is the first step that leads to enrolment in intervention strategies. Diminished school performance is often used by schools as a warning signal that all is not well with a child. Obesity is easy to assess, even without formal BMI measurement. However, signs of low mood or depression can be trickier to assess informally. Based on the findings from the current

study, schools should try to assess for signs of low mood or depression. It is important that children who exhibit depressive symptoms or who are obese is identified as early as possible for that child to receive the needed care.

There are various forms of intervention strategies for depression and obesity, for example, the use of medication to treat depression and obesity, which has been controversial. This issue has been brought up several times in relation to medicalising depression among young people (Lliffe *et al.* 2009), as well as medicalising obesity. In the case of working with adolescents, studies suggest that medicalising of depression should be the last treatment option, and suggesting the use of Cognitive Behavioural Therapy (CBT) and family therapy as more suitable treatment options (Gledhill *et al.* 2003). However, there are issues with implementing psychological interventions as such, one of which is engaging young people for longer period (Lliffe *et al.* 2009). The sections 7.2.1 and 7.2.3 provides an overview of the current treatment of childhood depression and obesity, as the findings from the study suggest that there is a relationship between depression and obesity, therefore there is no guarantee that the treatment for addressing one factor will reduce the other automatically. The findings suggest that any intervention or therapy needs to address both factors simultaneously for effective change in children's health status. The section 7.2.4 provides a review of the combined treatment for childhood depression and obesity, as well as the lack of combined treatments available.

7.2.1 Treatment for childhood depression

As previously mentioned in chapter two, depression was believed to be non-existent in children, as a result most of the treatment for depression were originally designed for adults (Maughan *et al.* 2013). Subsequently, the treatment for adults was further developed for the child and adolescent populations (Maughan *et al.* 2013). There are various treatments for depression in young children and adolescents. These include; CBT, family therapy including psychoeducational family programs, psychotherapy, interpersonal therapy and pharmacotherapy. An overview of the current treatment for depression is provided which gives context for the recommendations made from the findings of the current study. The following sections provide an overview of these different types of treatment for depression.

1. Cognitive Behavioural Therapy

Cognitive Behavioural Therapy (CBT) consists of behavioural techniques to increase coping skills, communication skills, peer relationships, problem solving, minimise negative thinking and regulate emotions (Clark *et al.* 2012, p.446). CBT is the mostly widely used treatment of depression among children and adolescent (Maughan *et al.* 2013, Sokolova 2003). For example, in the United Kingdom, CBT is the first treatment option given for children suffering from mild symptoms of depression

(Maughan *et al.* 2013). Research has shown that CBT is one of the effective forms of treatment for depression among adolescents (Weisz *et al.* 2006, Klein *et al.* 2007). However, the treatment effect of CBT was in the lower moderate range of 0.3 (Weisz *et al.* 2006). Research conducted in the United States called the Treatment of Adolescents and with Depression Study (TADS), found that adolescents' level of depression did not improve for those who received the CBT treatment as compared to the children who were in the placebo group (March *et al.* 2004).

2. Pharmacotherapy

Research has shown that fluoxetine is a more effective treatment among children and young people aged between 6 and 18 years of age (Hetrick *et al.* 2007). Fluoxetine is a type of Selective Serotonin Reuptake Inhibitor (SSRI), which is the most common method of treatment for children and adolescent, and is the only Food and Drug Administration (FDA) approved drug for treating depression among that age group in the US (Du 2013). Another approved drug for adolescents (12 years and over) is the Escitalopram, which was approved in the US based on an RCT study by Emslie and colleagues in 2009 (as cited in Maughan *et al.* 2013, p. 38). The use of pharmacotherapy for treating childhood depression has been controversial in the last decade due to reports of increased risk of suicide among children and adolescents who are on antidepressants (Du 2013).

3. Combined treatments

Research has shown that the combination of CBT and pharmacotherapy can be effective in treating depression among child populations, more specifically adolescents. The main study which provided evidence to support this view was the US study TADS (see section 7.4.1.1), which found that 12 weeks of CBT combined with fluoxetine treatment was far more effective than fluoxetine alone (March *et al.* 2004). The UK study Adolescent Depression, Antidepressants, and Psychotherapy Trial (ADAPT) also combined CBT with fluoxetine treatment; however, no improvement was reported (Goodyer *et al.* 2007). It is important to note that the studies were methodologically different, e.g. sample selection, treatment protocols, and outcome measures (Thapar *et al.* 2013).

7.2.2 Childhood depression treatment in Ireland

Fitzpatrick *et al.* in 2004 wrote a book called Coping with Depression in Young People, within which it was suggested that depressive disorders could not be treated by a single method. The treatment should consist of multiple approaches (Fitzpatrick *et al.* 2004). In the 1990s, there was an increased use of antidepressants among children and adolescents due to the popularity of SSRIs. Overall, the prevalence of antidepressants decreased in 2002; however, the prescription rate of fluoxetine increased between the years 2002 and 2011 (O'Sullivan *et al.* 2015). Despite the increased rates of fluoxetine, Irish prevalence of prescribing of antidepressants to children and adolescents were lower

compared to the US, but higher compared to Germany and Denmark (O'Sullivan *et al.* 2015). The most common treatments for childhood depression in Ireland are CBT, family therapy and pharmacotherapy (Fitzpatrick *et al.* 2004), however the first option is always CBT compared to family therapy or pharmacotherapy.

7.2.3 Treatment for childhood obesity

There are various approaches to treating childhood obesity; however, the majority of treatment options available to children are mostly directed towards exercising and healthy eating. The Health Service Executive (HSE) in Ireland states that losing weight will contribute to better quality of life, physical and psychological wellbeing, however, the treatment options provided by the HSE for childhood obesity focuses mainly on physical health rather than psychological wellbeing (HSE 2016). Psychological wellbeing is almost seen as an inevitable outcome of physical interventions to lose weight. Common treatment methods and interventions implemented among children are further discussed.

According to then Centre for public health and Excellence NICE guidelines for treating childhood obesity, multiple approaches should be considered. More specifically, it is recommended that the treatment should consist of behavioural, psychological and lifestyle approaches, with the involvement of parents (NICE 2006). The World Health Organization (WHO) recommends behavioural therapy with the involvement of parents or family members. WHO also recommends other forms of treatment which includes CBT and family therapy (Branca 2007).

The National Nutrition Surveillance Centre (2009) conducted a review on childhood obesity treatment. The report reviewed the following Irish interventions for childhood obesity, which are family based interventions; Activity, Confidence, Eating (ACE), Food Dude Healthy Eating Programme, Little Steps go a long way, Healthy Food for All, Children's Advertising Code, and Foods for Kids' Menus (NNSC 2009). ACE programme was designed by the HSE for children aged between 6 and 12 years with the aim of developing a pilot weight management programme. The intervention consisted of education sessions for parents, nutritional sessions with children, and education sessions with both the parents and the child, for over 12 weeks. An evaluation of the programme was conducted over three time points for 12 months, which indicated that the intervention was effective in decreasing BMI on a short term basis, however there was no long term decrease in BMI (O'Keeffe *et al.* 2008).

The Food Dude Healthy Eating Programme is a UK intervention, which was implemented between 2005 and 2008 in Ireland by Irish Food Board, with the aim of promoting healthy eating, mainly by

providing free fruits and vegetables at school for 16 days with videos and rewards. The intervention was conducted in 150 primary schools in Ireland, with approximately 31,000 children. The programme was carried out in the home setting with children aged between five and six years who ate very little fruits and vegetables. The initiative teaches parents to give praise, encouragement, and healthy rewards to children every time they eat fruits and vegetables. Ninety-four percent of teachers reported that the children ate more fruits, while 78% of teachers reported that the children ate more vegetables. Similarly, 98% of parents reported that their children's fruits and vegetables intake were higher (Horne *et al.* 2009).

The HSE, Safefood and the Health Promotion Agency in Northern Ireland (2009) introduced the Little Steps Go a Long Way campaign to increase major awareness through television, radio and digital activity about improving health through physical activity and healthier food choices (Safefood 2009).

The Healthy Food for All initiative was implemented to create awareness of food poverty among low-income families. The intervention promotes the availability and the access to healthy food, as well as affordable food for people from lower socioeconomic backgrounds. It mainly focuses on community food schemes and providing school dinners. The aim of the programme is to develop an education system to support best practice on endorsing healthy food, and create awareness of food poverty (Farrell *et al.* 2008). Due to the lack of funding to sustain the programme, Health Food for All ended in March of 2016.

The Children's Advertising Code has been introduced in Ireland to advertise health warning messages on fast food, confectionery and soft drinks. After three public consultations, which were conducted over 18 months, the code was introduced in the 2005 (NNSC 2009). In 2008, the Foods for Kids' Menus was launched by Irish Hotels, which provides chefs with healthy preparation guidelines and nutritious options for family-friendly and health menus (NNSC 2009).

Another intervention programme, which was not reviewed by the National Nutrition Surveillance Centre, is the W82GO programme developed by the Temple Street Children's University Hospital in 2005. W82GO is a family-based healthy lifestyles programme delivered over 12 months by a multidisciplinary team comprising of paediatrician, dietitian, nurse, physiotherapist and psychologists. The age range for participation in the programme is six to 16 years (O'Malley *et al.* 2014). A prospective study conducted by O'Malley and colleagues, it was reported that the W82GO programme was effective in reducing BMI 12 months after the treatment (O'Malley *et al.* 2014).

The Department of Health is currently working on creating new policy and action plan for obesity and has created a Special Action Group on Obesity (SAGO). There are two campaigns, which have been introduced in 2015, called *Let's Take on Childhood Obesity One Step at a Time* and the campaign *It's Bedtime* (DoH 2015). The Department of Health and SAGO's focus is primarily on healthy eating, physical activity, and weight management, however very little has been done in relation to depression and how it can affect obesity treatment. As previously mentioned, depression is currently seen as a by-product of obesity rather than a condition which has a direct relationship with obesity. This has not been taken into consideration when planning on effective treatment methods for children with obesity. The next section discusses the combined treatment of childhood depression and obesity.

It is evident from the interventions already in place that behavioural therapies and lifestyle changes involving parents have been effective in the past (e.g. O'Malley *et al.* 2014, O'Keeffe *et al.* 2008, Horne *et al.* 2009). From the current study, the logistic regression reported that physical wellbeing, body weight perception and school environment were significant factors for obesity. The interventions discussed above focuses on many aspects of the children's lifestyle, including healthy eating, however, only the W82G0 intervention reported including physical wellbeing, i.e. physical activity as part of the intervention. The majority of the interventions in place has a greater emphasis on healthy eating but lacks in other aspects which are very relevant to treating obesity, for example, targeting physical and mental health issues as well as healthy eating. Although mental health variables were not reported from the logistic regression as key predictors for obesity, the mediation analyses indicated that depression statistically significantly affected BMI scores. The W82GO programme does target some aspects of mental health; however, the intervention does not target depression specifically. The researcher consulted the W82GO coordinator over the phone to clarify if depression intervention is included as part of the programme. Furthermore, based on the findings from the current study, future interventions should involve the school as well as parents in order to create an effective obesity programme.

7.2.4 Combined treatment for childhood depression and obesity

The treatment of depression and obesity is said to be similar in some ways, which suggests that there is the potential for the two treatments to interact cooperatively to reinforce each other (Markowitz *et al.* 2008, p.12). However, there are also differences between the interventions that can hinder the effect of other interventions. The mediational findings from the current study reported that depression significantly influenced BMI scores, suggesting that depressive symptoms and obesity are linked. Based on the findings, practitioners should be aware of the relationship between depression

and obesity, the overlap in treatment and challenges, in order to integrate the care for the patients effectively (Markowitz *et al.* 2008).

Behavioural theories, more specifically CBT, have been effective in the treatment of childhood depression. The principles of CBT focus on coping strategies for dealing with setbacks, and negative thinking, while obesity treatments also make use of these principles. For example, interventions that promotes lifestyle changes such as physical activity, has been effective in weight management (Melzer *et al.* 2004), however, exercise has also been effective in improving mental health (Lawlor *et al.* 2001).

However, there are also challenges to treating depression and obesity as different comorbidities, for example, interventions that involve dieting and antidepressant medications. A study conducted by Murray and Colleagues (2004) in the UK reported that the use of antidepressants among children and adolescents gained popularity for treating depression (Murray *et al.* 2004). More recently, John *et al.* (2016) also reported an increased use of antidepressants among children and young people. Research has shown that dieting can worsen mood (Laederach-Hoffman *et al.* 2002). Treatment for depression can also affect obesity, as research has shown that antidepressants cause weight gain (Golden 2004). Therefore, health professionals should recommend interventions that are beneficial for both conditions (Markowitz *et al.* 2008, Boudreau *et al.* 2013).

An example of a recent intervention in the US is the COPE (Creating Opportunities for Personal Empowerment) Healthy Lifestyle TEEN (Thinking, Emotions, Exercise, Nutrition) program. The study conducted by Melynk and colleagues evaluated a 12-month intervention known as the program, among 779 adolescents. The COPE intervention is based on behavioural therapy, more specifically, the cognitive-behavioural skills-building aspects. The intervention was designed in the US and it targets both depression and obesity using behavioural therapy and physical activity integrated in health courses (Melynk *et al.* 2015). The program was found to be effective as there was a significant decrease in BMI and depressive symptoms of children who were in the intervention group as compared to the control group (Melynk *et al.* 2015).

There is currently no intervention in Ireland that provides interventions for childhood depression and childhood obesity concurrently. To successfully treat obesity and depression, the shared underlying mechanisms should be targeted (Reeves *et al.* 2008). As previously mentioned, the HSE and the Department of Health have focused primarily on the physical health aspect of obesity and not on the mental health side, in particular depression. Various childhood obesity clinics have been contacted in

Ireland to enquire about the mental health aspects of the treatment programs available to children, none was identified.

The focus should be to look for prevention rather than intervention. Most of the programmes, such as Healthy Schools Programme, aim to prevent issues such as obesity, perhaps more so than intervene. Even the campaign by the Department of Health on obesity is a prevention strategy. The Healthy Schools Programme was not an effective prevention programme as reported by the evaluation report in 2012. Prevention strategies should move their focus away from purely physical health aspect and incorporate mental health aspects. Prevention programmes should consider the impact of socioeconomic status, gender, and mental health, such as low mood and depressive symptoms, which can affect the physical wellbeing of children.

In relation to the findings from the current study, it was reported that depression statistically significantly affects BMI scores. Therefore, combined intervention strategies, which targets both factors concurrently, may be more beneficial in reducing obesity and depressive symptoms in children. It is also important to address the impact of other predictors of either depression or obesity when designing prevention and intervention strategies. From logistic regression findings, the predictors identified for depression were; gender, psychological wellbeing, bullying and body weight perception. The BMI predictors reported were physical wellbeing, school environment and body weight perception.

7.3 Strengths and limitations of the study

There are various strengths and limitations to the current study. Section 7.3.1 discusses the strengths of the study, while section 7.3.2 identifies and discusses the limitations of the current study.

7.3.1 Strength

The main strength of the study is the ecological validity of the study. Data were collected from children in a real school setting and the data provided a snapshot of how the key variables investigated relate in these children. That has provided a perspective that relates to the reality of schools and children in deprived areas in Ireland. The research question itself, which aimed to address the relationship between depression, obesity and school performance, is a strength. Very few studies have addressed this issue, more specifically among young children. A few studies have investigated the relationship between depression and obesity among adult populations, however, there are fewer which has been conducted among child populations. A narrative literature revealed three studies that were similar to the current study; however, the methodological approach was different.

Another strength of the study relates to the population from which the participants were recruited, a designated urban disadvantaged population. Previous research has indicated that children from disadvantaged populations are more likely to suffer from physical health and mental health issues. However, research has neglected to investigate the relationship between depression, obesity and school performance in this population. It is also important to note that the majority of studies, which investigate childhood depression, tend to be among adolescents rather than children as young as eight years of age. There are even fewer of those studies conducted in Ireland.

7.3.2 Limitations

The current study also has its limitations, and the main limitation of this study is that the data are observational cross-sectional, and causal inferences could not be drawn. The second limitation is that the children were from the same population, i.e. DEIS band 1. As previously discussed in chapter 4, DEIS is a policy instrument developed by the Department of Education and Skills to address educational disadvantaged. Band 1 consists of schools with the greatest level of disadvantaged. Since only DEIS band 1 schools were included in the study, the variable socioeconomic status was fixed and could not be used as a predictor in the model. If the data consisted of participants from various socioeconomic backgrounds, this variable would have been used as part of the analyses to identify its predicting effect on depression, obesity and school performance.

The second limitation was the sample size of the study. The current study had a sample size of 274 children and this was based on Cohen's sample size calculation (Cohen 1988). However, the proportion of children who were categorised into the depressed category or the obese category were less than those in the health categories. A bigger sample size in the future would help address this issue.

Thirdly, the surveys administered were self-report from children. Although research has shown that self-report surveys are effective in measuring health constructs (Riley 2004) and emotions (Durbin 2010), parent/guardian-report could have presented with different findings, more specifically on the health of the child, as well the health habits of the family.

Another key limitation in the current study is the lack of variability in the depression score. This was unavoidable and as a result, it has hampered efforts to establish the relationship between depression, obesity and poor school performance fully. There are more psychological variables that research has shown to be relevant predictors of obesity, which were not assessed, in the current study, for example, anxiety (Esposito *et al.* 2014). Given the time and resources, it was not feasible to assess the predictive

influence of all the possible variables that could influence the relationship between childhood depression, obesity and school performance.

7.4 Recommendations

Following the findings from the study, it is evident from the mediation analysis that depression has a significant direct impact on obesity and therefore have an effect on how both conditions are treated. The priority should be to develop evidence-based integrated prevention and intervention programs for childhood depression and obesity to manage both conditions concomitantly. Section 7.4.1 below provides a list of policy recommendations drawn from the current study.

7.4.1 Policy recommendations

The findings from the study indicate that there is a link between depression and obesity among urban disadvantaged children. As a result, the current practices for treating childhood obesity and depression were reviewed. There are various treatment methods available for childhood depression and obesity; however, these treatments are not delivered concurrently to address both depression and obesity. As previously mentioned, by treating depression and obesity separately, there are challenges, which prevent the improvement of both conditions (Markowitz *et al.* 2008). There are many intervention programmes aiming to solve problems around childhood depression and obesity with a specific focus on diet and exercise. Most of the programmes provide a generic approach to solving the problem; however, this is not the solution. The relationship between depression, obesity and poor school performance is complex. Prevention and intervention strategies should consider the complexity of the relationship between depression, obesity and poor school performance. The key recommendation from the findings of this PhD study is that future prevention and intervention programmes should be customised to the individual, family and the community. Based on the findings that the school environment influences BMI and depression, another recommendation is that schools should be involved from the onset in the prevention and intervention programmes. Specific focus should be given to parental involvement, psychological wellbeing, gender differences, bullying, and body weight perception when designing programmes.

7.4.2 Research recommendations

As previously mentioned, there have been very few studies, which have investigated the relationship between childhood depression, obesity and poor school performance among urban disadvantaged children. From the current study, it is evident that depression and obesity are linked. It is also evident that there is a need for further treatment evaluations of depression and obesity. More research is needed in the area of treatment which can be used together to treat depression and obesity. Another recommendation is to do a national (or international) longitudinal study with a sample of children

across DEIS bands, also including children who have been diagnosed with clinical depression. More research should be conducted to address the link between depression and school performance, and obesity and school performance.

7.5 Summary and Future Directions

Following on from the limitations of the current study, there are a few suggestions that future studies should consider when describing the relationship between depression, obesity and school performance.

As previously mentioned, the current study adopted an observational cross-sectional method. Future studies should consider a longitudinal study design in order to account for time and its effects on the variables of interest. Future studies should consider collecting data from participants of various socioeconomic backgrounds; this would allow for a comparison between different backgrounds and can be included in the model as a predictive variable to identify its effect on the variables of interest. A larger the sample size would be better especially when categorising children into health and non-healthy groups for comparison purpose.

7.6 Conclusions

The main aim of the study was to investigate the relationship between depression, obesity and school performance among urban disadvantaged children. The mediational findings reported that depression affected BMI scores of children and identified the following variables as significant predictors for depression; gender, psychological wellbeing, bullying and body weight perception. For BMI, three predictors were identified; physical wellbeing, school environment and body weight perception. It was also identified that there is currently no combined treatment for depression and obesity in Ireland, and previously research suggesting that these two illnesses should be treated together, the study provided recommendations to address these issues. These recommendations are intended to inform policy makers, health professionals and researchers in order to improve treatment methods, policies and further investigate the relationship between depression and obesity in future research.

Bibliography

Aber J.L., Bennett N.G., Conley D.C. & Li J. (1997) The effects of poverty on child health and development. *Annual Review of Public Health* **18**(1), 463-483.

Abramson L.Y., Seligman M.E. & Teasdale J.D. (1978) Learned helplessness in humans: critique and reformulation. *Journal of Abnormal Psychology* **87**(1), 49.

Adams K. (1992) An interpersonal approach to depression. *1992). Creating alternatives to depression in our schools. Assessment, Intervention, Prevention*, 57-66.

Afari N., Noonan C., Goldberg J., Roy-Byrne P., Schur E., Golnari G. & Buchwald D. (2010) Depression and obesity: do shared genes explain the relationship? *Depression and anxiety* **27**(9), 799-806.

Agnafors S., Svedin C.G., Oreland L., Bladh M., Comasco E. & Sydsjö G. (2016) A biopsychosocial approach to risk and resilience on behavior in children followed from birth to age twelve.

Aguirre A., Acosta W. & Aguirre A.P. (2013) Fat Metabolism, Obesity 7 Improvement in anxiety-depression manifestations, eating behavior and growth velocity by exercise in obese children with moderate short stature. *Hormone Research in Paediatrics* **80**, 233.

Ainsworth J.W. (2002) Why does it take a village? The mediation of neighborhood effects on educational achievement. *Social Forces* **81**(1), 117-152.

Akee R.K., Copeland W.E., Keeler G., Angold A. & Costello E.J. (2010) Parents' incomes and children's outcomes: A quasi-experiment. *American Economic Journal and Applied Economics* **2**(1), 86.

Alexander K.L., Entwisle D.R. & Dauber S.L. (1993) First-grade classroom behavior: Its short-and long-term consequences for school performance. *Child Development* **64**(3), 801-814.

Al-Hashimi S., Davis N. & Bull K. (2016) Weight-related quality of life of children and adolescents. *Archives of Disease in Childhood* **101**, A273.

Ali B.A.M., Abdelhakm A.A., Mohamed M.A.A.E. & Tawfik N.K. (2015) Quality of life in children with type I diabetes mellitus in Minia governorate, Egypt: Relationship with mood and family attitudes. *Pediatric Diabetes* **16**, 142.

Allen K.L., Byrne S.M., Blair E.M. & Davis E.A. (2006) Why do some overweight children experience psychological problems? The role of weight and shape concern. *International Journal Of Pediatric Obesity: IJPO: An Official Journal Of The International Association For The Study Of Obesity* **1**(4), 239-247.

Allen K.L., Byrne S.M., La Puma M., McLean N. & Davis E.A. (2008) The onset and course of binge eating in 8- to 13-year-old healthy weight, overweight and obese children. *Eating Behaviors* **9**(4), 438-446.

