An Evaluation of Family Engagement with a Family-Based Paediatric Obesity Intervention Programme

By

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Dedication

This thesis is dedicated to my beloved sister, Dr Nada Abuouf Hammed who died before this thesis complete, a very few weeks after obtaining her PhD in 'Early Childhood Education', from the University of Glasgow. Her thesis was described as outstanding work by her examiners and her faculty post-grad committee. Her performance and determination were an inspiration to me in pursuit of academic excellence; her ethos of hard-work and perseverance propelled me to continue and complete this study. She spurred me on in my hours of darkness, and had faith in me even when I doubted. I also dedicate this thesis to my wonderful family, whose practical and emotional support through life's ups and downs enabled me to complete my thesis. Particularly my loving parents, first my Dad Prof. Mohammed Abuouf Hammed he obtained his Msc and PhD before '40 years' ago from Glasgow university, and he strongly encouraged me to conduct my postgraduate study. My enormous thanks to my beloved wonderful Mum Ms Munira Daoud who always overwhelmed me with her warm, honest and unconditional great love and support. My great and faithful thanks goes to my precious young sister, Dr Nouran Abuouf Hammed, who helped me to stand again on my feet after our sister Nada's death. Finally, I dedicate my thesis to everyone who suffer from weight problem and to my patients (Parents & Children), past, present and future who make my working life so fulfilling and meaningful

Abstract

Background: Childhood obesity is prevalent in Scotland, however recent evidence from the National Child Measurment Programme suggests that the trend for rising prevalence of childhood obesity is now stabilising. The costs to society in lowered productivity are high, and there is a severe impact to health services as a result of the complex, lifelong health consequences for individuals. Research has indicated that causes are complex and multi-factorial. Treatment programmes worldwide have struggled to establish the most effective programme structure, and issues with attrition have predominated. The effectiveness of family-based weight management programmes which target lifestyle behavioural change to treat childhood obesity remains particularly an issue. This is due to estimated attrition rates ranging from 27–90% internationally. Previous studies have consistently reported the following as predictors: child age; child psychosocial status; parental BMI; parental psychosocial status; the family dynamic; coaches knowledge, attitude, and skills; and programme logistical factors and ethnicity. A minority have indicated an association between attrition and child BMI. Limited research has focused on gender, SES, child/parent motivation; child/parent recognition; parent concern; parental feeding style; parental expectations or programme structure and content. Factors explored in this study were examined within the context of The Ecological Theory (Davidson & Birch, 2001), emphasizing the multi-factorial risk factors leading to childhood obesity, and were related to the child, family, and community characteristics respectively.

Aims: This study aims to develop a better understanding of family and treatment programme characteristics associated with attrition in a family-based, lifestyle-behavioural group weight management intervention, which includes healthy eating and physical activity, for obese children aged 5–18 years across various Community Health Partnerships in Greater Glasgow & Clyde in Scotland in 2009–2013.

Methodology: This was a longitudinal quantitative study which considered data collected from overweight/obese children aged 5–18 years (BMI z score 91–99.9 centile) and their parents from 2009 –2013 (n=761). For the follow-up evaluation, n=275 from this total sample were involved. After ethical approval was obtained from the NHS Ethical Approval Committee in October 2011, three studies were conducted: 1) An analysis of the routinely collected child baseline data, which was extracted from the Health Service database (n=580); 2) a parental self-report baseline entry survey (n=181); and, 3) a follow-up exit survey evaluating satisfaction levels and perceived barriers associated with the programme reported by parents (n=275).

Results: Characteristics focusing on the child found that child age is a positive predictor of attrition only in the routine analysis study. The older the child the greater the risk of drop-out (OR=0.54 CI 95 0.33-1.88; p-value=0.014). Children aged 13–18 years, were more likely to drop-out. In the second study, the only child characteristic found to be associated with attrition was psychosocial status, considering the total score (SDQ; p-value=0.029) and the emotional domain score (SDQ; p-value=0.042). None of those variables which explored parental characteristics in the second study, the baseline 'Entry survey', were found to be associated with attrition.

From a programme (community) perspective identified in the logistic model in applied to the routine study data, syggest that attrition was significantly less likely in some locations, i.e. Renfrewshire (OR=0.59, CI 95 0.37-0.94; p-value=0.027) and Dumbartonshire (OR=0.53, CI 95 0.28-0.97; p-value=0.042), compared to Glasgow areas. The third study in this research, which explored programme characteristics, satisfaction levels and perceived barriers, concurred with the first study that the cohort impacted on attrition. Both found that earlier years of the programme had higher attrition than the later years in their respective multivariate adjusted logistic regression model (p-value<0.001 and p-value<0.05, respectively). Analysis of parental perceived barriers identified child psychosocial perception (p-value<0.001) and programmatic logistical factors (p-value<0.05) relatively as predictors of attrition.