American Psychiatric Association. (2013) *Diagnostic and statistical manual of mental disorders: DSM 5*. American Psychiatric Association.

American Psychiatric Association. (2000) *Diagnostic criteria from DSM-IV-TR*. American Psychiatric Association.

American Psychiatric Association (1994) *Diagnostic and statistical manual of mental disorders: DSM-IV.* American Psychiatric Association.

Ammouri A.A. (2004) Correlates of exercise participation in adolescents. University of Kansas, 207 p-207.

Anderson S.E., Cohen P., Naumova E.N., Jacques P.F. & Must A. (2007) Adolescent obesity and risk for subsequent major depressive disorder and anxiety disorder: prospective evidence. *Psychosomatic Medicine* **69**(8), 740-747.

Angold A. & Costello E.J. (1987) Mood and feelings questionnaire (MFQ). *Durham, NC: Developmental Epidemiology Program, Duke University*.

Anton S.D., Newton Jr R.L., Sothern M., Martin C.K., Stewart T.M. & Williamson D.A. (2006) Association of depression with Body Mass Index, sedentary behavior, and maladaptive eating attitudes and behaviors in 11 to 13-year old children. *Eating and Weight Disorders* **11**(3), e102-e108.

Arora M., Nazar G.P., Gupta V.K., Perry C.L., Reddy K.S. & Stigler M.H. (2012) Association of breakfast intake with obesity, dietary and physical activity behavior among urban school-aged adolescents in Delhi, India: results of a cross-sectional study. *BMC Public Health* **12**(1), 881.

Audas R. & Willms J.D. (2002) *Engagement and dropping out of school: A life-course perspective*. Applied Research Branch, Human Resources Development Canada

Axford N., Little M., Duffy L., Haran N. & Zappone K. (2004) How are our Kids. *Children and Families in Tallaght West, Co. Dublin*.

Ayta S., Uludüz D., Poyraz Findik O.T. & Özge A. (2016) Quality of life in children and adolescents with primary headache disorders. *Journal of Neurological Sciences* **33**(1), 185-193.

Babio N., Canals J., Pietrobelli A., Pérez S. & Arija V. (2009) A two-phase population study: Relationships between overweight, body composition and risk of eating disorders. *Nutricion Hospitalaria* **24**(4), 485-491.

Baeza I., Vigo L., de la Serna E., Calvo-Escalona R., Merchán-Naranjo J., Rodríguez-Latorre P., Arango C. & Castro-Fornieles J. (2017) The effects of antipsychotics on weight gain, weight-related hormones and homocysteine in children and adolescents: a 1-year follow-up study. *European Child and Adolescent Psychiatry* **26**(1), 35-46.

Bakker M. & Wicherts J.M. (2014) Outlier removal, sum scores, and the inflation of the type I error rate in independent samples t tests: The power of alternatives and recommendations. *Psychological methods* **19**(3), 409.

Balantekin K.N., Hayes J.F., Sheinbein D.H., Kolko R.P., Stein R.I., Saelens B.E., Welch R.R., Perri M.G., Schechtman K.B., Epstein L.H. & Wilfley D.E. (2017) Patterns of Disordered eating are associated with weight change in family-based behavioral obesity treatment. *FASEB Journal* **31**(1).

Balding J. (2002) HRBQ-providing baseline data. *Education & Health* **20**(4), 71.

Bandura A., Pastorelli C., Barbaranelli C. & Caprara G.V. (1999) Self-efficacy pathways to childhood depression. *Journal of Personality and Social Psychology* **76**(2), 258.

Baron R.M. & Kenny D.A. (1986) The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and social Psychology* **51**(6), 1173.

Beck A.T. (1967) *Depression: Clinical, experimental, and theoretical aspects*. University of Pennsylvania Press

Beck A.T. (1987) Cognitive models of depression. *Journal of Cognitive Psychotherapy*.

Bennett J.L., Gozal D. & Spruyt K. (2009) Self-reported coping in overweight children with OSA. *Sleep* **32**, A77.

Benton, T. and Craib, I. (2001) Philosophy of social science: *Philosophical Issues in Social Thought (traditions in social theory)*

Berrios G.E. (1988) Melancholia and depression during the 19th century: a conceptual history. *British Journal of Psychiatry* **153**, 298-304.

Bhattacharya J., Currie J. & Haider S. (2004) Poverty, food insecurity, and nutritional outcomes in children and adults. *Journal of Health Economics* **23**(4), 839-862.

Bin W., Hong-Bo Z. & Gang X. (2005) Survey on the Behavioral Problems in Children with Obesity from 6 to 11 Years Old. *Chinese Mental Health Journal* **19**(10), 679-681.

Blaine B. (2008) Does depression cause obesity? A meta-analysis of longitudinal studies of depression and weight control. *Journal of Health Psychology* **13**(8), 1190-1197.

Blatt S.J. & Shichman S. (1983) Two primary configurations of psychopathology. *Psychoanalysis & Contemporary Thought*.

Blatt S.J. & Zuroff D.C. (1992) Interpersonal relatedness and self-definition: Two prototypes for depression. *Clinical Psychology Review* **12**(5), 527-562.

Blatt S.J. (1974) Levels of object representation in anaclitic and introjective depression. *The Psychoanalytic study of the child*.

Blatt S.J. (2004) *Experiences of depression: Theoretical, clinical, and research perspectives*. American Psychological Association.

Boivin M., Hymel S. & Bukowski W.M. (1995) The roles of social withdrawal, peer rejection, and victimization by peers in predicting loneliness and depressed mood in childhood. *Development and Psychopathology* **7**(4), 765-785.

Bolger K.E., Patterson C.J., Thompson W.W. & Kupersmidt J.B. (1995) Psychosocial adjustment among children experiencing persistent and intermittent family economic hardship. *Child Development* **66**(4), 1107-1129.

Booth J.N., Tomporowski P.D., Boyle J.M.E., Ness A.R., Joinson C., Leary S.D. & Reilly J.J. (2014) Obesity impairs academic attainment in adolescence: Findings from ALSPAC, a UK cohort. *International Journal of Obesity* **38**(10), 1335-1342.

Borrell-Carrió F., Suchman A.L. & Epstein R.M. (2004) The biopsychosocial model 25 years later: principles, practice, and scientific inquiry. *The Annals of Family Medicine* **2**(6), 576-582.

Boudreau D.M., Arterburn D., Bogart A., Haneuse S., Theis M.K., Westbrook E. & Simon G. (2013) Influence of body mass index on the choice of therapy for depression and follow-up care. *Obesity* **21**(3), E303-E313.

Boutelle K.N., Hannan P., Fulkerson J.A., Crow S.J. & Stice E. (2010) Obesity as a prospective predictor of depression in adolescent females. *Health Psychology* **29**(3), 293-298.

Bowlby J. (1980) *Attachment and loss*. 3. Basic books

Boyle G.J. (1985) Self-report measures of depression: Some psychometric considerations. *British Journal of Clinical Psychology* **24**(1), 45-59.

Braden A.L., Madowitz J., Matheson B.E., Bergmann K., Crow S.J. & Boutelle K.N. (2015) Parent binge eating and depressive symptoms as predictors of attrition in a family-based treatment for pediatric obesity. *Childhood Obesity (Print)* **11**(2), 165-169.

Bradley R.H. & Corwyn R.F. (2002) Socioeconomic status and child development. *Annual Review of Psychology* **53**(1), 371-399.

Bradley R.H., Whiteside L., Mundfrom D.J., Casey P.H., Kelleher K.J. & Pope S.K. (1994) Early indications of resilience and their relation to experiences in the home environments of low birthweight, premature children living in poverty. *Child development* **65**(2), 346-360.

Bradshaw P. (2013) Growing up in Scotland. Birth cohort 2: results from the first year.

Brooks-Gunn J. & Duncan G.J. (1997) The effects of poverty on children. *The Future of Children*, 55-71.

Branca F., Nikogosian H. & Lobstein T. (2007) *The challenge of obesity in the WHO European Region and the strategies for response: summary*. World Health Organization

Braungart-Rieker J.M., Moore E.S., Planalp E.M. & Lefever J.B. (2014) Psychosocial pathways to childhood obesity: A pilot study involving a high risk preschool sample. *Eating Behaviors* **15**(4), 528-531.

Breland D., McCarty C., Richardson L., Zhou C. & Katon W. (2011) Are there gender differences in presentation among adolescents with depression? *Journal of Adolescent Health* **48**(2), S88-S89.

Brooks-Gunn J. & Duncan G.J. (1997) The effects of poverty on children. *The future of children*, 55-71.

Brown J., Weedn A., Darden P., Kyler K.J., Legako E. & Gillaspy S. (2012) Oklahoma pediatric providers needs assessment survey of overweight and obesity. *Journal of Investigative Medicine* **60**(1), 323.

Bryman A. (1984) The debate about quantitative and qualitative research: a question of method or epistemology? *British journal of Sociology*, 75-92.

Buchholz A., Rutherford J., Mohipp C., Clark L., Adamo K.B., Goldfield G. & Hadjiyannakis S. (2013) The medical and mental health status of children and youth with severe complex obesity. *Canadian Journal of Diabetes* **37**, S263.

Buckloh L.M., Lochri E.A.S., Milkes A., Antal H. & Wysocki T. (2009) Emotional and behavioral functioning in overweight children. *Diabetes* **58**.

Byng-Hall J. (1995) Creating a secure family base: Some implications of attachment theory for family therapy. *Family Process* **34**(1), 45-58.

Cadenas-Sánchez C., Mora-González J., Migueles J.H., Martín-Matillas M., Gómez-Vida J., Escolano-Margarit M.V., Maldonado J., Enriquez G.M., Pastor-Villaescusa B., de Teresa C., Navarrete S., Lozano R.M., de Dios Beas-Jiménez J., Estévez-López F., Mena-Molina A., Heras M.J., Chillón P., Campoy C., Muñoz-Hernández V., Martínez-Ávila W.D., Merchan M.E., Perales J.C., Gil Á., Verdejo-García A., Aguilera C.M., Ruiz J.R., Labayen I., Catena A. & Ortega F.B. (2016) An exercise-based randomized controlled trial on brain, cognition, physical health and mental health in overweight/obese children (ActiveBrains project): Rationale, design and methods. *Contemporary Clinical Trials* **47**, 315-324.

Calamaro C.J. & Waite R. (2009) Depression and obesity in adolescents. *Journal for Nurse Practitioners* **5**(4), 255-261.

Calderón C., Forns M. & Varea V. (2010) Implication of the anxiety and depression in eating disorders of young obese. *Nutricion Hospitalaria* **25**(4), 641-647.

Caputo E., Talarico V., Mattace F., Giancotti L., Anastasio E. & Baserga M. (2012) [Diet and lifesyle of a cohort of primary school children]. *La Pediatria Medica E Chirurgica: Medical And Surgical Pediatrics* **34**(2), 84-88.

Central Statistics Office (2011) *Census of population 2011: Preliminary Results*. Central Statistics Office, Central Statistics Office, Ireland.

Centre for Public Health Excellence at N. & National Collaborating Centre for Primary C. (2006) Obesity: the prevention, identification, assessment and management of overweight and obesity in adults and children.

Centres for Disease Control and Prevention (2015) About child & teen BMI.

Chaiton M., Sabiston C., O'Loughlin J., McGrath J.J., Maximova K. & Lambert M. (2009) A structural equation model relating adiposity, psychosocial indicators of body image and depressive symptoms among adolescents. *International Journal of Obesity* **33**(5), 588-596.

Champ Morera C.A. (2009) Psychosocial factors of childhood obesity. ProQuest Information & Learning, US, 4473-4473.

Chau K., Baumann M. & Chau N. (2013) Socioeconomic inequities patterns of multi-morbidity in early adolescence. *International Journal for Equity in Health* **12**(1).

Chawla N. & Panza A. (2014) Assessment of childhood obesity and overweight in Thai children grade 5-9 in BMA Bilingual Schools, Bangkok, Thailand. *Obesity Reviews* **15**, 239.

Chen E., Matthews K.A. & Boyce W.T. (2002) Socioeconomic differences in children's health: how and why do these relationships change with age? *Psychological bulletin* **128**(2), 295.

Cheon K.A., Lee D.H., Jun J.Y. & Namkoong K. (2006) Emotional instability and harm avoidance for childhood obesity are related to the motivation for weight loss: A pilot study in Korea. *Psychiatry Investigation* **3**(1), 87-96.

Cheung P.C.H., Ip P.L.S., Lam S.T. & Bibby H. (2007) A study on body weight perception and weight control behaviours among adolescents in Hong Kong. *Hong Kong medical journal* **13**(1), 16.

Childhood Development Initiative (2005) *A Place for Children Tallaght West, a strategy by the Childhood Development Initiative*. Childhood Development Initiative (CDI), Dublin.

Christiansen J. (1980) *Educational and psychological problems of abused children*. R & E Research Associates

Chung K.-H., Chiou H.-Y. & Chen Y.-H. (2015) Psychological and physiological correlates of childhood obesity in Taiwan. *Scientific Reports* **5**, 17439-17439.

Ciblis A. (2012) *Evaluation of the Effectiveness of a Cognitive Behavioural Therapy Model for Severely Obese Clients in Primary Care*. School of Psychology. University College Dublin, Ireland.

Clark A.M. (1998) The qualitative-quantitative debate: moving from positivism and confrontation to post-positivism and reconciliation. *Journal of Advanced Nursing* **27**(6), 1242-1249.

Clark M.S., Jansen K.L. & Anthony Cloy J. (2012) Treatment of childhood and adolescent depression. *American Family Physician* **86**(5), 442.

Cobb J.E. (2013) Child and parent readiness to change in a clinical sample of obese youth. ProQuest Information & Learning, US.

Cobreros R.R., Villa M.A. & Linares E.T. (2013) Social adaptation of a group of obese children by the trial of parents and teachers. *Atencion Primaria* **45**, 161-162.

Cohen J. (1988) Set correlation and contingency tables. *Applied Psychological Measurement* **12**(4), 425-434.

Cohen-Woods S. (2016) Role of depressive symptoms and stressors in FTO genetic and epigenetic variation in association with body composition through childhood and adolescence: A pilot study. *Behavior Genetics* **46**(6), 776.

Coleman J.S. & Karweit N.L. (1970) *Measures of School Performance*. Rand

Colton P.A., Olmsted M.P., Daneman D. & Rodin G.M. (2013) Depression, disturbed eating behavior, and metabolic control in teenage girls with type 1 diabetes. *Pediatric Diabetes* **14**(5), 372-376.

Comiskey C.M., Banka P. & Kelly P. (2013) The Healthy School's Programme Evaluation Fourth Year Preliminary Findings Report. Trinity College Dublin, Dublin.

Comiskey C.M., O'Sullivan K., Quirke M.B., Wynne C., Hollywood E. & McGilloway S. (2015) An analysis of the first implementation and impact of the World Health Organisation's health promoting school model within disadvantaged city schools in Ireland. *Vulnerable Children and Youth Studies* **10**(4), 281-293.

Comiskey C.M., O'Sullivan K., Quirke M.B., Wynne C., Hollywood E. & MGillloway S. (2012) Baseline results of the first Healthy Schools evaluation among a community of young, Irish, urban disadvantaged children and a comparison of outcomes with international norms. *Journal of School Health* **82**(11), 508-513.

Considine G. & Zappalà G. (2002) Factors influencing the educational performance of students from disadvantaged backgrounds. *COMPETING VISIONS*, 91.

Conti G. & Hansman C. (2013) Personality and the education-health gradient: A note on "Understanding differences in health behaviors by education". *Journal of Health Economics* **32**(2), 480-485.

Cornette R. (2008) The emotional impact of obesity on children. *Worldviews on Evidence-Based Nursing* **5**(3), 136-141.

Corona M. (2015) The association between depression and overweight/obesity among ethnic minority youth. ProQuest Information & Learning, US.

Cortese S., Cuzzolaro M., Maffeis C., Piccolo F., Ferrucci G., Tatò L., Pajno-Ferrara F. & Dalla Bernardina B. (2005) Depressive symptoms and low self-estreem in obese children and adolescents. *Minerva Pediatrica* **57**(2), 65-71.

Cortese S., Isnard P., Frelut M.L., Michel G., Quantin L., Guedeney A., Falissard B., Acquaviva E., Bernardina B.D. & Mouren M.C. (2007) Association between symptoms of attention-deficit/hyperactivity disorder and bulimic behaviors in a clinical sample of severely obese adolescents. *International Journal of Obesity* **31**(2), 340-346.

Cosgrove J., McKeown C., Travers J., Lysaght Z., Bhroin Ó.N. & Archer P. (2014) Educational Experiences and Outcomes for Children with Special Educational Needs. *Dublin: National Council for Special Education*.

Craighead W.E., Smucker M.R., Craighead L.W. & Ilardi S.S. (1998) Factor analysis of the Children's Depression Inventory in a community sample. *Psychological Assessment* **10**(2), 156.

Creswell J.W., Clark V.L.P. & Garrett A. (2008) Advances in mixed methods research. Daraganova G., Maguire B., Kaspar J. & Edwards B. (2012) *Growing Up in Australia: The Longitudinal Study of Australian Children 2012–13 Annual Report*. Australian Institute of Family Studies, Australia.

Croezen S., Visscher T.L.S., Ter Bogt N.C.W., Veling M.L. & Haveman-Nies A. (2009) Skipping breakfast, alcohol consumption and physical inactivity as risk factors for overweight and obesity in adolescents: results of the E-MOVO project. *European Journal of Clinical Nutrition* **63**(3), 405-412.

Dalbo V., Tucker P., Kingsley M., Humphries B. & Scanlan A. (2012) An examination of the influence of body mass index on disease prevalence in a regional Australian population. *Journal of Science and Medicine in Sport* **15**, S159-S160.

Daley A.J., Copeland R.J., Wright N.P. & Wales J.K.H. (2005) Protocol for: Sheffield Obesity Trial (SHOT): a randomised controlled trial of exercise therapy and mental health outcomes in obese adolescents [ISRCNT83888112]. *BMC Public Health* **5**, 113-113.

Danielsen Y.S., Nordhus I.H., Júlíusson P.B., Mæhle M. & Pallesen S. (2013) Effect of a family-based cognitive behavioural intervention on body mass index, self-esteem and symptoms of depression in children with obesity (aged 7-13): a randomised waiting list controlled trial. *Obesity Research & Clinical Practice* **7**(2), e116-e128.

Daraganova G., Maguire B., Kaspar J. & Edwards B. (2012) *Growing Up in Australia: The Longitudinal Study of Australian Children 2012–13 Annual Report*. Australian Institute of Family Studies, Australia.

Das J.K., Salam R.A., Lassi Z.S., Khan M.N., Mahmood W., Patel V. & Bhutta Z.A. (2016) Interventions for Adolescent Mental Health: An Overview of Systematic Reviews. *Journal of Adolescent Health* **59**, S49-S60.

D'Autume C., Musher-Eizenman D., Marinier E., Viarme F., Frelut M.L. & Isnard P. (2012) Eating behaviors and emotional symptoms in childhood obesity: A cross-sectional exploratory study using self-report questionnaires in 63 children and adolescents. *Archives de Pediatrie* **19**(8), 803-810.

Davis C.L., Williams C., Bustamante E.E. & Waller J.L. (2014) Effects of regular exercise vs sedentary after school program on mood and quality of life of overweight children. *Psychosomatic Medicine* **76**(3), A-113.

Day M.A., Ehde D.M., Ward L.C., Hartoonian N., Alschuler K.N., Turner A.P., Kraft G.H. & Jensen M.P. (2016) An empirical investigation of a biopsychosocial model of pain in multiple sclerosis. *The Clinical journal of pain* **32**(2), 155-163.

De Cuyper S., Timbremont B., Braet C., De Backer V. & Wullaert T. (2004) Treating depressive symptoms in schoolchildren. *European Child & Adolescent Psychiatry* **13**(2), 105-114.

De Onis M. & Lobstein T. (2010) Defining obesity risk status in the general childhood population: which cut-offs should we use?

De Sousa A. (2009) Maternal, child and family factors in childhood obesity. *International Journal of Diabetes and Metabolism* **17**(3), 111-112.

De Vaus D.A. & de Vaus D. (2001) *Research design in social research*. Sage

DeBoer M.D. (2013) Obesity, systemic inflammation, and increased risk for cardiovascular disease and diabetes among adolescents: a need for screening tools to target interventions. *Nutrition* **29**(2), 379-386.

Decaluwé V. & Braet C. (2001) Prevalentie en psychologische aspecten van eetbuien bij obese jongeren. = Prevalence and correlates of BE in obese children and adolescents. *Gedrag & Gezondheid: Tijdschrift voor Psychologie en Gezondheid* **29**(2), 86-97.

Decaluwé V., Braet C. & Fairburn C.G. (2003) Binge eating in obese children and adolescents. *International Journal of Eating Disorders* **33**(1), 78-84.

DeCator D.D., Carter J.S. & Schneider K.L. (2016) Brief report: Family meals, obesogenic factors, and depressive symptoms in youth. *Mental Health and Physical Activity* **10**, 1-3.

Dee A., Kearns K., O'Neill C., Sharp L., Staines A., O'Dwyer V., Fitzgerald S. & Perry I.J. (2014) The direct and indirect costs of both overweight and obesity: a systematic review. *BMC Research Notes* **7**(1), 1.

deJung J.E. & Duckworth K. (1986) Measuring Student Absences in the High Schools. Denman S., Moon A., Parsons C. & Stears D. (2003) *The health promoting school: Policy, research and practice*. Routledge

Denman S., Moon A., Parsons C. & Stears D. (2003) *The health promoting school: Policy, research and practice*. Routledge

Department Children and Youth Affairs. (2011) *National strategy for research and data on children's lives 2011-2016. Main report*. Government Publications, Dublin.

Department of Children and Youth Affairs. (2011) *Children first: National guidance for the protection and welfare of children.* Government Publications, Dublin.

Department of Education and Science. (2005) *DEIS (Delivering equality of opportunity in schools): An action plan for educational inclusion*. Department of Education and Science, Dublin.

Department of Education and Skills. (2011) *Department of Education and Skills Annual Report 2011*. Department of Education and Skills, Dublin.

Department of Health. (2015) *Obesity*. Retrieved from http://health.gov.ie/healthy-ireland/obesity/ on 1st September 2016.

Department of Health and Children. (2002) *Our Duty to Care*. Government Publications, Dublin.

Department of Social Protection. (2012) *Poverty in Ireland*. Government Publications, Dublin.

Derogatis L.R., Lipman R.S., Rickels K., Uhlenhuth E.H. & Covi L. (1974) The Hopkins Symptom Checklist (HSCL): A self-report symptom inventory. *Systems Research and Behavioral Science* **19**(1), 1-15.

Diehl K. (2014) A program for improving health and stress management for adolescents from low-income families: Integrating behavioral coping skills, nutrition education and yoga. *Journal of Adolescent Health* **54**(2), S73.

Dinsdale H., Ridler C. & Ells L.J. (2011) A simple guide to classifying body mass index in children. *National Obesity Observatory, Oxford*.

Dockray S., Susman E.J. & Dorn L.D. (2009) Depression, cortisol reactivity, and obesity in childhood and adolescence. *Journal of Adolescent Health* **45**(4), 344-350.

Dogar I. (2007) Biopsychosocial model. *Annals of Punjab Medical College* **1**(1), 11-13.

Dooris M. (2006) Healthy settings: challenges to generating evidence of effectiveness. *Health Promotion International* **21**(1), 55-65.

Doyle A.C., le Grange D., Goldschmidt A. & Wilfley D.E. (2007) Psychosocial and physical impairment in overweight adolescents at high risk for eating disorders. *Obesity (Silver Spring, Md.)* **15**(1), 145-154.

Drabkin I.E. (1955) Remarks on ancient psychopathology. *Isis* **46**(3), 223-234.

Du Y. (2013) Should antidepressants be used to treat childhood depression? *Shanghai Archives of Psychiatry* **25**(1), 48.

Duarte C.S., Sourander A., Nikolakaros G., Pihlajamaki H., Helenius H., Piha J., Kumpulainen K., Moilanen I., Tamminen T., Almqvist F. & Must A. (2010) Child mental health problems and obesity in early adulthood. *The Journal Of Pediatrics* **156**(1), 93-97.

Duman F., Kokaçya M.H., Doğru E., Katayıfcı N., Canbay Ö. & Aman F. (2016) The Role of Active Video-Accompanied Exercises in Improvement of the Obese State in Children: A Prospective Study from Turkey. *Journal of Clinical Research in Pediatric Endocrinology* **8**(3), 334-340.

Duncan C.M. & Lamborghini N. (1994) Poverty and Social Context in Remote Rural Communities1. *Rural Sociology* **59**(3), 437-461.

Duncan G.J., Yeung W.J., Brooks-Gunn J. & Smith J.R. (1998) How much does childhood poverty affect the life chances of children? *American Sociological Review*, 406-423.

Durbin C.E. (2010) Validity of young children's self-reports of their emotion in response to structured laboratory tasks. *Emotion* **10**(4), 519.

Durkin S.J. & Paxton S.J. (2002) Predictors of vulnerability to reduced body image satisfaction and psychological wellbeing in response to exposure to idealized female media images in adolescent girls. *Journal of Psychosomatic Research* **53**(5), 995-1005.

Dykstra H., Davey A., Fisher J.O., Polonsky H., Sherman S., Abel M.L., Dale L.C., Foster G.D. & Bauer K.W. (2016) Breakfast-skipping and selecting low-nutritional-quality foods for breakfast are common among low-income urban children, regardless of food security status. *The Journal of nutrition* **146**(3), 630-636.

EAPN (2013) European Anti Poverty Network Ireland. Retrieved from http://www.eapn.ie/eapn/training/defining-and-measuring-poverty on 1st September 2016.

Eckenrode J., Laird M. & Doris J. (1993) School performance and disciplinary problems among abused and neglected children. *Developmental Psychology* **29**(1), 53.

Eddy K.T., Tanofsky-Kraff M., Thompson-Brenner H., Herzog D.B., Brown T.A. & Ludwig D.S. (2007) Eating disorder pathology among overweight treatment-seeking youth: Clinical correlates and cross-sectional risk modeling. *Behaviour Research And Therapy* **45**(10), 2360-2371.

Education Act P.V., Section 32 (9) (1998) *Education Act, Part VI, Section 32 (9)*. Retrieved from http://www.irishstatutebook.ie/eli/1998/act/51/section/32/enacted/en/html on July 2016.

Educational Research Centre (2013) *Drumcondra Primary Tests Scoring System*. Retrieved from http://www.erc.ie/test-sales/drumcondra-primary-tests-scoring-system/ on 19th September 2016.

Edwards C., Nicholls D., Croker H., Van Zyl S., Viner R. & Wardle J. (2006) Family-based behavioural treatment of obesity: Acceptability and effectiveness in the UK. *European Journal of Clinical Nutrition* **60**(5), 587-592.

Ek A., Chamberlain K.L., Ejderhamn J., Fisher P.A., Marcus C., Chamberlain P. & Nowicka P. (2015) The More and Less Study: a randomized controlled trial testing different approaches to treat obesity in preschoolers. *BMC Public Health* **15**, 735-735.

Elder Jr G.H., Eccles J.S., Ardelt M. & Lord S. (1995) Inner-city parents under economic pressure: Perspectives on the strategies of parenting. *Journal of Marriage and the Family*, 771-784.

Elliott C.A., Tanofsky-Kraff M., Mirza N.M., Elliott C.A., Tanofsky-Kraff M. & Mirza N.M. (2013) Parent report of binge eating in Hispanic, African American and Caucasian youth. *Eating Behaviors* **14**(1), 1-6.

Ellis A. (1987) A sadly neglected cognitive element in depression. *Cognitive Therapy and Research* **11**(1), 121-145.

Emelyantseva T., Solntseva A., Grigorieva I., Marchuk S. & Dokukina T. (2015) Mental and behavioral variation in children with morbid obesity. *European Child and Adolescent Psychiatry* **24**(1), S153-S154.

Engel G.L. (1977) The need for a new medical model: a challenge for biomedicine. *Science* **196**(4286), 129-136.

Engel G.L. (1980) The clinical application of the biopsychosocial model. *American Journal Psychiatry* **137**(5), 535-544.

Engel G.L. (1989) The need for a new medical model: a challenge for biomedicine. *Holistic Medicine* **4**(1), 37-53.

Epstein L.H., Myers M.D. & Anderson K. (1996) The association of maternal psychopathology and family socioeconomic status with psychological problems in obese children. *Obesity Research* **4**(1), 65-74.

Epstein L.H., Paluch R.A., Consalvi A., Riordan K. & Scholl T. (2002) Effects of manipulating sedentary behavior on physical activity and food intake. *The Journal of Pediatrics* **140**(3), 334-339.

Epstein L.H., Valoski A., Wing R.R. & McCurley J. (1994) Ten-year outcomes of behavioral family-based treatment for childhood obesity. *Health Psychology* **13**(5), 373.

Epstein L.H., Valoski A.M., Vara L.S., McCurley J., Wisniewski L., Kalarchian M.A., Klein K.R. & Shrager L.R. (1995) Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychology* **14**(2), 109.

Epstein L.H., Wing R.R., Koeske R., Ossip D. & Beck S. (1982) A comparison of lifestyle change and programmed aerobic exercise on weight and fitness changes in obese children. *Behavior Therapy* **13**(5), 651-665.

Erdogan F., Eliacik M., Ozahi Ipek I., Arici N., Kadak M.T. & Ceran O. (2017) Is children's Body Mass Index associated with their parents' personality? A prospective controlled trial. *Minerva Pediatrica* **69**(4), 281-287.

Erford B.T., Erford B.M., Lattanzi G., Weller J., Schein H., Wolf E., Hughes M., Darrow J., Savin-Murphy J. & Peacock E. (2011) Counseling outcomes from 1990 to 2008 for school-age youth with depression: A meta-analysis. *Journal of Counseling and Development: JCD* **89**(4), 439.

Ergür A.T., Kirdaı G.A. & Uc¸ar S. (2015) In different method of the evaluation of state of feeling of obese children; goodenough harris 'the draw-a-person' test. *Hormone Research in Paediatrics* **84**, 443-444.

Erickson S.J. & Gerstle M. (2007) Developmental considerations in measuring children's disordered eating attitudes and behaviors. *Eating Behaviors* **8**(2), 224-235.

Erickson S.J., Robinson T.N., Haydel K.F. & Killen J.D. (2000) Are overweight children unhappy?: Body mass index, depressive symptoms, and overweight concerns in elementary school children. *Archives Of Pediatrics & Adolescent Medicine* **154**(9), 931-935.

Ernst P., Demissie K., Joseph L., Locher U. & Becklake M.R. (1995) Socioeconomic status and indicators of asthma in children. *American Journal of Respiratory and Critical Care Medicine* **152**(2), 570-575.

Esch L. & Zullig K.J. (2008) Middle school students' weight perceptions, dieting behaviors, and life satisfaction. *American Journal of Health Education* **39**(6), 345-352.

Esmaeilzadeh S. (2014) Relationship between depressive symptoms with physical activity and physical fitness among children. *Mental Health and Prevention* **2**(1-2), 11-17.

Esmaeilzadeh S. (2015) The association between depressive symptoms and physical status including physical activity, aerobic and muscular fitness tests in children. *Environmental Health and Preventive Medicine* **20**(6), 434-440.

Esposito M., Gallai B., Roccella M., Marotta R., Lavano F., Lavano S.M., Mazzotta G., Bove D., Sorrentino M., Precenzano F. & Carotenuto M. (2014) Anxiety and depression levels in prepubertal obese children: A case-control study. *Neuropsychiatric Disease and Treatment* **10**, 1897-1902.

Eurostat (2012) Eurostat Press Release. At risk of poverty or social exclusion in the EU27. Eurostat Press Office.

Evans E.H., Tovée M.J., Boothroyd L.G. & Drewett R.F. (2013) Body dissatisfaction and disordered eating attitudes in 7- to 11-year-old girls: testing a sociocultural model. *Body Image* **10**(1), 8-15.

Fairchild A.J. & MacKinnon D.P. (2009) A general model for testing mediation and moderation effects. *Prevention Science* **10**(2), 87-99.

Falconer C.L., Park M.H., Croker H., Kessel A.S., Saxena S., Viner R.M. & Kinra S. (2014) Can the relationship between ethnicity and obesity-related behaviours among school-aged children be explained by deprivation? A cross-sectional study. *BMJ Open* **4**(1), e003949.

Fareed M. & Afzal M. (2014) Evidence of inbreeding depression on height, weight, and body mass index: a population-based child cohort study. *American Journal Of Human Biology: The Official Journal Of The Human Biology Council* **26**(6), 784-795.

Farrell C., McAvoy H., Wilde J. & Combat Poverty Agency (2008) *Tackling health inequalities: An all-Ireland approach to social determinants*. Combat Poverty Agency

Farren G.L., Zhang T., Gu X. & Thomas K.T. (2017) Sedentary behavior and physical activity predicting depressive symptoms in adolescents beyond attributes of health-related physical fitness. *Journal of Sport and Health Science*.

Farrow J.A. (1992) The adolescent male with an eating disorder. *Pediatric Annals* **21**(11), 769-774.

Fekkes M., Pijpers F.I.M., Fredriks A.M., Vogels T. & Verloove-Vanhorick S.P. (2006) Do bullied children get ill, or do ill children get bullied? A prospective cohort study on the relationship between bullying and health-related symptoms. *Pediatrics* **117**(5), 1568-1574.

Fenner A.A., Howie E.K., Davis M.C. & Straker L.M. (2016) Relationships between psychosocial outcomes in adolescents who are obese and their parents during a multi-disciplinary family-based healthy lifestyle intervention: One-year follow-up of a waitlist controlled trial (Curtin University's Activity, Food and Attitudes Program). *Health and Quality of Life Outcomes* **14**.

Fennig S. & Hadas A. (2010) Suicidal behavior and depression in adolescents with eating disorders. *Nordic Journal of Psychiatry* **64**(1), 32-39.

Ferrari R. (2015) Writing narrative style literature reviews. *Medical Writing* **24**(4), 230-235.

Ferreiro F., Seoane G. & Senra C. (2011) A prospective study of risk factors for the development of depression and disordered eating in adolescents. *Journal of Clinical Child and Adolescent Psychology* **40**(3), 500-505.

Field A. (2013) *Discovering statistics using IBM SPSS statistics*. Sage

Figueroa-Colon R., von Almen T.K., Franklin F.A., Schuftan C. & Suskind R.M. (1993) Comparison of two hypocaloric diets in obese children. *American Journal of Diseases of Children* **147**(2), 160-166.

Figueroa-Munoz J., Chinn S. & Rona R. (2001) Association between obesity and asthma in 4–11 year old children in the UK. *Thorax* **56**(2), 133-137.

Finch A., Saylor C.F. & Edwards G.L. (1985) Children's depression inventory: sex and grade norms for normal children. *Journal of Consulting and Clinical Psychology* **53**(3), 424.

Finch Jr A., Saylor C.F., Edwards G.L. & McIntosh J.A. (1987) Children's Depression Inventory: Reliability over repeated administrations. *Journal of Clinical Child Psychology* **16**(4), 339-341.

Finn J.D. (1989) Withdrawing from school. *Review of Educational Research* **59**(2), 117-142.

Fisher M.M. & Bushlow M. (2014) Perceptions of family styles by adolescents with eating disorders and their parents. *Journal of Adolescent Health* **54**(2), S77-S78.

Fitzpatrick C. & Sharry J. (2004) *Coping with depression in young people: A guide for parents*. John Wiley & Sons

Fitzpatrick K.M., Piko B.F., Wright D.R. & LaGory M. (2005) Depressive symptomatology, exposure to violence, and the role of social capital among African American adolescents. *American Journal of Orthopsychiatry* **75**(2), 262.

Flodmark C.-E., Ohlsson T., Rydén O. & Sveger T. (1993) Prevention of progression to severe obesity in a group of obese schoolchildren treated with family therapy. *Pediatrics* **91**(5), 880-884.

Ford C., Miles D., Coyne-Beasley T. & Sanderson M. (2010) Parents' reported adolescent health-related educational needs. *Journal of Adolescent Health* **46**(2), S72.

Freud S. (1917) Mourning and melancholia. Standard Edition (Vol. 14, pp. 237-258). London: Hogarth Press

Fröhlich G., Pott W., Albayrak Ö., Hebebrand J. & Pauli-Pott U. (2011) Conditions of long-term success in a lifestyle intervention for overweight and obese youths. *Pediatrics* **128**(4), e779-e785.

Fröjd S.A., Nissinen E.S., Pelkonen M.U.I., Marttunen M.J., Koivisto A.-M. & Kaltiala-Heino R. (2008) Depression and school performance in middle adolescent boys and girls. *Journal of Adolescence* **31**(4), 485-498.

Fu W.P.C., Lee H.C., Ng C.J., Tay Y.D., Kau C.Y., Seow C.J., Siak J.K. & Hong C.Y. (2003) Screening for childhood obesity: international vs population-specific definitions. Which is more appropriate? *International Journal of Obesity* **27**(9), 1121-1126.

Gallop K., Anderson F. & Bram A. (2013) *Millennium Cohort Study fifth sweep (MCS5) teacher survey*. Technical Report). London: Centre for Longitudinal Studies, Institute of Education, University of London

Gammon C. (2017) Mediators and moderators of the relationship between family variables and child physical activity. ProQuest Information & Learning, US.

García-Huidobro D., Puschel K. & Soto G. (2012) Family functioning style and health: Opportunities for health prevention in primary care. *British Journal of General Practice* **62**(596), e198-e203.

Gaumé C. & Wunsch G. (2010) Self-rated health in the Baltic countries, 1994–1999. *European Journal of Population/Revue européenne de Démographie* **26**(4), 435-457.

Ge X., Conger R.D. & Elder Jr G.H. (2001) Pubertal transition, stressful life events, and the emergence of gender differences in adolescent depressive symptoms. *Developmental Psychology* **37**(3), 404.

Geist R., Davis R. & Heinmaa M. (1998) Binge/purge symptoms and comorbidity in adolescents with eating disorders. *Canadian Journal of Psychiatry* **43**(5), 507-512.

Gennetian L., Redcross C. & Miller C. (2000) *The effects of welfare reform in rural Minnesota: Experimental findings from the Minnesota Family Investment Program*. Northwestern University/University of Chicago Joint Center for Poverty Research

Ghasemi A. & Zahediasl S. (2012) Normality tests for statistical analysis: a guide for non-statisticians. *International journal of endocrinology and metabolism* **10**(2), 486.

Gladstone T.R., Beardslee W.R. & O'Connor E.E. (2011) The prevention of adolescent depression. *Psychiatric Clinics of North America* **34**(1), 35-52.

Gledhill J., Kramer T., Iliffe S. & Garralda M.E. (2003) Training general practitioners in the identification and management of adolescent depression within the consultation: a feasibility study. *Journal of adolescence* **26**(2), 245-250.

Golan M., Kaufman V. & Shahar D.R. (2006) Childhood obesity treatment: targeting parents exclusively v. parents and children. *British Journal of Nutrition* **95**(05), 1008-1015.

Goldbacher E.M. & Matthews K.A. (2007) Are psychological characteristics related to risk of the metabolic syndrome? A review of the literature. *Annals Of Behavioral Medicine: A Publication Of The Society Of Behavioral Medicine* **34**(3), 240-252.

Golden R.N. (2004) Making advances where it matters: improving outcomes in mood and anxiety disorders. *CNS Spectrums* **9**(S4), 14-22.

Gonzalez-Casanova I., Sarmiento O.L., Gazmararian J.A., Cunningham S.A., Martorell R., Pratt M. & Stein A.D. (2013) Comparing three body mass index classification systems to assess overweight and obesity in children and adolescents. *Revista Panamericana de Salud Pública* **33**(5), 349-355.

Goodman E. & Must A. (2011) Depressive symptoms in severely obese compared with normal weight adolescents: results from a community-based longitudinal study. *The Journal Of Adolescent Health: Official Publication Of The Society For Adolescent Medicine* **49**(1), 64-69.

Goodman E. & Whitaker R.C. (2002) A prospective study of the role of depression in the development and persistence of adolescent obesity. *Pediatrics* **110**(3), 497-504.

Goodman R., Ford T., Simmons H., Gatward R. & Meltzer H. (2000) Using the Strengths and Difficulties Questionnaire (SDQ) to screen for child psychiatric disorders in a community sample. *The British Journal of Psychiatry* **177**(6), 534-539.

Goodman R., Meltzer H. & Bailey V. (1998) The Strengths and Difficulties Questionnaire: A pilot study on the validity of the self-report version. *European Child & Adolescent Psychiatry* **7**(3), 125-130.

Goodyer I., Dubicka B., Wilkinson P., Kelvin R., Roberts C., Byford S., Breen S., Ford C., Barrett B. & Leech A. (2007) Selective serotonin reuptake inhibitors (SSRIs) and routine specialist care with and without cognitive behaviour therapy in adolescents with major depression: randomised controlled trial. *BMJ* **335**(7611), 142.

Goossens L., Braet C. & Bosmans G. (2010) Relations of dietary restraint and depressive symptomatology to loss of control over eating in overweight youngsters. *European Child & Adolescent Psychiatry* **19**(7), 587-596.

Goossens L., Braet C. & Decaluwé V. (2007) Loss of control over eating in obese youngsters. *Behaviour Research And Therapy* **45**(1), 1-9.

Greenleaf C., Petrie T.A. & Martin S.B. (2014) Relationship of Weight-Based Teasing and Adolescents' Psychological Well-Being and Physical Health. *Journal of School Health* **84**(1), 49-55.

Griffiths L.J., Cortina-Borja M., Sera F., Pouliou T., Geraci M., Rich C., Cole T.J., Law C., Joshi H. & Ness A.R. (2013) How active are our children? Findings from the Millennium Cohort Study. *BMJ Open* **3**(8), e002893.

Griffiths L.J., Dezateux C. & Hill A. (2011) Is obesity associated with emotional and behavioural problems in children? Findings from the Millennium Cohort Study. *Pediatric Obesity* **6**(2Part2).

Groot R.H.M., van Dijk M.L. & Kirschner P.A. (2015) Cohort profile of the GOALS study: A large-scale research of physical activity in Dutch students. *British Journal of Educational Technology* **46**(5), 947-952.

Gunnarsdottir T., Njardvik U., Olafsdottir A.S., Craighead L.W. & Bjarnason R. (2012) Teasing and social rejection among obese children enrolling in family-based behavioural treatment: Effects on psychological adjustment and academic competencies. *International Journal of Obesity* **36**(1), 35-44.

Gunnarsdottir, T., Njardvik, U., Olafsdottir, A.S., Craighead, L. and Bjarnason, R. (2012) Childhood obesity and co-morbid problems: effects of Epstein's family-based behavioural treatment in an Icelandic sample. *Journal of evaluation in clinical practice **18***(2), pp.465-472.

Gurley-Calvez T. & Higginbotham A. (2010) Childhood obesity, academic achievement, and school expenditures. *Public Finance Review* **38**(5), 619-646.

Gussinyer S., García-Reyna N.I., Carrascosa A., Gussinyer M., Yeste D., Clemente M. & Albisu M. (2008) Anthropometric, dietetic and psychological changes after application of the Niñas en movimiento program in childhood obesity. *Medicina Clinica* **131**(7), 245-249.

Hacking I.M. (1991) Representing and intervening: introductory topics in the philosophy of natural science.

Hammen C. & Rudolph K.D. (1996) *Childhood depression*. Hammen C.L. (1998) *Depression*. Hove: Psychology Press

Hammerton G., Thapar A. & Thapar A.K. (2014) Association between obesity and depressive disorder in adolescents at high risk for depression. *International Journal Of Obesity (2005)* **38**(4), 513-519.

Hampton T. (2014) Studies probe links between childhood asthma and obesity. *JAMA* **311**(17), 1718-1719.

Han H. (2011) Does obesity lead to poor school performance? Estimates from propensity score matching. PhD Dissertation, Center for Demography and Ecology, University of Wisconsin-Madison.

Hannon T.S., Rao G. & Arslanian S.A. (2005) Childhood obesity and type 2 diabetes mellitus. *Pediatrics* **116**(2), 473-480.

Harrington R., Fudge H., Rutter M., Pickles A. & Hill J. (1990) Adult outcomes of childhood and adolescent depression: I. Psychiatric status. *Archives of General Psychiatry* **47**(5), 465-473.

Hasler G., Pine D.S., Kleinbaum D.G., Gamma A., Luckenbaugh D., Ajdacic V., Eich D., Rössler W. & Angst J. (2005) Depressive symptoms during childhood and adult obesity: the Zurich Cohort Study. *Molecular Psychiatry* **10**(9), 842-850.

Haveman R. & Wolfe B. (1994) *Succeeding generations: On the effects of investments in children*. Russell Sage Foundation

Hazell P., O'Connell D., Heathcote D., Robertson J. & Henry D. (1995) Efficacy of tricyclic drugs in treating child and adolescent depression: a meta-analysis. *BMJ 310(6984), 897-901.*

He W., James S.A., Merli M.G. & Zheng H. (2014) An increasing socioeconomic gap in childhood overweight and obesity in China. *American journal of public health* **104**(1), e14-e22.

Health Act CHQ (2008) CHQ: Child Health Questionnaire. Retrieved from http://www.healthact.com/chq.php on 19th September 2016.

Health Service Executive. (2016) HSE welcomes new national obesity policy and action plan.

Health Service Executive & Safefood (2009) Little Steps Press Release. Health Service Executive and Safefood.

Health Service Executive Obesity. Retrieved from http://www.hse.ie/eng/health/az/O/Obesity/ on 22nd September 2016.

Heiberg J.L. (1927) *Geisteskrankheiten im klassischen Altertum*. 86. de Gruyter

Heinen M. (2014) The Childhood Obesity Surveillance Initiative (COSI) in the Republic of Ireland: Findings from 2008, 2010 and 2012. *Health* **1**, 03.

Helfert S. & Warschburger P. (2013) The face of appearance-related social pressure: Gender, age and body mass variations in peer and parental pressure during adolescence. *Child and Adolescent Psychiatry and Mental Health* **7**(1).

Heshmat R., Larijani F.A., Pourabbasi A. & Pourabbasi A. (2014) Do overweight students have lower academic performance than their classmates? A pilot cross sectional study in a middle school in Tehran. *Journal of Diabetes & Metabolic Disorders* **13**(1), 1.