Conclusions: The longer the programme ran, the higher were programme satisfaction levels, parental ratings and retention rates. With time, the programme increasingly recruited heavier and heavier children, and was successfully recruiting the target deprived population. This occurred as the programme improved to better meet the needs of the family group. This time trend was a much stronger predictor than any child or family characteristic. Thus, family engagement can be increased by improving programme delivery.

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Within Saudi Arabia, the Saudi Arabian government has been the principal sponsors of my doctorate, and for this I am truly grateful to the 'Higher Ministry of Education'. I am also grateful to my very honest and true friends Dr. Jude Eze and Mr Salah Barnawi for their honest support and encourgement as their belief on me helped me to get through all the obstacles and difficulties which I faced during my study journy. Also, my faithful thanks go to all friends specially my very best friend Miss Sana Rahaman for her wonderful support and my colleagues for their overall help and for any beneficial suggestions they have me in over our informal discussions.

Finally, yet importantly, special thanks and appreciation are due to my family who have stood beside me, tolerantly sharingthe ups and downs of my studies, and providing endless encouragement, support, and patience throughout my studies.

I initially came to Glasgow to study for my doctorate, but undertaking the PhD was just a small part of the experience of finding another culture and way of life. These past few years have given me the chance to develop in so many more ways than just academically; I thank everyone who has contributed to that development.

Author Declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature: _____

Printed Name: _____

Abstracts and Presentations

1. Hammed S. Attrition in Paediatric Weight Management Programme. The Saudi 5th International Conference, July 2011, Warwick University, UK.

2. Hammed S. Assessing Engagemnt With A Childhood Obesity Family Based Intervention Programme; Scotland, The 7th Saudi Scientific Conference, 1-2 February, 2014, Edinburgh, Scotland, UK.

3. Hammed s, Wright C, Morrison D. Why Do Families Drop out Of Obesity Treatment Programme? Programme Factors May Be More Important Than Family Factors. The 21st European Congress on Obesity Conference, 28-31 May, 2014, Sofia, Bulgaria.

4. Hammed S, Wright C, David M. NHS Family-based Paediatric Weight Management Programme: How To Improve Retention? The Royal College of Paediatrics and Child Health Annual Conference - RCOCH, 8-10 April, 2014, Birmingham, UK.

5. Hammed S. How To Improve the Outcomes of Multi-component Obesity Weight Management Programme for Children: A Community Based Intervention. The 1st Pediatrics International Saudi Conference on Childhood Obesity, 26-28 April, 2014, Jeddah, Saudi Arabia.

6. Hammed S, Wright C, Morrison D. Will They Come and Will They Stay? Uptake and Attrition Over Time In The ACES Childhood Obesity Programme. The Faculty Of Public Health Annual Conferences, 5-6 November, 2015, UK

List of Abbreviations

ACES:	Active Children Eating Smart
BASC:	Behaviour Assessment System for Children
BMI:	Body Mass Indexes
CBCL:	Child Behavioural Checklist
CBIS:	Child Body Image Test
CBT:	Cognitive Behavioural Therapy
CDC:	Centre for Disease Control
CFQ:	Child Feeding Score
EST:	Ecological System Theory
FACES:	Family Adaptability and Cohesion Evaluation Scales
GG & C:	Greater Glasgow and Clyde
GP	General Practitioner
HEAT:	Health, Effectiveness, Access to Services and Treatment
HRQL:	Health-related Quality of Life
IOTF:	International Obesity Task Force
FWMP:	Multidisciplinary Family-based Weight Management Programme

MEND	Mind Exercise Nutrition Do it
NCMP:	National Child Measurment Programme
NHS:	National Health Service
PedsQL:	Paediatric Quality of Life
QoL:	Quality of Life
SDQ:	Strengths and Difficulties Questionnaire
sd:	Standard Deviation
SCOTT	Scottish Chidhood Obesity Treatment
SDS:	Standard Deviation Scores
SES:	Socio-Economic Status
SIMD	Scottish Index of Multiple Deprivations
SMART:	Specific MeasurableAchievableRelevant Timescale
SPPA:	Self Perception Profile for Adolescents
SPPC:	Self-Perception Profile for Children
USDHHS:	United States Department of Health and Human Services
WHO:	World Health Organisation

Chapter 1. Introduction to the Research

1.1 Introduction

This thesis is largely drawn from an analysis of data obtained from the family-based community weight management programme Active Children Eating Smart (ACES); this programme aims to deliver and promote healthy eating and physical activity lifestyle change for children resident in greater Glasgow aged 5-18 years old. The current chapter will define the problem of childhood obesity, its impact and its causes. It reviews the current literature on the varying factors that impact on childhood obesity itself, treatment programmes, as well as attrition in paediatric treatment programmes. The review aims to contextualise the diverse nature of treatment programmes and seeks to identify the multiple barriers and possible solutions that programme designers have proposed. The EST conceptual model that is used to analyse the complex multi-variant causes of childhood obesity will also be described.