Hetrick S., Merry S., McKenzie J., Sindahl P. & Proctor M. (2007) Selective serotonin reuptake inhibitors (SSRIs) for depressive disorders in children and adolescents. *Cochrane Database Syst Rev* **3**.

Hilbe J.M. (2011) Logistic regression. In *International Encyclopedia of Statistical Science*, Springer, pp. 755-758.

Hilbert A. & Brauhardt A. (2014) Childhood loss of control eating over five-year follow-up. *The International Journal Of Eating Disorders* **47**(7), 758-761.

Hilbert A., Hartmann A.S., Czaja J. & Schoebi D. (2013) Natural course of preadolescent loss of control eating. *Journal Of Abnormal Psychology* **122**(3), 684-693.

Hjern A. (2006) Chapter 7: Children's and young people's health. *Scandinavian Journal of Public Health* **34**(SUPPL. 67), 165-183.

Hoare E., Fuller-Tyszkiewicz M., Skouteris H., Millar L., Nichols M. & Allender S. (2015) Systematic review of mental health and well-being outcomes following community-based obesity prevention interventions among adolescents. *BMJ Open* **5**(1), e006586-e006586.

Hoare E., Millar L., Fuller-Tyszkiewicz M., Skouteris H., Nichols M., Jacka F., Swinburn B., Chikwendu C. & Allender S. (2014) Associations between obesogenic risk and depressive symptomatology in Australian adolescents: a cross-sectional study. *Journal Of Epidemiology And Community Health* **68**(8), 767-772.

Hoare E., Millar L., Fuller-Tyszkiewicz M., Skouteris H., Nichols M., Malakellis M., Swinburn B. & Allender S. (2016) Depressive symptomatology, weight status and obesogenic risk among Australian adolescents: a prospective cohort study. *BMJ Open* **6**(3), e010072.

Hofferth S.L. & Curtin S. (2005) Poverty, food programs, and childhood obesity. *Journal of Policy Analysis and Management* **24**(4), 703-726.

Hollywood E., Comiskey C., Begley T., Snel A., O'Sullivan K., Quirke M. & Wynne C. (2013) Measuring and modelling body mass index among a cohort of urban children living with disadvantage. *Journal of Advanced Nursing* **69**(4), 851-861.

Horne P.J., Hardman C.A., Lowe C.F., Tapper K., Le Noury J., Madden P., Patel P. & Doody M. (2009) Increasing parental provision and children's consumption of lunchbox fruit and vegetables in Ireland: the Food Dudes intervention. *European Journal of Clinical Nutrition* **63**(5), 613-618.

Hou F., Xu S., Zhao Y., Lu Q., Zhang S., Zu P., Sun Y., Su P. & Tao F. (2013) Effects of emotional symptoms and life stress on eating behaviors among adolescents. *Appetite* **68**, 63-68.

Houghton F., Cowley H., Houghton S. & Kelleher K. (2003) The Children's Depression Inventory short form (CDI-S) in an Irish context. *Irish Journal of Psychology* **24**(3-4), 193-198.

Hoying J.A. (2017) COPE: A pilot study with urban sixth grade youth to improve physical activity and mental health outcomes. ProQuest Information & Learning, US.

Hoyos Cillero I. & Jago R. (2010) Systematic review of correlates of screen-viewing among young children. *Preventive Medicine* **51**(1), 3-10.

Huang D.Y.C., Lanza H.I., Wright-Volel K. & Anglin M.D. (2013) Developmental trajectories of childhood obesity and risk behaviors in adolescence. *Journal of Adolescence* **36**(1), 139-148.

Hudson C.G. (2005) Socioeconomic status and mental illness: tests of the social causation and selection hypotheses. *American Journal of Orthopsychiatry* **75**(1), 3.

Hughes E.K., Goldschmidt A.B., Labuschagne Z., Loeb K.L., Sawyer S.M. & Grange D.L. (2013) Eating Disorders with and without Comorbid Depression and Anxiety: Similarities and Differences in a Clinical Sample of Children and Adolescents. *European Eating Disorders Review* **21**(5), 386-394.

Hurt L., Pinto C.D., Watson J., Grant M. & Gielner J. (2014) Diagnosis and screening for obesity-related conditions among children and teens receiving Medicaid--Maryland, 2005-2010. *MMWR. Morbidity And Mortality Weekly Report* **63**(14), 305-308.

Hyo Jin L., Sung Suk C. & Kyoung Hwa J. (2016) Factors of Depressive Symptoms Among Elementary, Middle, and High School Students. *Archives of Psychiatric Nursing* **30**(3), 302-308.

IBM (2016) SPSS statistical software. *Armonk, NY: IBM Corporation*.

Iliffe S., Williams G., Fernandez V., Vila M., Kramer T., Gledhill J. & Miller L. (2009) Treading a fine line: is diagnosing depression in young people just medicalising moodiness? *British Journal of General Practice* **59**(560), 156-157.

Imai K., King G. & Stuart E.A. (2008) Misunderstandings between experimentalists and observationalists about causal inference. *Journal of the Royal Statistical Society: Series A (statistics in society)* **171**(2), 481-502.

Incledon m., Wake M. & Hay M. (2011) Psychological predictors of adiposity: systematic review of longitudinal studies. *International Journal of Pediatric Obesity* **6**(sup3), 1-11.

Inequality Watch (2010) Inequality Watch. Retrieved from http://www.inequalitywatch.eu/spip.php?article99&lang=en on July 2016

Inventory short form (CDI-S) in an Irish context. *Irish Journal of Psychology* **24**(3-4), 193-198.

Irish Universities Nutrition Alliance (2005) *National Children's Food Survey. Main Report*. Irish Universities Nutrition Alliance, Ireland.

Irish Universities Nutrition Alliance (2008) *National Children's Food Survey. Main Report*. Irish Universities Nutrition Alliance, Ireland.

Isasi C.R., Ostrovsky N.W. & Wills T.A. (2013) The association of emotion regulation with lifestyle behaviors in inner-city adolescents. *Eating Behaviors* **14**(4), 518-521.

Jackson S.W. (1969) Galen—on mental disorders. *Journal of the History of the Behavioral Sciences* **5**(4), 365-384.

Jacob J.J. & Isaac R. (2012) Behavioral therapy for management of obesity. *Indian Journal of Endocrinology and Metabolism* **16**(1), 28.

Jacobson D. & Melnyk B.M. (2012) A primary care healthy choices intervention program for overweight and obese school-age children and their parents. *Journal Of Pediatric Health Care: Official Publication Of National Association Of Pediatric Nurse Associates & Practitioners* **26**(2), 126-138.

Jacobson D. (2009) A primary care school age Healthy Choices Intervention program. Arizona State University, 291 p-291 p.

Jan S., Bellman C., Barone J., Jessen L. & Arnold M. (2009) Shape it up: a school-based education program to promote healthy eating and exercise developed by a health plan in collaboration with a college of pharmacy. *Journal Of Managed Care Pharmacy: JMCP* **15**(5), 403-413.

Jeffery A.N., Hyland M.E., Hosking J. & Wilkin T.J. (2014) Mood and its association with metabolic health in adolescents: A longitudinal study, EarlyBird 65. *Pediatric Diabetes* **15**(8), 599-605.

Jenkins R., Baingana F., Ahmad R., McDaid D. & Atun R. (2011) Mental health and the global agenda: core conceptual issues. *Mental Health in Family Medicine* **8**(2), 69.

Jeronimus B.F., Stavrakakis N., Veenstra R. & Oldehinkel A.J. (2015) Relative age effects in Dutch adolescents: Concurrent and prospective analyses. *PLoS ONE* **10**(6).

Jette M., Barry W. & Pearlman L. (1977) The effects of an extracurricular physical activity program on obese adolescents. *Canadian Journal of Public Health* **68**(1), 39-42.

Jouret B., Sudres J.L., Dupuy M., Ghrib F., Desjardins H., Hubert I., Glattard M., Arnaud C., Diene G. & Tauber M. (2011) Evaluation of body therapy sessions in a programme of therapeutic education for obese adolescents. *Hormone Research in Paediatrics* **76**, 172.

Kalarchian M.A. & Marcus M.D. (2012) Psychiatric comorbidity of childhood obesity. *International Review of Psychiatry* **24**(3), 241-246.

Kamimura-Nishimura K., Chiodo L., Hannigan J., Janisse J., Sokol R., Greewald M. & Delaney-Black V. (2009) Childhood behavioral predictors of adolescent's obesity. *Pediatric Research* **66**(4), 479.

Kaminski J.W., Perou R., Visser S.N., Scott K.G., Beckwith L., Howard J., Smith D.C. & Danielson M.L. (2013) Behavioral and socioemotional outcomes through age 5 years of the legacy for children public health approach to improving developmental outcomes among children born into poverty. *American Journal of Public Health* **103**(6), 1058-1066.

Kandel D.B. & Davies M. (1982) Epidemiology of depressive mood in adolescents: An empirical study. *Archives of general psychiatry* **39**(10), 1205-1212.

Kanner L. (1960) Do behavioural symptoms always indicate psychopathology? *Journal of Child Psychology and Psychiatry* **1**(1), 17-25.

Karande S. & Kulkarni M. (2005) Poor school performance. *The Indian Journal of Pediatrics* **72**(11), 961-967.

Kashani J.H., Husain A., Shekim W.O., Hodges K.K., Cytryn L. & McKnew D.H. (1981) Current perspectives on childhood depression: An overview. *American Journal of Psychiatry* **138**(2), 143-153.

Kashani J.H., Keller M.B., Solomon N., Reid J.C. & Mazzola D. (1985) Double depression in adolescent substance users. *Journal of Affective Disorders* **8**(2), 153-157.

Katzmarzyk P.T., Barlow S., Bouchard C., Catalano P.M., Hsia D.S., Inge T.H., Lovelady C., Raynor H., Redman L.M. & Staiano A.E. (2014) An evolving scientific basis for the prevention and treatment of pediatric obesity. *International Journal of Obesity* **38**(7), 887-905.

Kazdin A.E. & Weisz J.R. (1998) Identifying and developing empirically supported child and adolescent treatments. *Journal of Consulting And Clinical Psychology* **66**(1), 19-36.

Kazdin A.E., French N.H., Unis A.S. & Esveldt-Dawson K. (1983) Assessment of childhood depression: Correspondence of child and parent ratings. *Journal of the American Academy of Child Psychiatry* **22**(2), 157-164.

Keane E., Kearney P.M., Perry I.J., Kelleher C.C. & Harrington J.M. (2014) Trends and prevalence of overweight and obesity in primary school aged children in the Republic of Ireland from 2002-2012: a systematic review. *BMC Public Health* **14**(1), 1.

Keane E., Layte R., Harrington J., Kearney P.M. & Perry I.J. (2012) Measured parental weight status and familial socio-economic status correlates with childhood overweight and obesity at age 9. *PloS One* **7**(8), e43503.

Keaver L., Webber L., Dee A., Shiely F., Marsh T., Balanda K. & Perry I. (2013) Application of the UK foresight obesity model in Ireland: the health and economic consequences of projected obesity trends in Ireland. *PloS One* **8**(11), e79827.

Keeley T.J.H. & Fox K.R. (2009) The impact of physical activity and fitness on academic achievement and cognitive performance in children. *International Review of Sport & Exercise Psychology* **2**(2), 198-214.

Kelly N.R., Shomaker L., Thompson K., Radin R.M., Cassidy O., Brady S., Galescu O., Demidowich A., Courville A., Chen K.Y., Tanofsky-Kraff M. & Yanovski J.A. (2016) Associations between sleep, coping, and disinhibited eating among overweight adolescent girls. *Sleep* **39**, A339.

Kendler K.S., Neale M.C., MacLean C.J., Heath A.C., Eaves L.J. & Kessler R.C. (1993) Smoking and major depression: a causal analysis. *Archives of General Psychiatry* **50**(1), 36-43.

Kerkar N., D'Urso C., Kochin I.N., Gault A., Arnon R., Miloh T.A., Suchy F.J. & Annunziato R. (2011) Depression markers are more prevalent in obese children with nonalcoholic fatty liver disease than in those without. *Hepatology* **54**, 710A.

KIDSCREEN Group Europe (2006) *The KIDSCREEN Questionnaires Handbook*. Pabst Science Publishers Germany.

Kim E.Y., Choi M.S., Kim S.Y. & Hwang I.T. (2014) The perception of body image and self-esteem in girls with precocious puberty, being treatment with GNRH analogue. *Hormone Research in Paediatrics* **82**, 450.

Kim H.S., Ham O.K., Kim J.W. & Park J.Y. (2012) Association between sleep duration and psychological health in overweight and obese children in Korea. *Nursing & Health Sciences* **14**(2), 238-243.

Kim J.-S. & Lee K. (2010) The relationship of weight-related attitudes with suicidal behaviors in Korean adolescents. *Obesity* **18**(11), 2145-2151.

Kirschenbaum D.S., Caraher K.J. & Pecora K.M. (2014) Convergent Validity of the Clinical Assessment of Depression as a Screening Procedure in Immersion Treatment of Adolescent Obesity. *Child & Family Behavior Therapy* **36**(4), 305-317.

Klein J.B., Jacobs R.H. & Reinecke M.A. (2007) Cognitive-behavioral therapy for adolescent depression: a meta-analytic investigation of changes in effect-size estimates. *Journal of the American Academy of Child & Adolescent Psychiatry* **46**(11), 1403-1413.

Kolko R.P., Stein R.I., Theim K.R., Saelens B.E., Welch R.R., Perri M.G., Epstein L.H. & Wilfley D.E. (2011) Change in children's depression as a predictor of outcome during weight loss treatment. *Obesity* **19**, S103.

Kolko R.P., Teim K.R., Stein R.I., Saelens B.E., Perri M.G., Schechtman K.B., Epstein L.H. & Wilfey D.E. (2010) Self-and parent-reported psychosocial symptoms in overweight children. *Obesity* **18**, S116.

Kolodziejczyk J.K., Gutzmer K., Wright S.M., Arredondo E.M., Hill L., Patrick K., Huang J.S., Gottschalk M. & Norman G.J. (2015) Influence of specific individual and environmental variables on the relationship between body mass index and health-related quality of life in overweight and obese adolescents. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care & Rehabilitation* **24**(1), 251-261.

Korczak D.J., Lipman E., Morrison K. & Szatmari P. (2013) Are children and adolescents with psychiatric illness at risk for increased future body weight? A systematic review. *Developmental Medicine & Child Neurology* **55**(11), 980-987.

Kovacs M. & Goldston D. (1991) Cognitive and social cognitive development of depressed children and adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry* **30**(3), 388-392.

Kovacs M. & Staff M.H.S. (2003) Children's Depression Inventory (CDI): Technical Manual Update. North Tonawanda, NY: Multi-Health Systems. *Inc b31*.

Kovacs M. (1985) The Children's Depression, Inventory (CDI).

Kovacs M. (1992) *Children's depression inventory*. Multi-Health System North Tonawanda, NY

Kovacs M., Goldston D. & Gatsonis C. (1993) Suicidal behaviors and childhood-onset depressive disorders: a longitudinal investigation. *Journal of the American Academy of Child & Adolescent Psychiatry* **32**(1), 8-20.

Kushner R.F. & Sarwer D.B. (2011) Medical and behavioral evaluation of patients with obesity. *Psychiatric Clinics of North America* **34**(4), 797-812.

Kutcher S., Kusumakar V., LeBlanc J., Santor D., Lagace D. & Morehouse R. (2004) The characteristics of asymptomatic female adolescents at high risk for depression: the baseline assessment from a prospective 8-year study. *Journal Of Affective Disorders* **79**(1-3), 177-185.

Laederach-Hofmann K., Kupferschmid S. & Mussgay L. (2002) Links between body mass index, total body fat, cholesterol, high-density lipoprotein, and insulin sensitivity in patients with obesity related to depression, anger, and anxiety. *International Journal of Eating Disorders* **32**(1), 58-71.

Lahiff J. (2008) *TWCDI Healthy Schools Manual*. Childhood Development Initiative, Dublin.

Lakdawalla Z., Hankin B.L. & Mermelstein R. (2007) Cognitive theories of depression in children and adolescents: A conceptual and quantitative review. *Clinical Child and Family Psychology Review* **10**(1), 1-24.

Lakshman R., Elks C.E. & Ong K.K. (2012) Childhood obesity. *Circulation* **126**(14), 1770-1779.

Lam T. (2012) The effects of psychological stress, depressive symptoms, and cortisol on body mass and central adiposity in 10- to 12-year-old children. University of Alabama at Birmingham, 226 p-226 p.

Landis A.M., Doctor A.D., Evans Y. & Schlocker E. (2016) Adolescent wellness-an inter-disciplinary approach to obesity management in older adolescents. *Journal of Adolescent Health* **58**(2), S64-S65.

Larsen J.K., Otten R., Fisher J.O. & Engels R.C.M.E. (2014) Depressive symptoms in adolescence: A poor indicator of increases in body mass index. *Journal of Adolescent Health* **54**(1), 94-99.

Larson K., Russ S.A., Crall J.J. & Halfon N. (2008) Influence of multiple social risks on children's health. *Pediatrics* **121**(2), 337-344.

Lau B. & Alsaker F.D. (2000) Assessment of weight and eating concerns in Norwegian adolescents. *Scandinavian Journal Of Psychology* **41**(3), 189-196.

Lawlor D.A. & Hopker S.W. (2001) The effectiveness of exercise as an intervention in the management of depression: systematic review and meta-regression analysis of randomised controlled trials. *BMJ* **322**(7289), 763.

Layte R. & McCrory C. (2011) *Growing Up in Ireland: National longitudinal study of children: overweight and obesity among 9-year-olds*. Stationery Office

Lee J.O., Kosterman R., Jones T.M., Herrenkohl T.I., Rhew I.C., Catalano R.F. & Hawkins J.D. (2016) Mechanisms linking high school graduation to health disparities in young adulthood: a longitudinal analysis of the role of health behaviours, psychosocial stressors, and health insurance. *Public Health* **139**, 61-69.

Lefkowitz M.M. & Burton N. (1978) Childhood depression: a critique of the concept. *Psychological Bulletin* **85**(4), 716.

Lewinsohn P.M. (1974) Clinical and theoretical aspects of depression. *Innovative Treatment Methods in Psychopathology. New York: Wiley*, 63-120.

Li N., Strobino D., Ahmed S. & Minkovitz C. (2011) Is There a Healthy Foreign Born Effect for Childhood Obesity in the United States? *Maternal & Child Health Journal* **15**(3), 310-323.

Libbey H.P., Story M.T., Neumark-Sztainer D.R. & Boutelle K.N. (2008) Teasing, disordered eating behaviors, and psychological morbidities among overweight adolescents. *Obesity* **16**(suppl2), S24-S29.

Liem E.T., Sauer P.J., Oldehinkel A.J. & Stolk R.P. (2008) Association between depressive symptoms in childhood and adolescence and overweight in later life: review of the recent literature. *Archives of Pediatrics & Adolescent Medicine* **162**(10), 981-988.

Lim H.J., Chung S.S. & Joung K.H. (2016) Factors of depressive symptoms among elementary, middle, and high school students. *Archives of Psychiatric Nursing* **30**(3), 302-308.

Lin H.C., Tang T.C., Yen J.Y., Ko C.H., Huang C.F., Liu S.C. & Yen C.F. (2008) Depression and its association with self-esteem, family, peer and school factors in a population of 9586 adolescents in southern Taiwan. *Psychiatry and Clinical Neurosciences* **62**(4), 412-420.

Lobstein T., Baur L. & Uauy R. (2004) Obesity in children and young people: A crisis in public health. *Obesity Reviews, Supplement* **5**(1), 4-104.

Lochrie A.S., Buckloh L.M., Antal H., Wysocki T. & Milkes A. (2010) Emotional and behavioral functioning in obese children participating in a 14-week lifestyle intervention to prevent DM2. *Diabetes*.

Loeber R. (1988) Natural histories of conduct problems, delinquency, and associated substance use. In *Advances in Clinical Child Psychology*, Springer, pp. 73-124.

López-Morales C.M., Pascalis-Orozco J., Gonzalez-Heredia R., Brito-Zurita O.R. & Sabag-Ruiz E. (2014) Depression and state of nutrition in schoolchildren from Sonora. *Revista Medica Del Instituto Mexicano Del Seguro Social* **52 Suppl 1**, S64-S67.

Lorenzo C.R., Lavori P.W. & Lock J.D. (2002) Eating attitudes in high school students in the Philippines: A preliminary study. *Eating and Weight Disorders* **7**(3), 202-209.

Lovett B.W. (2012) Identifying the role of body weight and depression for sleep wellness in adolescents. ProQuest Information & Learning, US, 3956-3956.

Luca P., Dettmer E., Khoury M., Grewal P., Manlhiot C., McCrindle B.W., Birken C.S. & Hamilton J.K. (2015) Adolescents with severe obesity: Outcomes of participation in an intensive obesity management programme. *Pediatric Obesity* **10**(4), 275-282.

Luca P.D., Dettmer E., Grewal P., McCrindle B.W., Birken C.S. & Hamilton J.K. (2013) Evaluation of the sickkids team obesity management program (STOMP). *Endocrine Reviews* **34**(3).

Lucas S.R. & Platts-Mills T.A. (2005) Physical activity and exercise in asthma: relevance to etiology and treatment. *Journal of Allergy and Clinical Immunology* **115**(5), 928-934.

Ludwig D.S. (2007) Childhood obesity - The shape of things to come. *New England Journal of Medicine* **357**(23), 2325-2327.

Luiz A.M.A.G., Gorayeb R. & Del Roio Liberatore R., Jr. (2010) Avaliação de depressão, problemas de comportamento e competência social em crianças obesas. = Evaluation of depression, behavioral problems and social skills in obese children. *Estudos de Psicologia* **27**(1), 41-48.

Lumeng J.C., Appugliese D., Cabral H.J., Bradley R.H. & Zuckerman B. (2006) Neighborhood safety and overweight status in children. *Archives of Pediatrics and Adolescent Medicine* **160**(1), 25-31.

Lumeng J.C., Gannon K., Cabral H.J., Frank D.A. & Zuckerman B. (2003) Association Between Clinically Meaningful Behavior Problems and Overweight in Children. *Pediatrics* **112**(5), 1138-1145.

Luppino F.S., de Wit L.M., Bouvy P.F., Stijnen T., Cuijpers P., Penninx B.W. & Zitman F.G. (2010) Overweight, obesity, and depression: a systematic review and meta- analysis of longitudinal studies. *Archives of General Psychiatry* **67**(3), 220-229.

Lynch F., Mills C., Daly I. & Fitzpatrick C. (2006) Challenging times: prevalence of psychiatric disorders and suicidal behaviours in Irish adolescents. *Journal of Adolescence* **29**(4), 555-573.

Maahs D., Serna D.G.d., Kolotkin R.L., Ralston S., Sandate J., Qualls C. & Schade D.S. (2006) Randomized, double-blind, placebo-controlled trial of orlistat for weight loss in adolescents. *Endocrine Practice* **12**(1), 18-28.

MacKinnon D.P. & Luecken L.J. (2008) How and for whom? Mediation and moderation in health psychology. *Health Psychology* **27**(2S), S99.

MacKinnon D.P. (2008) *Introduction to statistical mediation analysis*. Routledge

MacKinnon D.P., Lockwood C.M. & Williams J. (2004) Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate behavioral research* **39**(1), 99-128.

Maitre N., Whelan (2006) Reconfiguring the measurement of deprivation and consistent poverty in Ireland. *Policy Research Series, the Economic and Social Research Institute* **58**.

March J., Silva S., Petrycki S., Curry J., Wells K., Fairbank J., Burns B., Domino M., McNulty S. & Vitiello B. (2004) Fluoxetine, cognitive-behavioral therapy, and their combination for adolescents with depression: Treatment for Adolescents with Depression Study (TADS) randomized controlled trial. *Jama* **292**(7), 807-820.

March J.S., Conners C., Arnold G., Epstein J., Parker J., Hinshaw S., Abikoff H., Molina B., Wells K. & Newcorn J. (1999) The Multidimensional Anxiety Scale for Children (MASC): Confirmatory factor analysis in a pediatric ADHD sample. *Journal of Attention Disorders* **3**(2), 85-89.

Markowitz S., Friedman M.A. & Arent S.M. (2008) Understanding the relation between obesity and depression: causal mechanisms and implications for treatment. *Clinical Psychology: Science and Practice* **15**(1), 1-20.

Marks S., Shaikh U., Hilty D.M. & Cole S. (2009) Weight status of children and adolescents in a telepsychiatry clinic. *Telemedicine and e-Health* **15**(10), 970-974.

Marmorstein N.R. & Iacono W.G. (2016) Associations between depression and obesity in parents and their late-adolescent offspring: A community-based study. *Psychosomatic Medicine* **78**(7), 861-866.

Marshall G. (1998) Poverty. Oxford Dictionary of Sociology, 2nd edn. Oxford University Press, New York.

Marshall K., McIvor J. & Puthi V.R. (2013) Experiences implementing obesity services for children and adolescents (OSCA) consensus guidelines in a secondary care setting for children with obesity. *Hormone Research in Paediatrics* **80**, 244.

Matherne C.E., Tanofsky-Kraff M., Altschul A.M., Shank L.M., Schvey N.A., Brady S.M., Galescu O., Demidowich A.P., Yanovski S.Z. & Yanovski J.A. (2015) A preliminary examination of Loss of Control Eating Disorder (LOC-ED) in middle childhood. *Eating Behaviors* **18**, 57-61.

Matson K.L. & Fallon R.M. (2012) Treatment of obesity in children and adolescents. *The Journal of Pediatric Pharmacology and Therapeutics* **17**(1), 45-57.

Maughan B., Collishaw S. & Stringaris A. (2013) Depression in childhood and adolescence. *Journal of the Canadian Academy of Child & Adolescent Psychiatry* **22**(1).

Mayer S. (2003) What is a 'Disadvantaged Group?'–Effective Communities Project. Article (November 13 Page 1).

McCall R.B. & Green B.L. (2004) *Beyond the methodological gold standards of behavioral research: Considerations for practice and policy*. Society for Research in Child Development

McCarty C.A., Mason W.A., Kosterman R., Hawkins J.D., Lengua L.J. & McCauley E. (2008) Adolescent school failure predicts later depression among girls. *Journal of Adolescent Health* **43**(2), 180-187.

McClanahan K.K., Huff M.B. & Omar H.A. (2009) Overweight children and adolescents: impact on psychological and social development. *International Journal of Child Health & Human Development* **1**(4), 378-384.

McDuffie J.R., Calis K.A., Booth S.L., Uwaifo G.I. & Yanovski J.A. (2002) Effects of Orlistat on Fat-Soluble Vitamins in Obese Adolescents. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy* **22**(7), 814-822.

McDuffie J.R., Calis K.A., Uwaifo G.I., Sebring N.G., Fallon E.M., Frazer T.E., Hubbard V.S. & Yanovski J.A. (2004) Efficacy of orlistat as an adjunct to behavioral treatment in overweight African American and Caucasian adolescents with obesity-related co- morbid conditions. *Journal of Pediatric Endocrinology and Metabolism* **17**(3), 307-320.

McDuffie J.R., Calis K.A., Uwaifo G.I., Sebring N.G., Fallon E.M., Hubbard V.S. & Yanovski J.A. (2002) Three-month tolerability of Orlistat in adolescents with obesity- related comorbid conditions. *Obesity Research* **10**(7), 642-650.

McKercher C., Schmidt M.D., Sanderson K., Dwyer T. & Venn A.J. (2012) Physical activity and depressed mood in primary and secondary school-children. *Mental Health and Physical Activity* **5**(1), 50-56.

McLeod J.D. & Shanahan M.J. (1993) Poverty, parenting, and children's mental health. *American Sociological Review*, 351-366.

McLeod J.D. & Shanahan M.J. (1996) Trajectories of poverty and children's mental health. *Journal of Health and Social Behavior*, 207-220.

Meehan F., Houghton F., Cowley H., Houghton S. & Kelleher K. (2008) Children's depression, gender and age norms for an Irish national (primary) school population. *Irish Journal of Psychological Medicine* **25**(03), 88-94.

Mehler-Wex C. & Kölch M. (2008) Depression in children and adolescents. *Deutsches Aerzteblatt International* **105**(9), 149.

Melnyk B.M., Jacobson D., Kelly S.A., Belyea M.J., Shaibi G.Q., Small L., O'Haver J.A. & Marsiglia F.F. (2015) Twelve-Month Effects of the COPE Healthy Lifestyles TEEN Program on Overweight and Depressive Symptoms in High School Adolescents. *Journal of School Health* **85**(12), 861-870.

Melzer K., Kayser B. & Pichard C. (2004) Physical activity: the health benefits outweigh the risks. *Current Opinion in Clinical Nutrition & Metabolic Care* **7**(6), 641-647.

Mendez R. & Grissom M. (2013) Disorders of childhood growth and development: childhood obesity. *FP Essentials* **410**, 20-24.

Merikangas A.K., Mendola P., Pastor P.N., Reuben C.A. & Cleary S.D. (2012) The association between major depressive disorder and obesity in US adolescents: Results from the 2001–2004 National Health and Nutrition Examination Survey. *Journal of Behavioral Medicine* **35**(2), 149-154.

Merten M.J., Wickrama K.A.S. & Williams A.L. (2008) Adolescent obesity and young adult psychosocial outcomes: Gender and racial differences. *Journal Of Youth And Adolescence* **37**(9), 1111-1122.

Meyer B.D. & Sullivan J.X. (2012) Identifying the disadvantaged: official poverty, consumption poverty, and the new supplemental poverty measure. *The Journal of Economic Perspectives* **26**(3), 111-135.

Micali N., Horton N., Crosby R., Swanson S., Sonneville K., Solmi F., Calzo J., Eddy K. & Field A. (2017) Eating disorder behaviours amongst adolescents: investigating classification, persistence and prospective associations with adverse outcomes using latent class models. *European Child & Adolescent Psychiatry* **26**(2), 231-240.

Mitchell S.H., Petrie T.A., Greenleaf C.A. & Martin S.B. (2017) A biopsychosocial model of dietary restraint in early adolescent boys. *The Journal of Early Adolescence* **37**(5), 593-617.

Moffatt V. (2008) Irish adolescents and depression: a study of mental health literacy and help-seeking/thesis presented to the School of Public Health and Population Science, University College Dublin, as part requirement for the degree of Master of Science in Child Health by Valerie Moffatt. *HSE Research*.

Moffitt T.E., Gabrielli W.F., Mednick S.A. & Schulsinger F. (1981) Socioeconomic status, IQ, and delinquency. *Journal of Abnormal Psychology* **90**(2), 152.

Moher D., Liberati A., Tetzlaff J. & Altman D.G. (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement-David Moher and colleagues introduce PRISMA, an update of the QUOROM guidelines for reporting systematic reviews and meta-analyses. *BMJ (CR)-print* **338**(7716), 332.

Moon A., Mullee M., Rogers L., Thompson R., Speller V. & Roderick P. (1999) Helping schools to become health-promoting environments—an evaluation of the Wessex Healthy Schools Award. *Health Promotion International* **14**(2), 111-122.

Morales L.S., Edwards T.C., Flores Y., Barr L., Patrick D.L., Morales L.S., Edwards T.C., Flores Y., Barr L. & Patrick D.L. (2011) Measurement properties of a multicultural weight-specific quality-of-life instrument for children and adolescents. *Quality of Life Research* **20**(2), 215-224.

Mo-suwan L., Lebel L., Puetpaiboon A. & Junjana C. (1999) School performance and weight status of children and young adolescents in a transitional society in Thailand. *International Journal of Obesity & Related Metabolic Disorders* **23**(3).

Mufson L.H., Dorta K.P., Olfson M., Weissman M.M. & Hoagwood K. (2004) Effectiveness research: Transporting interpersonal psychotherapy for depressed adolescents (IPT-A) from the lab to school-based health clinics. *Clinical Child and Family Psychology Review* **7**(4), 251-261.

Mühlig Y., Antel J., Föcker M. & Hebebrand J. (2016) Are bidirectional associations of obesity and depression already apparent in childhood and adolescence as based on high-quality studies? A systematic review. *Obesity Reviews: An Official Journal Of The International Association For The Study Of Obesity* **17**(3), 235-249.

Murray M.L., de Vries C.S. & Wong I.C.K. (2004) A drug utilisation study of antidepressants in children and adolescents using the General Practice Research Database. *Archives of Disease in Childhood* **89**(12), 1098-1102.

Mustillo S., Worthman C., Erkanli A., Keeler G., Angold A. & Costello E.J. (2003) Obesity and psychiatric disorder: Developmental trajectories. *Pediatrics* **111**(4), 851-859.

Najman J.M., Hallam D., Bor W.B., O'Callaghan M., Williams G.M. & Shuttlewood G. (2005) Predictors of depression in very young children. *Social Psychiatry and Psychiatric Epidemiology* **40**(5), 367-374.

Naticchioni K. (2013) The Relationship between Obesity and Academic Achievement of School-Age Children.

National Anti-Poverty Strategy. (1997) *Sharing in Progress: National Anti-Poverty Strategy*. Government Publications, Dublin.

National Nutrition Surveillance Centre. (2009) *Family Based Interventions in the Prevention and Management of Childhood Overweight and Obesity: An International review of Best Practices, and A review of current Irish Interventions*. National Nutrition Surveillance Centre, Ireland.

Neissaar I. & Raudsepp L. (2011) Changes in physical activity, self-efficacy and depressive symptoms in adolescent girls. *Pediatric Exercise Science* **23**(3), 331-343.

Nemade R., Staats Reiss N. & Dombeck M. (2013) Historical understandings of depression. *MentalHelp. net*.

NICE (2006) Obesity prevention, Vol. CG43. National Institute for Health and Care Excellence (NICE).

Nikulina V. & Widom C. (2013) Child neglect, race, childhood family and neighborhood poverty and adult physical health: does mental health mediate or moderate these relations? *Comprehensive Psychiatry* **54**(1), e7-e8.

Nolen-Hoeksema S. (2000) The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology* **109**(3), 504.

Norgren S., Danielsson P., Jurold R., Lötborn M. & Marcus C. (2003) Orlistat treatment in obese prepubertal children: a pilot study. *Acta Paediatrica* **92**(6), 666-670.

Nowicka P., Triberio S.S., Kerr D.C.R. & Capaldi D.M. (2013) A longitudinal examination of parental depression and monitoring on children's BMI in middle childhood. *Obesity Facts* **6**, 186.

O'Sullivan K., Boland F., Reulbach U., Motterlini N., Kelly D., Bennett K. & Fahey T. (2015) Antidepressant prescribing in Irish children: secular trends and international comparison in the context of a safety warning. *BMC pediatrics* **15**(1), 119.

OED (2016) *OED Oxford English Dictionary*. Retrieved from http://www.oed.com/view/Entry/149126?redirectedFrom=poverty#eid on May 2016.

Ogden C.L. & Carroll M.D. (2010) Prevalence of overweight, obesity, and extreme obesity among adults: United States, trends 1960–1962 through 2007–2008. *National Center for Health Statistics* **6**(1), 1-6.

O'Keeffe N., Purtill E., Hegarty M. & Glennon C. (2008) Activity Confidence and Eating; a pilot group approach to management of childhood overweight and obesity: dietetic perspective in an interdisciplinary team. *Proceedings of the Nutrition Society* **67**(OCE7), E261.

Oksuz A.N., Orhan F.O., Ekerbicer H.C., Karaaslan M.F. & Findikli E. (2013) Night eating syndrome and binge eating disorder in depression. *Bulletin of Clinical Psychopharmacology* **23**, S107-S108.

Olive L.S., Telford R.M., Byrne D.G., Abhayaratna W.P. & Telford R.D. (2016) Psychological distress leads to reduced physical activity and fitness in children: The Australian longitudinal LOOK study. *Journal of Behavioral Medicine* **39**(4), 587-598.

O'Malley G., Dowdall G., Burls A., Perry I.J. & Curran N. (2014) Exploring the usability of a mobile app for adolescent obesity management. *JMIR mHealth and uHealth* **2**(2), e29.

Orenstein M. (2009) Social emotional and cognitive functioning of obese and non-obese minority, low SES children. ProQuest Information & Learning, US, 4460-4460.

Ornstein R., Lane-Loney S. & Hollenbeak C. (2011) Clinical outcomes of a novel, family-centered partial hospitalization program for young patients with eating disorders. *Journal of Adolescent Health* **48**(2), S49.

Ortega F.B., Ruiz J.R., Castillo M.J. & Sjöström M. (2008) Physical fitness in childhood and adolescence: A powerful marker of health. *International Journal of Obesity* **32**(1), 1-11.

Owens M., Stevenson J., Hadwin J.A. & Norgate R. (2012) Anxiety and depression in academic performance: An exploration of the mediating factors of worry and working memory. *School Psychology International* **33**(4), 433-449.

Paiva T. & Matos M. (2011) Sleep duration, quality of life, habits and academic success in adolescents: Results from a portuguese national survey. *Sleep Medicine* **12**, S93.

Papoutsakis C., Priftis K.N., Drakouli M., Prifti S., Konstantaki E., Chondronikola M., Antonogeorgos G. & Matziou V. (2013) Childhood overweight/obesity and asthma: is there a link? A systematic review of recent epidemiologic evidence. *Journal of the Academy of Nutrition and Dietetics* **113**(1), 77-105.

Parsons T.J., Power C., Logan S. & Summerbelt C. (1999) Childhood predictors of adult obesity: a systematic review. *International Journal of Obesity* **23**.

Patel H., Vankar J., Shah S., Patil T., Phatak A. & Nimbalkar S. (2016) Prevalence of bullying and profile of bullies and victims amongurban schoolgoing adolescents in anand and vadodara, gujarat, india. *European Journal of Pediatrics* **175**(11), 1819.

Patel V. & Sumathipala A. (2001) International representation in psychiatric literature. *The British Journal of Psychiatry* **178**(5), 406-409.

Patten S.B., Wilkes T.C.R., Williams J.V.A., Lavorato D.H., El-Guebaly N., Wild T.C., Colman I. & Bulloch A.G.M. (2016) Childhood adversity and subsequent mental health status in adulthood: Screening for associations using two linked surveys. *Epidemiology and Psychiatric Sciences* **25**(2), 160-170.

Pauli-Pott U., Becker K., Albayrak Ö., Hebebrand J. & Pott W. (2013) Links between psychopathological symptoms and disordered eating behaviors in overweight/obese youths. *International Journal of Eating Disorders* **46**(2), 156-163.

Peña M. & Bacalloa J. (2000) *Obesity and poverty: a new public health challenge*. 576. Pan American Health Organisation

Penninx B.W., Milaneschi Y., Lamers F. & Vogelzangs N. (2013) Understanding the somatic consequences of depression: biological mechanisms and the role of depression symptom profile. *BMC Medicine* **11**(1), 1.

Pereyra M., Eguivar Y. & Aguirre A. (2012) Exercise produce clinical and behavioural improvement in obese adolescents with anxious-depressive syndrome. *Hormone Research in Paediatrics* **78**, 48.

Petty K.H., Davis C.L., Tkacz J., Young-Hyman D. & Waller J.L. (2009) Exercise effects on depressive symptoms and self-worth in overweight children: A randomized controlled trial. *Journal Of Pediatric Psychology* **34**(9), 929-939.

Phillips B.A., Gaudette S., McCracken A., Razzaq S., Sutton K., Speed L., Thompson J. & Ward W. (2012) Psychosocial functioning in children and adolescents with extreme obesity. *Journal of Clinical Psychology in Medical Settings* **19**(3), 277-284.

Phipps S.A., Burton P.S., Osberg L.S. & Lethbridge L.N. (2006) Poverty and the extent of child obesity in Canada, Norway and the United States. *Obesity Reviews* **7**(1), 5-12.

Pine D.S., Goldstein R.B., Wolk S. & Weissman M.M. (2001) The association between childhood depression and adulthood body mass index. *Pediatrics* **107**(5), 1049-1056.

Pinto I., Coelho R. & Calhau C. (2012) Attachment, internalizing disorders and physiological vulnerability in childhood obesity: An interactive multisystem approach. *Obesity Facts* **5**, 97.

Poulton R., Caspi A., Milne B.J., Thomson W.M., Taylor A., Sears M.R. & Moffitt T.E. (2002) Association between children's experience of socioeconomic disadvantage and adult health: a life-course study. *Lancet (London, England)* **360**(9346), 1640-1645.

Power C., Manor O. & Matthews S. (2003) Child to adult socioeconomic conditions and obesity in a national cohort. *International Journal of Obesity* **27**(9), 1081-1086.

Pratt K.J., Lamson A.L., Lazorick S., Swanson M.S., Cravens J. & Collier D.N. (2011) A Biopsychosocial Pilot Study of Overweight Youth and Care Providers' Perceptions of Quality of Life. *Journal of Pediatric Nursing* **26**(6), e61-68.

Pratt K.J., Lamson A.L., Swanson M.S., Lazorick S. & Collier D.N. (2012) The importance of assessing for depression with HRQOL in treatment seeking obese youth and their caregivers. *Quality Of Life Research: An International Journal Of Quality Of Life Aspects Of Treatment, Care And Rehabilitation* **21**(8), 1367-1377.

Preacher K.J. & Hayes A.F. (2004) SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior research methods* **36**(4), 717-731.

Ptomey L.T., Steger F.L., Schubert M.M., Lee J., Willis E.A., Sullivan D.K., Szabo-Reed A.N., Washburn R.A. & Donnelly J.E. (2016) Breakfast intake and composition is associated with superior

academic achievement in elementary school children. *Journal of the American College of Nutrition* **35**(4), 326-333.

Pugh S.J., Hutcheon J.A., Richardson G.A., Brooks M.M., Himes K.P., Day N.L. & Bodnar L.M. (2016) Child academic achievement in association with pre-pregnancy obesity and gestational weight gain. *Journal Of Epidemiology And Community Health* **70**(6), 534-540.

Quirke M.B. (2015) An evaluation of the effect of a health promoting school approach, The Healthy Schools Programme, on the psychological health and well-being of primary school-aged children. National University of Ireland Maynooth.

Radden J. (2003) Is This Dame Melancholy?: Equating today's depression and past melancholia. *Philosophy, Psychiatry, & Psychology* **10**(1), 37-52.

Radoszewska J. (2006) Sense of self-contact experienced by an obese child] *Endokrynologia, Diabetologia I Choroby Przemiany Materii Wieku Rozwojowego: Organ Polskiego Towarzystwa Endokrynologow Dzieciecych* **12**(2), 135-139.

Ranzenhofer L.M., Engel S.G., Crosby R.D., Haigney M. & Tanofsky-Kraff M. (2016) A pilot study of attachment style and emotional experience in adolescent girls with loss of control eating. *Advances in Eating Disorders* **4**(3), 250-263.

Rasberry C.N., Lee S.M., Robin L., Laris B.A., Russell L.A., Coyle K.K. & Nihiser A.J. (2011) The association between school-based physical activity, including physical education, and academic performance: a systematic review of the literature. *Preventive Medicine* **52**, S10-S20.

Ratcliffe C.E. & McKernan S.-M. (2012) Child poverty and its lasting consequence. *Urban Institute Low-Income Working Families Working Paper* (21).

Ravens-Sieberer U., Gosch A., Abel T., Auquier P., Bellach B.-M., Bruil J., Dür W., Power M., Rajmil L. & European K.G. (2001) Quality of life in children and adolescents: a European public health perspective. *Sozial-und Präventivmedizin* **46**(5), 294-302.

Ravens-Sieberer U., Herdman M., Devine J., Otto C., Bullinger M., Rose M. & Klasen F. (2014) The European KIDSCREEN approach to measure quality of life and well-being in children: development, current application, and future advances. *Quality of life research* **23**(3), 791-803.

Reber A.S. & Reber E. (2001) Dictionary of Psychology. The Penguin Dictionary of Psychology, 3rd edn. Penguin Books, England.

Reece L., Sachdev P., Copeland C., Wright N. & Wales J. (2014) Psychosocial outcomes, Physical Activity and Physical Fitness measures from the BOB study-pilot study assessing the use of an intragastric balloon and a lifestyle support program to promote weight loss in severely obese adolescents. *Obesity Facts* **7**, 150-151.

Rees D.I., Sabia J.J. & Argys L.M. (2009) A head above the rest: height and adolescent psychological well-being. *Economics And Human Biology* **7**(2), 217-228.

Reeves G.M., Postolache T.T. & Snitker S. (2008) Childhood obesity and depression: connection between these growing problems in growing children. *International Journal of Child Health and Human Development: IJCHD* **1**(2), 103.

Reilly J.J., Armstrong J., Dorosty A.R., Emmett P.M., Ness A., Rogers I., Steer C. & Sherriff A. (2005) Early life risk factors for obesity in childhood: cohort study. *BMJ* **330**(7504), 1357.

Reilly J.J., Methven E., McDowell Z.C., Hacking B., Alexander D., Stewart L. & Kelnar C.J.H. (2003) Health consequences of obesity. *Archives of Disease in Childhood* **88**(9), 748-752.

Rice M. (2008) Relationship between children's self-report of self-concept and teacher reports of the Behavioral Assessment System for Children from three cohorts of the PASS program. *Southern Online Journal of Nursing Research* **8**(2), 1p-1p.

Richards J., Foster C., Townsend N. & Bauman A. (2014) Physical fitness and mental health impact of a sport-for-development intervention in a post-conflict setting: randomised controlled trial nested within an observational study of adolescents in Gulu, Uganda. *BMC Public Health* **14**, 619-619.

Richardson L.P., Davis R., Poulton R., McCauley E., Moffitt T.E., Caspi A. & Connell F. (2003) A longitudinal evaluation of adolescent depression and adult obesity. *Archives Of Pediatrics & Adolescent Medicine* **157**(8), 739-745.

Rieck T., Jackson A., Martin S.B., Petrie T. & Greenleaf C. (2013) Health-related fitness, body mass index, and risk of depression among adolescents. *Medicine And Science In Sports And Exercise* **45**(6), 1083-1088.

Riley A.W. (2004) Evidence that school-age children can self-report on their health. *Ambulatory Pediatrics* **4**(4), 371-376.

Riley M., Locke A.B. & Skye E.P. (2011) Health maintenance in school-aged children: Part I. History, physical examination, screening, and immunizations. *American Family Physician* **83**(6), 683-688.

Roberts R.E. & Duong H.T. (2015) Does major depression affect risk for adolescent obesity? *Journal Of Affective Disorders* **186**, 162-167.

Roberts R.E., Deleger S., Strawbridge W.J. & Kaplan G.A. (2003) Prospective association between obesity and depression: evidence from the Alameda County Study. *International Journal of Obesity* **27**(4), 514-521.

Roberts R.E., Kaplan G.A., Shema S.J. & Strawbridge W.J. (2000) Are the obese at greater risk for depression? *American Journal of Epidemiology* **152**(2), 163-170.

Robinson T.N., Matheson D.M., Kraemer H.C., Wilson D.M., Obarzanek E., Thompson N.S., Alhassan S., Spencer T.R., Haydel K.F., Fujimoto M., Varady A. & Killen J.D. (2010) A randomized controlled trial of culturally tailored dance and reducing screen time to prevent weight gain in low-income African American girls: Stanford GEMS. *Archives of Pediatrics and Adolescent Medicine* **164**(11), 995-1004.

Rocchini A.P. (2002) Childhood obesity and a diabetes epidemic. *New England Journal of Medicine* **346**(11), 854-855.

Rocha-Filho P.A. & Santos P.V. (2014) Headaches, quality of life, and academic performance in schoolchildren and adolescents. *Headache: The Journal of Head and Face Pain* **54**(7), 1194-1202.

Rochlin G. (1959) The loss complex: A contribution to the etiology of depression. *Journal of the American Psychoanalytic Association*.

Rodgers R.F., Paxton S.J. & McLean S.A. (2014) A biopsychosocial model of body image concerns and disordered eating in early adolescent girls. *Journal Of Youth And Adolescence* **43**(5), 814-823.

Rofey D.L., Blake R.G., Silk J.S., Loughran M.J., Ryan N. & Dahl R.E. (2010) Impact of physical activity on mood for obese girls: An ecological momentary assessment study. *Obesity* **18**, S113-S114.

Rogovik A.L. & Goldman R.D. (2011) Pharmacologic treatment of pediatric obesity. *Canadian Family Physician* **57**(2), 195-197.

Romo L., Coëffec A. & Guilmin-Crepon S. (2012) Assessment of personality, motivation to change and family factors present in young treated for obesity. *Annales Medico-Psychologiques* **170**(9), 649-653.

Rønning J.A., Haavisto A., Nikolakaros G., Helenius H., Tamminen T., Moilanen I., Kumpulainen K., Piha J., Almqvist F. & Sourander A. (2011) Factors associated with reported childhood depressive symptoms at age 8 and later self-reported depressive symptoms among boys at age 18. *Social Psychiatry and Psychiatric Epidemiology* **46**(3), 207-218.

Rooney B., Mathiason M. & Schauberger C. (2011) Predictors of Obesity in Childhood, Adolescence, and Adulthood in a Birth Cohort. *Maternal & Child Health Journal* **15**(8), 1166-1175.

Roos N.P., Brownell M., Guevremont A., Fransoo R., Levin B., MacWilliam L. & Roos L.L. (2006) The complete story: A population-based perspective on school performance and educational testing. *Canadian Journal of Education/Revue canadienne de l'éducation*, 684-705.

Rosenbloom A.L. (2002) Increasing incidence of type 2 diabetes in children and adolescents. *Pediatric Drugs* **4**(4), 209-221.

Ruo B., Rumsfeld J.S., Hlatky M.A., Liu H., Browner W.S. & Whooley M.A. (2003) Depressive symptoms and health-related quality of life: the Heart and Soul Study. *JAMA* **290**(2), 215-221.

Ryan N.D., Puig-Antich J., Ambrosini P., Rabinovich H., Robinson D., Nelson B., Iyengar S. & Twomey J. (1987) The clinical picture of major depression in children and adolescents. *Archives of general psychiatry* **44**(10), 854-861.

Sacher P.M., Kolotourou M., Chadwick P.M., Cole T.J., Lawson M.S., Lucas A. & Singhal A. (2010) Randomized controlled trial of the MEND program: a family-based community intervention for childhood obesity. *Obesity* **18**(S1), S62-S68.

Safefood (2008) Campaign launched to tackle obesity across the island of Ireland showing how little steps can lead to a healthier future. Northern Ireland Release. *safefood.eu*.

Sallis J.F., McKenzie T.L., Kolody B., Lewis M., Marshall S. & Rosengard P. (1999) Effects of health-related physical education on academic achievement: Project SPARK. *Research quarterly for exercise and sport* **70**(2), 127-134.

Salzinger S., Kaplan S., Pelcovitz D., Samit C. & Krieger R. (1984) Parent and teacher assessment of children's behavior in child maltreating families. *Journal of the American Academy of Child Psychiatry* **23**(4), 458-464.

Sandercock G.R.H., Voss C. & Dye L. (2010) Associations between habitual school-day breakfast consumption, body mass index, physical activity and cardiorespiratory fitness in English schoolchildren. *European Journal of Clinical Nutrition* **64**(10), 1086-1092.

Santiago C.D., Kaltman S. & Miranda J. (2013) Poverty and Mental Health: How Do Low-Income Adults and Children Fare in Psychotherapy? *Journal of Clinical Psychology* **69**(2), 115-126.

Sarkar S., Sinha V.K. & Praharaj S.K. (2012) Depressive disorders in school children of suburban India: an epidemiological study. *Social Psychiatry and Psychiatric Epidemiology* **47**(5), 783-788.

Sather C.A., Lagges A., Cupp H., Brubaker J., LaMothe V.J., Marshall A., Liu G.C. & Gupta S.K. (2011) BMI screening starting between ages 2-5 years impacts obesity and related morbidity better than current recommendations. *Gastroenterology* **140**(5), S618.

Sato M., Suzuki K., Tanaka T., Kondo N., Nagai A. & Yamagata Z. (2011) Trajectories of weight status and depression during puberty. *American Journal of Epidemiology* **173**, S127.

Savoye M., Shaw M., Dziura J., Tamborlane W.V., Rose P., Guandalini C., Goldberg-Gell R., Burgert T.S., Cali A.M. & Weiss R. (2007) Effects of a weight management program on body composition and metabolic parameters in overweight children: a randomized controlled trial. *JAMA* **297**(24), 2697-2704.

Schiel R., Beltschikow W., Radón S., Kramer G., Schmiedel R., Berndt R.D. & Stein G. (2008) Long-term treatment of obese children and adolescents using a telemedicine support programme. *Journal of Telemedicine & Telecare* **14**(1), 13-16.

Scholder S.v.H.K., Smith G.D., Lawlor D.A., Propper C. & Windmeijer F. (2012) The effect of fat mass on educational attainment: examining the sensitivity to different identification strategies. *Economics & Human Biology* **10**(4), 405-418.

Schvey N.A., Sbrocco T., Stephens M., Bryant E.J., Ress R., Spieker E.A., Conforte A., Bakalar J.L., Pickworth C.K., Barmine M., Klein D., Brady S.M., Yanovski J.A. & Tanofsky-Kraff M. (2015) Comparison of overweight and obese military-dependent and civilian adolescent girls with loss-of-control eating. *The International Journal Of Eating Disorders* **48**(6), 790-794.

Schweinhart L.J. (1987) Can preschool programs help prevent delinquency? In *Families, Schools, and Delinquency Prevention*, Springer, pp. 135-153.

Schwimmer J.B., Burwinkle T.M. & Varni J.W. (2003) Health-related quality of life of severely obese children and adolescents. *Jama* **289**(14), 1813-1819.

Seibert P.S. & Ellis H.C. (1991) Irrelevant thoughts, emotional mood states, and cognitive task performance. *Memory & Cognition* **19**(5), 507-513.

Selewski D.T., Collier D.N., MacHardy J., Gross H.E., Pickens E.M., Cooper A.W., Bullock S., Earls M.F., Pratt K.J., Scanlon K., McNeill J.D., Messer K.L., Lu Y., Thissen D., DeWalt D.A. & Gipson D.S. (2013) Promising insights into the health related quality of life for children with severe obesity. *Health and Quality of Life Outcomes* **11**(1).

Seligman M.E. (1975) *Helplessness: On depression, development, and death*. WH Freeman/Times Books/Henry Holt & Co

Selvakumar P.K.C., Alkhouri N., Lappe S., Kabbany M.N. & Worley S. (2016) Improved identification of pediatric obesity related comorbidities in a dedicated weight management program compared to pediatric primary care. *Journal of Pediatric Gastroenterology and Nutrition* **63**, S328.

Shahar G. Recognition of Psychotherapy Effectiveness.

Sharma V., Coleman D., Sharples P., Nixon P., Hamilton-Shield P. & Bryant D. (2017) Gaining consensus on obesity-related co-morbidities to include in a screening tool for children and adolescents attending community weight management services. *Obesity Facts* **10**, 12.

Sharp L.K. & Lipsky M.S. (2002) Screening for depression across the lifespan. *American Family Physician* **66**, 1001-1008.

Shin S.H. & Miller D.P. (2012) A longitudinal examination of childhood maltreatment and adolescent obesity: Results from the National Longitudinal Study of Adolescent Health (AddHealth) Study. *Child Abuse & Neglect* **36**(2), 84-94.

Shoemaker A.E. (2013) An evidence-based combined-lifestyle treatment program for pediatric obesity in primary care. ProQuest Information & Learning, US.

Shomaker L.B., Tanofsky-Kraff M., Zocca J.M., Field S.E., Drinkard B. & Yanovski J.A. (2012) Depressive symptoms and cardiorespiratory fitness in obese adolescents. *Journal of Adolescent Health* **50**(1), 87-92.

Shrewsbury V. & Wardle J. (2008) Socioeconomic status and adiposity in childhood: a systematic review of cross-sectional studies 1990–2005. *Obesity* **16**(2), 275-284.

Siegel R.E. (1973) *Galen on psychology, psychopathology, and function and diseases of the nervous system*. Karger Basel

Sigfúsdóttir I.D., Kristjánsson A.L. & Allegrante J.P. (2007) Health behaviour and academic achievement in Icelandic school children. *Health Education Research* **22**(1), 70-80.

Sigman G.S. (2003) Eating disorders in children and adolescents. *Pediatric Clinics of North America* **50**(5), 1139-1177.

Silva A.A., Barbieri M.A., Cardoso V.C., Batista R.F., Simões V.M., Vianna E.O., Gutierrez M.R., Figueiredo M.L., Silva N.A., Pereira T.S., Rodriguez J.D., Loureiro S.R., Ribeiro V.S. & Bettiol H. (2011) Prevalence of non-communicable diseases in Brazilian children: follow-up at school age of two Brazilian birth cohorts of the 1990's. *BMC Public Health* **11**, 486-486.

Silva G.E., Goodwin J.L., Parthasarathy S., Sherrill D.L., Vana K.D., Drescher A.A. & Quan S.F. (2011) Longitudinal association between short sleep, body weight, and emotional and learning problems in hispanic and caucasian children. *Sleep* **34**(9), 1197-1205.

Singhal V., Schwenk W.F. & Kumar S. (2007) Evaluation and management of childhood and adolescent obesity. *Mayo Clinic Proceedings* **82**(10), 1258-1264.

Smith E.E.F. (2014) Self-concept as a moderator of the relationship between body mass index, achievement, and psycho-social outcomes of adolescents. ProQuest Information & Learning, US.

Sokolova I. (2003) Depression in Children: What Causes It and How We Can Help. *Retrieved October* **23**, 2006.

Song N.K. (2017) Family risk factors and federal food assistance benefits: A longitudinal examination of predictors of childhood obesity. ProQuest Information & Learning, US.

Spear B.A., Barlow S.E., Ervin C., Ludwig D.S., Saelens B.E., Schetzina K.E. & Taveras E.M. (2007) Recommendations for treatment of child and adolescent overweight and obesity. *Pediatrics* **120** Supplemental **4**, S254-288.

Sperry L., Powers C. & Griffith J. (2008) Biopsychosocial Issues. *The Journal of Individual Psychology* **64**(3), 369-376.

Spitz R.P., Kim L.P. & Gavazza J.H. (2017) Development and testing of a pilot integrated mental health and nutrition education program for low-income families in southern California. *FASEB Journal* **31**(1).

Srinivasan S., Ambler G.R., Baur L.A., Garnett S.P., Tepsa M., Yap F., Ward G.M. & Cowell C.T. (2006) Randomized, controlled trial of metformin for obesity and insulin resistance in children and adolescents: improvement in body composition and fasting insulin. *The Journal of Clinical Endocrinology & Metabolism* **91**(6), 2074-2080.

Starfield B., Riley A.W., Witt W.P. & Robertson J. (2002) Social class gradients in health during adolescence. *Journal of Epidemiology and Community Health* **56**(5), 354-361.

Statistics L. (2015) Statistical tutorials and software guides. *Retrieved from www.laerdstatistics.com*

Steinberg E., Tanofsky-Kraff M., Cohen M.L., Elberg J., Freedman R.J., Semega-Janneh M., Yanovski S.Z. & Yanovski J.A. (2004) Comparison of the child and parent forms of the Questionnaire on Eating and Weight Patterns in the assessment of children's eating-disordered behaviors. *International Journal of Eating Disorders* **36**(2), 183-194.

Stice E., Presnell K., Shaw H. & Rohde P. (2005) Psychological and behavioral risk factors for obesity onset in adolescent girls: a prospective study. *Journal Of Consulting And Clinical Psychology* **73**(2), 195-202.

Stiles-Shields E.C., Goldschmidt A.B., Boepple L., Glunz C., Le Grange D., Stiles-Shields E.C., Goldschmidt A.B., Boepple L., Glunz C. & Le Grange D. (2011) Driven exercise among treatment-seeking youth with eating disorders. *Eating Behaviors* **12**(4), 328-331.

Studenmund A. & Cassidy H. (1987) Using econometrics.

Stunkard A.J., Faith M.S. & Allison K.C. (2003) Depression and obesity. *Biological Psychiatry* **54**(3), 330-337.

Sun Y. (2016) Associations between active commuting to school, body fat, and mental wellbeing: Population based, cross sectional study in China. *Journal of Adolescent Health* **58**(2), S54.

Symons C.W., Cinelli B., James T.C. & Groff P. (1997) Bridging student health risks and academic achievement through comprehensive school health programs. *Journal of School Health* **67**(6), 220-227.

Tabachnick B.G. & Fidell L.S. (2007) Multivariate analysis of variance and covariance. *Using multivariate statistics* **3**, 402-407.

Tadiello P., Salvatoni A., Alberti G., Bosetti G., Gambarini G. & Marni E. (1990) Obesity and mental disorders in childhood. *La Pediatria Medica E Chirurgica: Medical and Surgical Pediatrics* **12**(6), 647-654.

Takizawa R., Danese A., Maughan B. & Arseneault L. (2015) Bullying victimization in childhood predicts inflammation and obesity at mid-life: a five-decade birth cohort study. *Psychological Medicine* **45**(13), 2705-2715.

Tanofsky-Kraff M., Faden D., Yanovski S.Z., Wilfley D.E. & Yanovski J.A. (2005) The Perceived Onset of Dieting and Loss of Control Eating Behaviors in Overweight Children. *International Journal of Eating Disorders* **38**(2), 112-122.

Tanofsky-Kraff M., Shomaker L.B., Olsen C., Roza C.A., Wolkoff L.E., Columbo K.M., Raciti G., Zocca J.M., Wilfley D.E., Yanovski S.Z. & Yanovski J.A. (2011) A prospective study of pediatric loss of control eating and psychological outcomes. *Journal of Abnormal Psychology* **120**(1), 108-118.

Tanofsky-Kraff M., Shomaker L.B., Wilfley D.E., Young J.F., Sbrocco T., Stephens M., Ranzenhofer L.M., Elliott C., Brady S., Radin R.M., Vannucci A., Bryant E.J., Osborn R., Berger S.S., Olsen C., Kozlosky M., Reynolds J.C. & Yanovski J.A. (2014) Targeted prevention of excess weight gain and eating disorders in high-risk adolescent girls: a randomized controlled trial. *The American Journal of Clinical Nutrition* **100**(4), 1010-1018.

Taras H. & Potts-Datema W. (2005) Obesity and student performance at school. *Journal of School Health* **75**(8), 291-295.

Taveras E.M., Gortmaker S.L., Hohman K.H., Horan C.M., Kleinman K.P., Mitchell K., Price S., Prosser L.A., Rifas-Shiman S.L. & Gillman M.W. (2011) Randomized controlled trial to improve primary care to prevent and manage childhood obesity: the High Five for Kids study. *Archives of Pediatrics & Adolescent Medicine* **165**(8), 714-722.

Taylor C.J. (2013) Depression and anxiety as predictors of obesity in children. ProQuest Information & Learning, US.

ter Bogt T.F.M., van Dorsselaer S.A.F., Monshouwer K., Verdurmen J.E.E., Engels R.C.M. & Vollebergh W.A.M. (2006) Body mass index and body weight perception as risk factors for internalizing and externalizing problem behavior among adolescents. *Journal of Adolescent Health* **39**(1), 27-34.

Tercyak K.P., Abraham A.A., Graham A.L., Wilson L.D. & Walker L.R. (2009) Association of multiple behavioral risk factors with adolescents' willingness to engage in eHealth promotion. *Journal Of Pediatric Psychology* **34**(5), 457-469.

Tershakovec A.M., Weller S.C. & Gallagher P.R. (1994) Obesity, school performance and behaviour of black, urban elementary school children. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity* **18**(5), 323-327.

Terwilliger S.H., Gueldner S.H. & Bronstein L. (2012) A preliminary evaluation of the Well-Being Picture Scale-Children's Version (WPS-CV) in a sample of fourth and fifth graders. *Nursing Science Quarterly* **25**(2), 160-166.

Tevie J. & Shaya F.T. (2014) Depression and comorbid obesity and hypertension in United States children. *Value in Health* **17**(3), A193.

Thapar A., Collishaw S., Pine D.S. & Thapar A.K. (2012) Depression in adolescence. *The Lancet* **379**(9820), 1056-1067.

Thomas C.L., James A.C. & Bachmann M.O. (2002) Eating attitudes in English secondary school students: Influences of ethnicity, gender, mood, and social class. *International Journal of Eating Disorders* **31**(1), 92-96.

Thompson J.K., Coovert M.D., Richards K.J., Johnson S. & Cattarin J. (1995) Development of body image, eating disturbance, and general psychological functioning in female adolescents: Covariance structure modeling and longitudinal investigations. *International Journal of Eating Disorders* **18**(3), 221-236.

Thurston I.B., Sonneville K.R., Milliren C.E., Kamody R.C., Gooding H.C. & Richmond T.K. (2017) Cross-sectional and prospective examination of weight misperception and depressive symptoms among youth with overweight and obesity. *Prevention Science* **18**(2), 152-163.

Tillman T. (2004) The perceptions of elementary school-age children toward overweight peers. ProQuest Information & Learning, US, 4361-4361.

Tobin K. (2013) Fast-food consumption and educational test scores in the USA. *Child: Care, Health and Development* **39**(1), 118-124.

Tomporowski P.D., Davis C.L., Miller P.H. & Naglieri J.A. (2008) Exercise and children's intelligence, cognition, and academic achievement. *Educational psychology review* **20**(2), 111.

Topham G.L., Page M.C., Hubbs-Tait L., Rutledge J.M., Kennedy T.S., Shriver L. & Harrist A.W. (2010) Maternal depression and socio-economic status moderate the parenting style/child obesity association. *Public Health Nutrition* **13**(8), 1237-1244.

Tovey H. & Share P. (2003) *A sociology of Ireland*. Gill & Macmillan Ltd

Townsend P. (1979) *Poverty in the United Kingdom: a survey of household resources and standards of living*. University of California Press

Tracy T.J. (1969) Physiological Theory and the Doctrine of the Mean in Plato and Aristotle.

Tremblay M.S., Inman J.W. & Willms J.D. (2000) The relationship between physical activity, self-esteem, and academic achievement in 12-year-old children. *Pediatric Exercise Science* **12**(3), 312-323.

Tremblay R.E., Masse B., Perron D., LeBlanc M., Schwartzman A.E. & Ledingham J.E. (1992) Early disruptive behavior, poor school achievement, delinquent behavior, and delinquent personality: longitudinal analyses. *Journal of Consulting and Clinical Psychology* **60**(1), 64.

Trowell J., Joffe I., Campbell J., Clemente C., Almqvist F., Soininen M., Koskenranta- Aalto U., Weintraub S., Kolaitis G. & Tomaras V. (2007) Childhood depression: a place for psychotherapy. *European Child & Adolescent Psychiatry* **16**(3), 157-167.

Van Allen J., Seegan P.L., Haslam A. & Steele R.G. (2016) Hope mediates the relationship between depression and quality of life among youths enrolled in a family-based pediatric obesity intervention. *Children's Health Care* **45**(4), 441-454.

Van Vlierberghe L., Braet C. & Goossens L. (2009) Dysfunctional schemas and eating pathology in overweight youth: A case-control study. *International Journal of Eating Disorders* **42**(5), 437-442.

Van Vlierberghe L., Braet C., Goossens L. & Mels S. (2009) Psychiatric disorders and symptom severity in referred versus non-referred overweight children and adolescents. *European Child & Adolescent Psychiatry* **18**(3), 164-173.

Vannucci A., Shomaker L.B., Field S.E., Sbrocco T., Stephens M., Kozlosky M., Reynolds J.C., Yanovski J.A. & Tanofsky-Kraff M. (2014) History of weight control attempts among adolescent girls with loss of control eating. *Health Psychology: Official Journal Of The Division Of Health Psychology, American Psychological Association* **33**(5), 419-423.

Varni J.W., Burwinkle T.M., Seid M. & Skarr D. (2003) The PedsQL™* 4.0 as a pediatric population health measure: feasibility, reliability, and validity. *Ambulatory Pediatrics* **3**(6), 329-341.

Ventura E., Davis J., Byrd-Williams C., Alexander K., McClain A., Lane C.J., Spruijt-Metz D., Weigensberg M. & Goran M. (2009) Reduction in risk factors for type 2 diabetes mellitus in response to a low-sugar, high-fiber dietary intervention in overweight Latino adolescents. *Archives of Pediatrics & Adolescent Medicine* **163**(4), 320-327.

Viner R.M., Haines M.M., Taylor S.J.C., Head J., Booy R. & Stansfeld S. (2006) Body mass, weight control behaviours, weight perception and emotional well being in a multiethnic sample of early adolescents. *International Journal of Obesity* **30**(10), 1514-1521.

von Hinke Kessler Scholder S., Propper C., Windmeijer F., Smith G.D. & Lawlor D.A. (2009) The effect of child weight on academic performance: evidence using genetic markers. *Economics of Diet and Obesity, University of Bristol* **20**.

Wade D.T. & Halligan P.W. (2017) The biopsychosocial model of illness: a model whose time has come.

Walliman N. (2015) *Social research methods: The essentials*. Sage

Walpole B., Dettmer E., Morrongiello B., McCrindle B. & Hamilton J. (2011) Motivational interviewing as an intervention to increase adolescent self-efficacy and promote weight loss: methodology and design. *BMC Public Health* **11**, 459-459.

Walton J. (2012) National Pre-School Nutrition Survey, summary report on: Food and nutrient intakes, physical measurements and barriers to healthy eating. *Irish Universities Nutrition Alliance, Cork*.

Wang C. (2013) Improving health among elementary school children: A comparison of aerobic and mind-body exercise. ProQuest Information & Learning, US.

Wang H., Fu J., Lu Q., Tao F. & Hao J. (2014) Physical activity, body mass index and mental health in Chinese adolescents: a population based study. *The Journal Of Sports Medicine And Physical Fitness* **54**(4), 518-525.

Wang Y., Liang H. & Chen X. (2009) Measured body mass index, body weight perception, dissatisfaction and control practices in urban, low-income African American adolescents. *BMC Public Health* **9**(1), 183.

Wang Y.J., He B.Y., Fang L.H. & Li H.J. (2011) Preliminary study on the health status among the "left-behind" children in the Xian-tao rural area of Hubei Province. *Chinese Journal of Contemporary Pediatrics* **13**(12), 977-980.

Wardle J., Williamson S., Johnson F. & Edwards C. (2006) Depression in adolescent obesity: cultural moderators of the association between obesity and depressive symptoms. *International Journal Of Obesity (2005)* **30**(4), 634-643.

Watson D., Whelan C.T. & Maître B. (2009) Class and poverty: cross-sectional and dynamic analysis of income poverty and life-style deprivation. *Social Class in Europe: an Introduction to the European Socio-Economic Classification. London: Routledge*.

Weare K. (2007) Delivering health education: The contribution of social and emotional learning. *Health Education* **107**(2), 109-113.

Weiss B., Weisz J.R., Politano M., Carey M., Nelson W.M. & Finch A.J. (1991) Developmental differences in the factor structure of the Children's Depression Inventory. *A Journal of Consulting and Clinical Psychology* **3**(1), 38.

Weisz J.R., McCarty C.A. & Valeri S.M. (2006) Effects of psychotherapy for depression in children and adolescents: a meta-analysis. *Psychological Bulletin* **132**(1), 132.

Whelan C.T. & Maître B. (2012) Understanding material deprivation: A comparative European analysis. *Research in Social Stratification and Mobility* **30**(4), 489-503. Whelan C.T., Nolan B. & Maître B. (2006) Measuring consistent poverty in Ireland with EU SILC data.

Whelton H., Harrington J., Crowley E., Kelleher V., Cronin M. & Perry I.J. (2007) Prevalence of overweight and obesity on the island of Ireland: results from the North South Survey of Children's Height, Weight and Body Mass Index, 2002. *BMC Public Health* **7**(1), 187.

Whetstone L.M., Morrissey S.L. & Cummings D.M. (2007) Children at risk: the association between perceived weight status and suicidal thoughts and attempts in middle school youth. *Journal of School Health* **77**(2), 59-66.

Wichstrøm L. (2000) Psychological and behavioral factors unpredictive of disordered eating: A prospective study of the general adolescent population in Norway. *International Journal of Eating Disorders* **28**(1), 33-42.

Wiegand S., l'Allemand D., Hübel H., Krude H., Bürmann M., Martus P., Grüters A. & Holl R.W. (2010) Metformin and placebo therapy both improve weight management and fasting insulin in obese insulin-resistant adolescents: a prospective, placebo- controlled, randomized study. *European Journal of Endocrinology* **163**(4), 585-592.

Wildes J.E., Marcus M.D., Kalarchian M.A., Levine M.D., Houck P.R., Cheng Y., Wildes J.E., Marcus M.D., Kalarchian M.A., Levine M.D., Houck P.R. & Cheng Y. (2010) Self-reported binge eating in severe pediatric obesity: impact on weight change in a randomized controlled trial of family-based treatment. *International Journal of Obesity* **34**(7), 1143-1148.

Wilkinson G.S. (1993) *WRAT-3: Wide range achievement test administration manual*. Wide Range, Incorporated

Williams C., Storch E.A. & Paradora M. (2008) A further examination of the relationships among peer victimization, physical activity, and social psychological adjustment in obese youth. In *Life style and health research progress.* (Turley A.B., Hofmann G.C., Turley A.B. & Hofmann G.C., eds), Nova Biomedical Books, Hauppauge, NY, US, pp. 17-35.

Williams J., Greene S., Doyle E., Harris E., Layte R., McCoy S., McCrory C., Murray A., Nixon E. & O'Dowd T. (2009) Growing Up in Ireland. The Lives of 9-Year-Olds. Report 1. *Dublin, Ireland: Office of the Minister for Children and Youth Affairs*.

Wilson D.M., Abrams S.H., Aye T., Lee P., Lenders C., Lustig R.H., Osganian S.V. & Feldman H.A. (2010) Metformin extended release treatment of adolescent obesity: a 48-week randomized, double-blind, placebo-controlled trial with 48-week follow-up. Archives of Pediatrics & Adolescent Medicine 164(2), 116-123.

Wilson W.J. (1987) Truly Disadvantaged: The Inner City, the Underclass, and Public Policy.

Winding T.N., Nohr E.A., Labriola M., Biering K. & Andersen J.H. (2013) Personal predictors of educational attainment after compulsory school: influence of measures of vulnerability, health, and school performance. Scandinavian Journal of Public Health 41(1), 92-101.

Wong M.-L. & Licinio J. (2001) Research and treatment approaches to depression. *Nature Reviews Neuroscience* **2**(5), 343-351.

World Health Organization. (2005) *European strategy for child and adolescent health and development*. World Health Organization, Europe.

World Health Organization. (2006) *What is the Evidence on School Health Promotion in Improving Health or Preventing Disease And, Specifically, what is the Effectiveness of the Health Promoting Schools Approach?* WHO Regional Office for Europe

World Health Organization. (2014) *Investing in children: the European child and adolescent health strategy 2015-2020*. World Health Organization, Copenhagen, European Office.

World Health Organization. (2012) A global crisis. *World Federation for Mental Health*. World Health Organization (2005) The Bangkok Charter for health promotion in a globalized world. Health promotion journal of Australia: official journal of Australian Association of Health Promotion Professionals 16(3), 168.

World Health Organization. (2007) *The challenge of Obesity in the WHO European Region and the strategies for response*

Wu P.-C. & Kuo S.-T. (2015) Academic achievement, self-concept and depression in Taiwanese children: Moderated mediation effect. School Psychology International 36(1), 36-53.

Wunsch G., Russo F. & Mouchart M. (2010) Do we necessarily need longitudinal data to infer causal relations? *Bulletin de Méthodologie Sociologique* **106**(1), 5-18.

Wyn J., Cahill H., Holdsworth R., Rowling L. & Carson S. (2000) MindMatters, a whole- school approach promoting mental health and wellbeing. *Australian and New Zealand Journal of Psychiatry* **34**(4), 594-601.

Wynne C., Comiskey C. & McGilloway S. (2016) The role of body mass index, weight change desires and depressive symptoms in the health-related quality of life of children living in urban disadvantage: Testing mediation models. *Psychology & Health* **31**(2), 147-165.

Wynne C., Comiskey C., Hollywood E., Quirke M.B., O'Sullivan K. & McGilloway S. (2014) The relationship between body mass index and health-related quality of life in urban disadvantaged children. *Quality of Life Research* **23**(6), 1895-1905.

Wynne C.E. (2013) Predictors of Health-Related Quality of Life in Urban Disadvantaged Children.

Xie B., Chou C.P., Spruijt-Metz D., Liu C., Xia J., Gong J., Li Y. & Johnson C.A. (2005) Effects of perceived peer isolation and social support availability on the relationship between body mass index and depressive symptoms. *International Journal Of Obesity (2005)* **29**(9), 1137-1143.

Xie B., Liu C., Chou C., Xia J., Spruijt-Metz D., Gong J., Li Y., Wang H. & Johnson C.A. (2003) Weight perception and psychological factors in Chinese adolescents. *Journal of Adolescent Health* **33**(3), 202-210.

Yackobovitch-Gavan M., Meshy-Tamir R., Nagelberg N., Phillip M. & Meyerovitch J. (2014) Psychosocial factors associated with depressive mood in Israeli obese adolescents. *Journal Of Health Psychology* **19**(4), 574-584.

Yang Q., Deng H., You S. & Wu P. (1998) Factors related to behavior problems in children of inland and special district. *Chinese Mental Health Journal* **12**(4), 216-217.

Yang S.J., Kim J.M. & Yoon J.S. (2010) Disturbed eating attitudes and behaviors in south Korean boys and girls: A school-based cross-sectional study. *Yonsei Medical Journal* **51**(3), 302-309.

Yanovski J.A., Krakoff J., Salaita C.G., McDuffie J.R., Kozlosky M., Sebring N.G., Reynolds J.C., Brady S.M. & Calis K.A. (2011) Effects of metformin on body weight and body composition in obese insulin-resistant children a randomized clinical trial. *Diabetes* **60**(2), 477-485.

Yarriswamy M. & Shivakumar G. (2014) A Study on Academic Achievement of Secondary School Students in relation to their Mental Health and Personal Adjustment in Science.

Yau P.L., Castro M.G., Tagani A., Tsui W.H. & Convit A. (2012) Obesity and metabolic syndrome and functional and structural brain impairments in adolescence. *Pediatrics* **130**(4), e856-e864.

Yen C.-F., Liu T.-L., Ko C.-H., Wu Y.-Y. & Cheng C.-P. (2014) Mediating effects of bullying involvement on the relationship of body mass index with social phobia, depression, suicidality, and self-esteem and sex differences in adolescents in Taiwan. *Child Abuse & Neglect* **38**(3), 517-526.

Yoshikawa H., Aber J.L. & Beardslee W.R. (2012) The effects of poverty on the mental, emotional, and behavioral health of children and youth: implications for prevention. *American Psychologist* **67**(4), 272.

Young Minds (2013) Mental health statistics. Young Minds. Retrieved from http://www.youngminds.org.uk/training_services/policy/mental_health_statistics/ on September 2016.

Young T.K., Reading J., Elias B. & O'Neil J.D. (2000) Type 2 diabetes mellitus in Canada's First Nations: status of an epidemic in progress. *CMAJ* **163**(5), 561-566.

Zahedi-Shoolami L., Hashemzadeh M. & KaramiRad M. (2013) The epidemiology of obesity, a survey on 1000 iranian patients. *Obesity Surgery* **23**(8), 1157.

Zeller M.H., Saelens B.E., Roehrig H., Kirk S. & Daniels S.R. (2004) Psychological adjustment of obese youth presenting for weight management treatment. *Obesity Research* **12**(10), 1576-1586.

Zimmerman M., Martinez J.H., Young D., Chelminski I. & Dalrymple K. (2013) Severity classification on the Hamilton depression rating scale. *Journal of Affective Disorders* **150**(2), 384-388.

Zu P., Zhao Y.-q., Xu S.-j., Hao J.-h., Su P.-y., Zhu P. & Tao F.-b. (2011) [Association between self-assessed somatotypes and symptom depression among children and adolescents]. *Zhonghua Liu Xing Bing Xue Za Zhi = Zhonghua Liuxingbingxue Zazhi* **32**(12), 1208-1211.

Appendices

Appendix 1: Consent forms for parents

This research aims to extend the examination of the Healthy Schools programme and its impact on the wellbeing of children, their families, and their communities.

By participating in this study, you are agreeing for your child to be asked questions on their physical and psychological health, diet, Drumcondra test scores and social behaviour. Children in 3rd class and above will answer these questions in school during class time. If your child has any additional needs (such as literacy difficulties) we invite you to highlight your concerns below so that we may provide extra support during assessment time.

All children will also have their weight, height, and waist measurements taken, privately, in the presence of a children's nurse. As their parent/guardian, you will also be contacted by phone or at the school and asked questions relating to your child's health as well as your views on the Healthy Schools programme. This information will be collected this year beginning in February 2013 and will continue if funding permits over a further 3 years.

All information and your child's identity will remain confidential. The name of you or your child will not be published or disclosed to anyone outside the research team. Access to any information relating to your child will be fully accessible to you upon request. This information will only be held for purposes of the research study. If as a result of the assessments or measurements it is believed that your child needs medical or further attention you will be informed of this via the Principal at your school and efforts will be made to help you to access the relevant services.

Parent/Guardian Declaration

I have read, or have had read to me, the information leaflet for this project and I understand the contents. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. I freely and voluntarily agree to support my child to be part of this research study. I understand that participation or non-participation will in no way affect the receipt of services for my child from the Healthy Schools programme. I understand that my child or I may withdraw from the study or withdraw our information from the study at any time without prejudice and have received a copy of this agreement.

Please sign Part One to indicate that you are willing to support this study by agreeing to allow your child to participate in the questionnaires and measurements.

Part One

I voluntarily give my agreement for (**insert child's name here)** to participate in this study without prejudice to their legal and ethical rights. I also agree to be contacted by a researcher at a time that is convenient for me.

Your Name: _____

Your Signature: _____Date: _____

Any requests or concerns regarding your child's needs (i.e. literacy difficulties):

Please sign Part Two to indicate that you are willing to support the part of the study that evaluates the progress of the Healthy Schools programme, which gives you the opportunity to say your views.

Part Two

I (**insert guardian's name here**) voluntarily give my consent to be invited for an interview to give my views on the progress of the Healthy Schools programme at a time that is convenient for me.

Your Signature: _____

Phone number (s) _____Best day and time to call: _____

Appendix 2: Parent Invitation Letter

Parent/Guardian Letter of Invitation

The Evaluation of the Healthy Schools Programme

1st February 2012

Dear Parent/Guardian,

You may recall that your child's school was selected to take part in a brand new type of partnership between the Health Services Executive (HSE) and the school with a view to establishing a strong link between education, health and social care. The school implemented a Healthy Schools early intervention programme through a 'healthy school co-ordinator' working with the principal, the teachers and families to improve children's health and increase their access to primary care services.

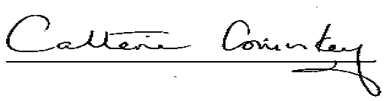
We would like to invite your child to continue to take part in an evaluation of this Healthy Schools programme. This evaluation will involve assessing the health of your child over a further three year period. The evaluation will also review how the programme is being run and what possible changes can be made to the programme to improve its impact on the health of primary school children.

Participation is entirely voluntary, however this is a very important study on the health and well-being of school-aged children and the results of this study will be much stronger if we have a large number of participants. Therefore, we would be most grateful if you would consider allowing your child to take part in the health questionnaires and measurements. We would also appreciate your participation in answering questions relating to your child's health and your views on how the programme is being run. By providing your views on the programme, we can identify the parts of the programme which are successful in improving the health of children and also areas that need further development. Please find attached a detailed information sheet on the study and what it involves.

All of your information will be treated in strict confidence. You or your child may decide to withdraw from the study or withdraw your information at any time without prejudice. Should you agree to your child participating in the study, please sign the attached consent form and return it to the collection box in your child's classroom. If you have any questions, please do not hesitate to contact me or another member of the research team at 0894962348.

Many thanks.

Yours faithfully,



Professor Catherine Comiskey
Principal Investigator on the Healthy Schools Evaluation Team.
School of Nursing and Midwifery, Trinity College Dublin

Appendix 3: Parent Information Leaflet

What is the study about?

The aim of this research is to carry out an evaluation of the Healthy Schools Programme and its implementation in a number of primary schools in Tallaght West.

The Healthy Schools Programme aims to demonstrate a new type of partnership between the Health Services Executive and schools with a view to preventing significant health problems amongst primary school children.

Five schools will set up a health promotion and early intervention programme through a 'healthy school coordinator' who works with the children, school principal, teachers and families to improve children's physical and emotional health and increase their access to primary care services.

Do children in schools with the Healthy Schools Programme have to participate?

No. Participation is completely voluntary. However this is a very important study. With your involvement, we can establish how the Healthy Schools Programme is progressing. In doing so, we can identify those parts of the programme which are helping to improve the health of children and also establish which parts of the programme might need more work. You or your child may decide to withdraw from the study or withdraw your information at any time without consequence.

What if my child or I do not participate?

Whether or not you or your child participates in, or withdraws from the study, will not affect your child in any way, or the service they receive from the Healthy Schools Programme.

What does the study involve?

If your child takes part in the study they will be asked to fill in a questionnaire (first class and above) about their health, wellbeing, food preferences, Drumcondra test scores and social activities. The questionnaires will be completed by your child during school time in the presence of a researcher with experience of working with children. Parent/guardian of younger children (junior and senior infants) will be contacted at a time suitable to them to fill in the questionnaire on their child's behalf. This can be done over the phone or at the school.

These questionnaires will be completed this year and if funding continues once a year over a further three years to find out if the Healthy Schools programme improves the overall health of primary school-aged children.

If your child has any additional needs they will have the assistance of a

school staff member or researcher in completing the questions. If you agree for your child to participate you will have an opportunity to highlight any particular concerns or requests on the agreement form. This will be sent to you in the near future.

Also, during P.E. class your child will be asked for some physical measurements. These will include height, weight and waist measures. This will be carried out in privacy with only a nurse and researcher present. You are very welcome to attend this short P.E. break if you wish. All children will receive a Healthy Schools 'participation certificate' for being part of a Healthy School.

From these results, we can find out much more about the health of school-aged children than would be possible with questions on nutrition and lifestyles only.

Parents are also invited to participate in the evaluation of the effectiveness of the healthy schools programme. With your help we can identify the parts of the programme which are successful in improving the health of children and also establish which parts need further development. This will involve an interview with a small group of parents/guardians to hear your views.

Are there any risks involved?

There are no known risks involved in this study. Every effort will be made to explain each stage of the study to your child. At all times, the well-being of your child will be the priority. If your child verbally or non-verbally expresses a wish not to participate, or decides to withdraw, their decision will be fully respected.

Is the study confidential?

Yes. All the information from the study will be treated as strictly confidential and the name of your child will not be disclosed to anyone outside the research team. The survey has been approved by the Faculty of Health Sciences Research Ethics Committee, of Trinity College Dublin, which checks that proper safeguards are in place. If however as a result of these assessments it is believed that your child needs medical or further attention, you will be informed of this immediately via the school principal.

Who is involved in the study?

This study is being carried out by scientific researchers who have extensive experience in working with children and in healthcare research. The study team comprises:

- Researchers
- Doctors
- Psychologists
- Service Providers
- Family Members
- Teachers
- Children's Nurses

What if I have any other questions?

If you have any questions or would like more information about the study, please do not hesitate to call or email the Researcher below.

Sonam Banka
Researcher
Healthy Schools Evaluation Project
School of Nursing & Midwifery
Trinity College Dublin
24 D'Olier Street
Dublin 2
Tel: 089 4962348
E-mail: hsevaluation@hotmail.com

Trinity College Dublin

healthy schools

An evaluation of the *Healthy Schools Programme* for the Tallaght West Childhood Development Initiative

Parent Information Leaflet

CDI

Childhood Development Initiative

Appendix 4: Teacher Information Leaflet

What is the study about?

The aim of this research is to carry out an evaluation of the Healthy Schools Programme and its implementation in a number of primary schools in Tallaght West.

The Healthy Schools Programme aims to demonstrate a new type of partnership between the Health Services Executive and schools with a view to preventing significant health problems amongst primary school children.

Five schools will set up a health promotion and early intervention programme through a 'healthy school coordinator' who works with the children, school principal, teachers and families to improve children's physical and mental health and increase their access to primary care services.

Do children in schools with the Healthy Schools Programme have to participate?

No. Participation is completely voluntary. However this is a very important study. With the child's involvement, we can establish how the programme is progressing. In doing so, we can identify those parts of the programme which are helping to improve the health of children and also establish which parts of the programme might need more work. The child may decide to withdraw from the study or withdraw their information at any time without consequence.

For children to participate in the study parental consent will first be obtained. In accordance with Trinity Ethical policy, information leaflets will first be given out to children to bring home. One week later consent packs will be distributed to children.

Parents/guardians, if willing to partake in the study, will be asked to return their consent form via their children to a consent return box available in each classroom. To improve child participation, a member of the research team will visit each class during this period to remind children to ask their parents to return the consent forms.

What if the child does not participate?

Whether or not the child participates in, or withdraws from the study, will not affect the child in any way, or the service they receive from the Healthy Schools Programme.

What does the study involve?

This is a longitudinal evaluation and data pertaining to the children's health will be collected once a year over three years. Children in 1st class and above will be asked to fill in a questionnaire about their health, wellbeing, food preferences, and social activities.

This will be completed in the school at a time convenient for you. In-class assessments will take approximately 40 minutes.

The parents/guardians of children in junior and senior infants will be contacted by phone (or at the school if more convenient) and asked questions by the interviewer on similar topics as the older children. This will be done in a sensitive and confidential manner.

If a child has any additional needs they will have the assistance of a researcher (or if feasible a school staff member) in completing the questions. Parents/guardians will also have an opportunity to highlight any particular concerns or requests on the consent form.

Also, at a suitable time during P.E. class, physical health measurements will be taken by our paediatric nurses. These will include height, weight and waist circumference and will be completed in a private manner. The parent/guardian will be invited to attend if they wish.

From these results, we can find out much more about the health of school-aged children than would be possible with questions on nutrition and lifestyles only.

All children will also receive a Healthy Schools 'participation certificate' for being part of a Healthy Schools.
Teachers may also be invited to participate in a focus group to hear your views concerning the effectiveness of the healthy schools programme. With your help we can identify the parts of the programme which are successful in improving the health of children and also establish which parts need further development.

Are there any risks involved?

There are no known risks involved in this study. Every effort will be made to explain each stage of the study to the child. At all times, the well-being of the child will be the priority. If the child verbally or non-verbally expresses a wish not to participate, or decides to withdraw, their decision will be fully respected.

Is the study confidential?

Yes. All the information from the study will be treated as strictly confidential and the name of the child will not be disclosed to anyone outside the research team. The survey has been approved by the Faculty of Health Sciences Research Ethics Committee, of Trinity College Dublin, which checks that proper safeguards are in place. If however as a result of these assessments it is believed that the child needs medical or further

attention, the parent will be informed of this immediately via the Healthy Schools coordinator, or the school principal.

Who is involved in the study?

This study is being carried out by scientific researchers who have extensive experience in working with children and in healthcare research. The study team comprises:

- Researchers
- Doctors
- Psychologists
- Service Providers
- Family Members
- Teachers
- Children's Nurses

What if I have any other questions?

If you have any questions or would like more information about the study, please do not hesitate to call or email the Healthy Schools Evaluation Researcher below.

Ms Sonam Banka
Healthy Schools Evaluation Project
School of Nursing & Midwifery
Trinity College Dublin
24 D'Olier Street
Dublin 2
Tel: 0894962348
E-mail: hsevaluation@hotmail.com

An evaluation of the *Healthy Schools Programme* for the Tallaght West Childhood Development Initiative

Teacher Information Leaflet

CDI

Childhood Development Initiative

Appendix 5: Referral template

Referral Template

HEALTHY SCHOOLS EVALUATION REFERRAL FORM AND INITIAL INFORMATION RECORD - WRITTEN CONFIRMATION OF A CHILD PROTECTION REFERRAL TO SCHOOL PRINCIPAL					
This form should be used by Healthy Schools Evaluation researchers to detail a referral to the School Principal where there is concern that a child is at risk of significant physical or mental harm. This form must be presented to the Principal immediately for him/her to proceed with the case.					
DETAILS OF REFERRAL					
Name of referrer (please print):			Role:		
Office address:					
Telephone:			Fax:		
Date and time of assessment:					
Name of School:			Name of Principal:		
DETAILS OF CHILD					
Surname	Forename	Gender	Age	Class	Class Teacher
Is the child aware of the referral? Yes No					
NATURE OF THE PROBLEM					

Appendix 6: Permission to use surveys

Kidscreen-27 permission

Dear [redacted]

Thank you for your interest in the Kidscreen instruments. I am a co-worker of Prof. Dr. Ravens-Sieberer, working in the co-ordination of the European Kidscreen project in Hamburg , Germany . We have received your signed collaboration form and are very happy to collaborate with you.

You are registered for the use of the Kidscreen Quality of Life questionnaires for children/adolescents and parents. For the following countries linguistic adapted language versions are available: Austria , Brazil , Czech Republic , France , Germany , Greece , Hungary , Ireland , Korea , Netherlands , Poland , Portugal , Spain , Sweden , Switzerland , United Kingdom.

The non-commercial use of the Kidscreen questionnaires is free. In case of commercial use, the licence fee is 500 Euro for each language version of the Kidscreen questionnaire in each study. If that is applying to your study you will find the corresponding invoice attached to this email.

We are looking forward to collaborating with you and whish you all the best for your studies.

With best wishes,

Anne Jäger

Kidscreen Group Europe

Collaboration Center

Children's Depression Inventory permission

Access to tool was only possible upon payment-Invoices available

Health Related Behaviour Questionnaire permission

Hi [redacted]
Agreement for [HRBQ] arrived this morning, thanks.
We are obliged to charge VAT - as a charity, I guess you don't get to claim this back.
Have you come across this before?
1000 Euros will be fine although if we could add the VAT on top of this it would be better from our point of view.
Year 2 questionnaire attached

Best wishes
Angela Balding

Survey Manager at the Schools Health Education Unit (SHEU)

angela.balding@sheu.org.uk

Appendix 7: Survey booklet including the demographic questions, Kidscreen 27, Health Related Behaviour Questionnaire (HRBQ), Children's Depression Inventory (CDI-S)

ID Number……

Some tips to begin!

- Here are some questions for you to answer on your own.
- If any questions are unclear, ask the Healthy Schools team for help.

- *Your class teachers and friends will NOT find out what your answers are. Don't look at anyone else's answers and keep your answers private.
- We are interested in your honest answers. If any problems come up for you about your health we will talk to you and your family about this at another time.

❖ When you have answered all of the questions watch us put this booklet in the large envelope. We will then take it away from the school.

1. I am a …..

Boy ○ Girl ○

2(a) Age ……. Years

2(b) If you know, write down your date of birth:

Date____ (e.g.24th) **Month**_____ (e.g. June) **Year**_____ (e.g. 2001)

3. Who do you live with? *tick all the people who are in your home*

Mother ○	Brother(s) ○	Grandmother ○
Father ○	Stepbrother(s) ○	Grandfather ○
Stepmother ○	Sister(s) ○	Other adult relative_____
Stepfather ○	Stepsister(s) ○	
Foster parent ○		

4 (a) How many brothers do you have? (include your stepbrothers)

Place the number in the circle (0,1,2….) ○

4 (b) How many sisters do you have? (include your stepsisters)

Place the number in the circle (0,1,2….) ○

5. If you have brothers and sisters, how many are older than you?

Place the number in the circle (0,1,2….) ○

7. Do you have a medical condition (like diabetes, asthma, eczema etc.) that has been treated by a doctor? (*Please tick one circle)*

Yes ○ No ○ I Don't Know ○

If Yes, what is it? ……..

Physical Activities and Health

Tick one box

In general, how would you say your health is?

1.

- ○ excellent
- ○ very good
- ○ good
- ○ fair
- ○ poor

For all the questions please tick one box on every line

Thinking about the last week...

	not at all	a little	a fair amount	very	All the time
2 Have you felt fit and well?	○	○	○	○	○
3. Have you been physically active (e.g. running, climbing, cycling)?	○	○	○	○	○
4 Have you been able to run well?	○	○	○	○	○

Thinking about the last week...

	never	sometimes	quite often	very often	always
5. Have you felt full of energy?	○	○	○	○	○

2. General Mood and Feelings about Yourself

Thinking about the last week...

	not at all	a little	a fair amount	very	All the time
1. Has your life been enjoyable?	○	○	○	○	○

Thinking about the last week...	never	sometimes	quite often	very often	always
2. Have you been in a good mood?	○	○	○	○	○
3. Have you had fun?	○	○	○	○	○

Thinking about the last week...	never	sometimes	quite often	very often	always
4. Have you felt sad?	○	○	○	○	○
5. Have you felt so bad that you didn't want to do anything?	○	○	○	○	○
6. Have you felt lonely?	○	○	○	○	○
7. Have you been happy with the way you are?	○	○	○	○	○

3. Family and Free Time

Thinking about the last week...	never	sometimes	quite often	very often	always
1. Have you had enough time for yourself?	○	○	○	○	○
2. Have you been able to do the things that you want to do in your free time?	○	○	○	○	○
3. Have your parent(s) had enough time for you?	○	○	○	○	○
4. Have your parent(s) treated you fairly?	○	○	○	○	○

	never	sometimes	quite often	very often	always
5. Have you been able talk to your parent(s) when you wanted to?	○	○	○	○	○
6. Have you had enough money to do the same things as your friends?	○	○	○	○	○
 7. Have you had enough money for things you need to buy?	○	○	○	○	○

4. Friends

Thinking about the last week...

	never	sometimes	quite often	very often	always
1. Have you spent time with your friends?	○	○	○	○	○
2. Have you had fun with your friends?	○	○	○	○	○
3. Have you and your friends helped each other?	○	○	○	○	○
4. Have you been able to rely on your friends? (rely = have your friends been there for you when you needed them?)	○	○	○	○	○

5. School and Learning

Thinking about the last week...

	not at all	a little	a fair amount	very	All the time
1. Have you been happy at school?	○	○	○	○	○
2. Have you got on well at school?	○	○	○	○	○

Thinking about the last week...

	never	sometimes	quite often	very often	always
3. Have you been able to pay attention?	○	○	○	○	○
4. Have you got along well with your teachers?	○	○	○	○	○

These questions are about Food

1 How important do you think it is to eat healthy food?

Not at all important	A little important	Fairly important	Very important
○	○	○	○

2 Which sentence describes you best?

I would like to put on weight . . . . . ?

I would like to lose weight . . . . . ?

I am happy with my weight as it is . . . . . ?

3 How many pieces of fruit or vegetables do you eat on a normal day? (e.g. an apple or some carrots)

Put number in box(e.g., 1,2,3…) ☐

Tip: One portion = 1 piece of fruit or some veg or salad with dinner.
Potatoes don't count when thinking about fruit and vegetables

4a Did you eat or drink anything before school this morning?

Tick more than one box if you need to ✓

No ..... ☐

Yes, something at home ..... ☐

Yes, something on the way to school.....	☐
Yes, something at school	☐

Skip this question if you answered NO above

4b If you did eat breakfast, ***What*** did you eat or drink this morning?(e.g. cereal, toast, juice, tea, sweets)

(*Please write in the box*)

5 How often do you eat or drink any of the following?

Meat	never ○	sometimes ○	most days ○
Fish	never ○	sometimes ○	most days ○
Any of **Milk/Yogurt/Cheese**	never ○	sometimes ○	most days ○
Brown bread	never ○	sometimes ○	most days ○
Any of **Potatoes/Rice/Pasta**	never ○	sometimes ○	most days ○
Cereal	never ○	sometimes ○	quite often ○
Fruit or Vegetables	never ○	sometimes ○	quite often ○
Fizzy drinks	never ○	sometimes ○	most days ○
Water	never ○	sometimes ○	most days ○
Crisps	never ○	sometimes ○	most days ○
Sweets/Chocolate	never ○	sometimes ○	most days ○

6 How much do you enjoy exercise? (like running and jumping)

Not at all	A little	A lot
○	○	○

7 How important do you think it is to be fit?
(i.e. able to do exercise without going out of breath)

Not at all important	A little important	Fairly important	Very important
○	○	○	○

8 How often do you play or do any of these things <u>outside school</u>?(in your own time or in a club)

	never	1-2 days a week	3 or more days a week
Riding your bike	○	○	○
Running (races or games)	○	○	○
Dancing/gymnastics	○	○	○
Going on walks with someone	○	○	○
Swimming	○	○	○
Playing computer fitness games (like Wii fit)	○	○	○
Playing other computer games	○	○	○
Watching TV/DVDs	○	○	○
Playing with your friends	○	○	○
Playing a sport	○	○	○
Reading a story book	○	○	○
Doing Homework	○	○	○
Extra lessons you go to Write here what the lessons are _____	○	○	○

	never	1-2 days a week	3 or more days a week
Go to a minder after school write below who your minder is _____	○	○	○
Doing something else outside school Write here _____	○	○	○

9a This question is about alcohol, tick the box that is true for you (WHOLE DRINKS like beer and wine, NOT JUST A SIP)

I have drank alcohol	Never	One or two times ***ever***	Sometimes (e.g special occasions)	Once or twice a week	I don't know
	○	○	○	○	○

If you have never drunk alcohol, go to Question ☎ 10a


9b If you have ever drunk alcohol, please write the names(s) of the drink(s) in the box below.

☎ 

If you have never smoked a cigarette, go to Question ■ 10c*. Otherwise, please go to Question* ● 10b *below.*

Yes	No
○	○

● **10b How many cigarettes did you smoke <u>in the last 7 days</u>**

Write number here ⇨ ☐

■ 10c Do you think that you will smoke when you are older?

No	Maybe	Yes
○	○	○

11 Have any of the people below told you what illegal drugs are?(*illegal means drugs that are not used as medicines*)

	Yes	No	Don't know
Parents	○	○	○
Teachers in school lessons	○	○	○
School nurse (if there is one)	○	○	○
Visitors in school lessons	○	○	○
Friends	○	○	○
Brothers or sisters	○	○	○
Other close family member (e.g. grandparents, aunt, cousin) *Write who* _____	○	○	○

12 Do you know anybody who uses drugs (not as medicines)?

Yes ○ No ○ Don't know ○

13 Have you ever been offered illegal drugs?

Yes ○ No ○ Don't know ○

14. How harmful do you think these are:

	Not at all harmful	A little harmful	Fairly harmful	Very harmful	Don't know
Alcohol	○	○	○	○	○
Smoking cigarettes	○	○	○	○	○
Illegal drugs	○	○	○	○	○

These questions are about Travel

● 15 How do you *usually* get to school. *(tick more than one if needed)*

Car	School bus	Walking	Bicycle	Ordinary bus	Taxi	Other_____
○	○	○	○	○	○	○

♥ 16 Have you got a bike?

Yes	No
○	○

♦ 17 If you have a bike do you wear a safety helmet when cycling?

Never	Sometimes	Always	I don't have a bike
○	○	○	○

♦ 18 Do you wear a seatbelt when in the car?

Never	Sometimes	Always
○	○	○

Thinking about the last 2 questions.....

19 How important do you think it is to stay safe?
(e.g. when crossing the road and not talking to strangers etc..)

Not at all important	A little important	Fairly important	Very important
○	○	○	○

☻ 20 Do you wash your hands after going to the toilet?

Never	Sometimes	Always
○	○	○

♥ 21 How many times a day do you clean your teeth?

0 times a day	1 time a day	2 times a day	3 times a day	More than 3 times a day
○	○	○	○	○

 22a In the last year, did you have an accident and had to go to a doctor or a hospital? (e.g. a broken bone, burn …)

Yes	No	Don't know
○	○	○

22b. If yes, what happened_____

 **23 Do you feel safe in the area where you live?**

Always	Sometimes	Never	Don't know
○	○	○	○

■ **24 Do you think where you live is a good place to live?**

Yes, it's really good	It's OK	No. it's not good	Don't know
○	○	○	○

☎25 How often *do you worry* about the problems listed below?

Schoolwork	never ○	Sometimes ○	A lot ○
Tests	never ○	Sometimes ○	A lot ○
Health problems	never ○	Sometimes ○	A lot ○
Friend problems	never ○	Sometimes ○	A lot ○
Family problems	never ○	Sometimes ○	A lot ○
The way I look	never ○	Sometimes ○	A lot ○
Not having enough money	never ○	Sometimes ○	A lot ○
Crime	never ○	Sometimes ○	A lot ○
Anything else you want to add? _____	never ○	Sometimes ○	A lot ○

26 If you were feeling worried or sad about the things below, who is the first person you would talk to about it?

School Problem	Mum/Dad ○	Sister/Brother ○	Friend ○	Teacher ○	Keep it to myself ○	Other adult , who_____ ○
Family Problem	Mum/Dad ○	Sister/Brother ○	Friend ○	Teacher ○	Keep it to myself ○	Other adult , who_____ ○
Health Problem	Mum/Dad ○	Sister/Brother ○	Friend ○	Teacher ○	Keep it to myself ○	Other adult , who_____ ○

Problem with friends	Mum/Dad ○	Sister/Brother ○	Friend ○	Teacher ○	Keep it to myself ○	Other adult, who_____ ○
Bullying problem ***in*** school	Mum/Dad ○	Sister/Brother ○	Friend ○	Teacher ○	Keep it to myself ○	Other adult, who_____ ○
Bullying problem ***outside*** school	Mum/Dad ○	Sister/Brother ○	Friend ○	Teacher ○	Keep it to myself ○	Other adult, who_____ ○

27a Have you been bullied at or near school in the last year?

Yes	No	Don't know
○	○	○

27b Have any of the following happened to you in this school year?

Been teased or made fun of	never ○	Sometimes ○	Always ○
Called nasty names	never ○	Sometimes ○	Always ○
Bullied through my mobile phone	never ○	Sometimes ○	Always ○
Bullied through email/internet	never ○	Sometimes ○	Always ○
Pushed/hit for no reason	never ○	Sometimes ○	Always ○
Had belongings taken/broken	never ○	Sometimes ○	Always ○
Been threatened (scared by someone) for no reason	never ○	Sometimes ○	Always ○
Been asked for money	never ○	Sometimes ○	Always ○
Been ganged-up on	never ○	Sometimes ○	Always ○
Any other reason? (write below) _____	never ○	Sometimes ○	Always ○

If you ticked 'never' to all, go to Question ☻29. Otherwise, please go to Question ♥28 below.

♥28 Do you think you are being 'picked on' or bullied for any of the following reasons?

Your size or weight	Yes ○	No ○
The way you look	Yes ○	No ○
The clothes you wear	Yes ○	No ○
Your family background/skin colour/religion	Yes ○	No ○
A illness or disability	Yes ○	No ○

29 Do you think your school tries to stop bullying?

Yes	No	Don't know
○	○	○

These Questions are about ENJOYING and ACHIEVING

30 During school break times, do you spend time doing the following?

Chatting/talking with friends	never ○	Sometimes ○	Often ○
Playing running skipping games (e.g. football)	never ○	Sometimes ○	Often ○

Doing something else? *Write here*_____	never	Sometimes	Often
	○	○	○

31 Please think about each of these sentences and say if you agree with them or not?

	Yes	No	Not sure
The rules in this school are fair	○	○	○
Our school is a nice place to be	○	○	○
I feel I belong at this school	○	○	○
Teachers listen to me	○	○	○
When I need extra help, I get it	○	○	○
Our teachers treat us all the same	○	○	○
My school work is corrected so I can see how to do better	○	○	○
I get praised (told I've done well) for working hard in school	○	○	○

Pick out the sentences that describe you best in the (ONLY ONE)

PAST TWO WEEKS

Item 1

- I am sad once in a while
- I am sad many times
- I am sad all the times

Item 2

- Nothing will ever work out for me
- I am not sure if things will work out for me
- Things will work out for me OK

Item 3

- I do most things OK
- I do many things wrong
- I do everything wrong

Item 4

- I hate myself
- I do not like myself
- I like myself

Item 5

- I feel like crying everyday
- I feel like crying many days
- I feel like crying once in a while

Item 6

- Things bother me all the time
- Things bother me many times
- Things bother me once in a while

Item 7

- I look OK
- There are some bad things about my look
- I look ugly

Item 8

- I do not feel alone
- I feel along many time
- I feel alone all the time

Item 9

- I have plenty of friends
- I have some friends but I wish I had more
- I do not have any friends

Item 10

- Nobody really loves me
- I am not sure if anybody loves me
- I am sure somebody loves me

We are nearly there
Go on the next page to draw a picture……

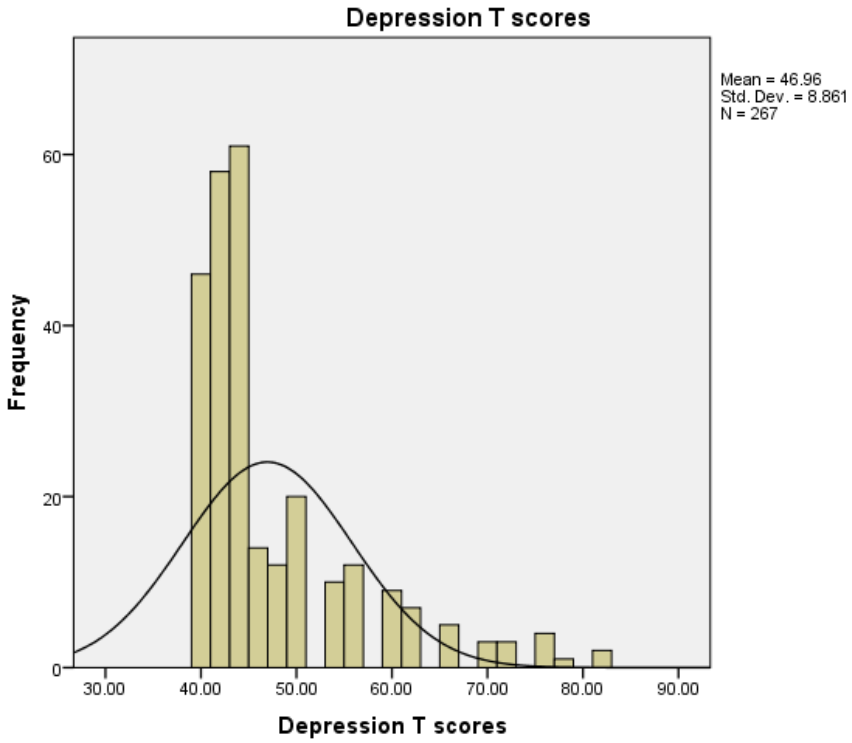
Draw a picture of your family life…

THE END!

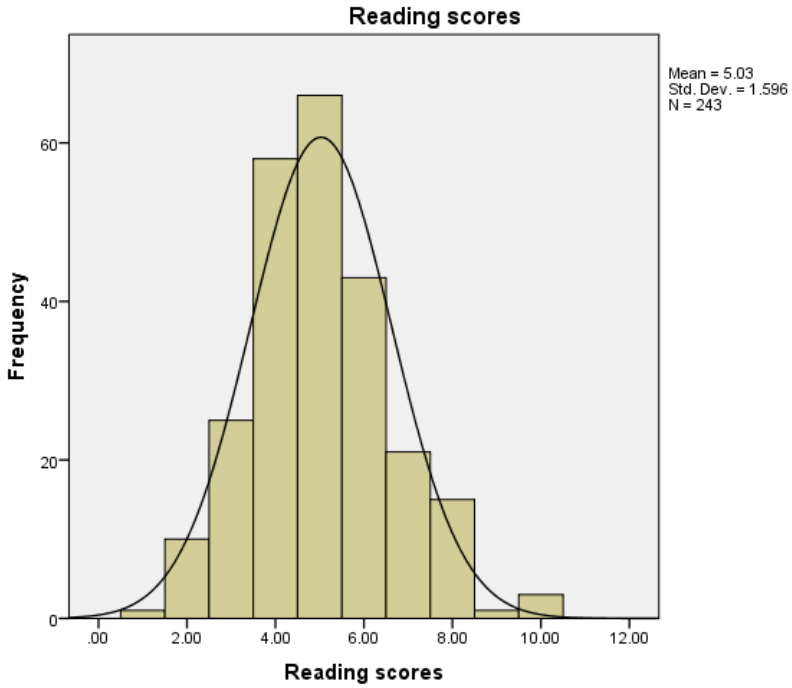
Thank you for completing this questionnaire!

Please put up your hand to let us know you've finished

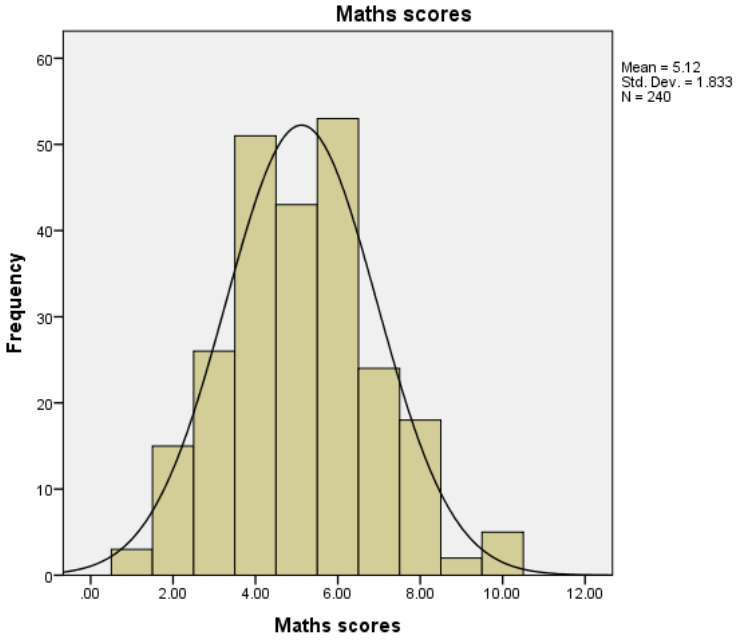
Appendix 8: Normality tests and results for depression, reading and maths performance



As shown in the figure above the data is not normally distributed. Depression data is positively skewed with a skewness of 1.784 (SE = .149) and kurtosis of 2.810 (SE = .297). The z scores for skewness (11.97) and kurtosis (9.46) were outside the range of ±2.58, i.e. exceeded a significance of 0.01. Normality was also assessed based on Shapiro-Wilk test, and a *p* value of less than .001 was reported, indicating a violation of the assumption.



According to the histogram above, the data appears somewhat normally distributed. However, this data is not normally distributed as indicated by skewness z score of 2.69. The actual skewness score is .420 (SE = .156) and kurtosis score is .352 (SE = 1.13). The z scores for skewness (2.69) exceeded the range of ±2.58, i.e. exceeded the significance of 0.01. The kurtosis z score (1.43) was within the range of ±2.58. Based on the Shapiro-Wilk test, the normality assumption is violated, reporting a *p* value of less than .001



The figure indicates that the scores for maths are not normally distributed. The skewness score for maths reading score is .328 (SE = .157) and kurtosis score is -.089 (SE = .313). The z scores for kurtosis (-2.84) exceeded the range of ±2.58, i.e. exceeded the significance of 0.01. The skewness z score (1.31) was within the range of ±2.58. Based on the Shapiro-Wilk test, the normality assumption is violated, reporting a *p* value of less than .001