1.2 Statement of the Problem

Attrition is a major problem for weight management programmes. A common phenomenon in paediatric and adult weight management programmes, it is a major cause of obesity treatment failure and can serve as an index of programme quality. Thus, the effectiveness of any weight management programme can be measured by its ability to retain participants throughout the course of the programme. The greater the number of treatment sessions attended by participants, the greater the likelihood of their attaining the programmes' desired outcomes. In this study, the main sign of the success of the ACES programme is considered to be its ability to retain participants. Of course, the effectiveness of a weight management programme should primarily be assessed by the weight loss achieved by participants. This is an optimal outcome as it gives an indication of the effectiveness of the programme at reducing the weights of the participants. Due to the scale of the attrition problem and the lack of research providing answers, there is an immediate need for programmes to continue to investigate ways to develop and tailor interventions that are more effective. This thesis intends to study ACES' attrition level, and factors associated with it, in order to provide lessons learnt that should inform future weight management programmes in Scotland.

There is limited information on family decisions regarding their discontinuation of weight management programmes that treat overweight and obese children. A recent review explored attrition in paediatric weight management care, reporting attrition rates ranging from 27% to 73% (Skelton & Beech, 2011). A variety of predictors of attrition were identified, including: ethnicity, socio-economic status (SES), degree of obesity, and psychosocial and behavioural stressors, with inconsistent findings across studies. In this review, Skelton and Beech (2011) reported physical barriers (e.g. scheduling issues, transportation, distance, conflict with work and school, not meeting needs and expectations of families) as main reasons for discontinuing care. Similarly, another review of the determinants of attrition from adult weight management programmes (Moroshko *et al.*, 2011) reported inconsistent results. However, from this adult data, psychological and behavioural patient factors (e.g. poorer mental health, lower levels of physical activity, etc.) were more commonly associated with drop-out than the background characteristics of the adult (e.g. age, sex, etc.). It is well known that an adult's psycho-social, SES and weight status are relevant factors of attrition in child weight management programmmes (see section 1.9.2). As many factors predictive of attrition may be modifiable (and potentially preventable), there is an urgent need to determine predictors that may identify families at risk of attrition. Additionally, it is critical to develop a thorough understanding of family characteristics, and so identify their perceived barriers, and thus their reasons for drop-out. Due to the scale of the attrition problem and the lack of research providing answers, there is an immediate need for programmes to continue to investigate ways to develop and tailor interventions that are more effective. When the reasons for children discontinuing programmes are better understood, paediatric weight management programmes can promote interventions that will improve retention (Cote *et al*., 2004; Honas *et al*., 2003).

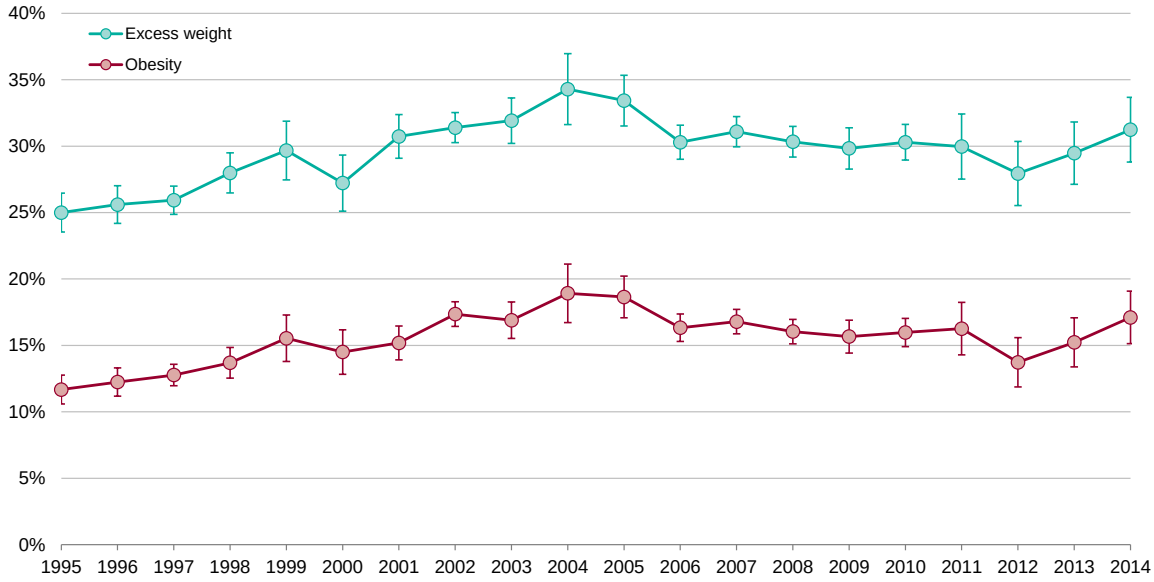
Therefore, the issue is to determine what can be done to reduce drop-out, and whether the emphasis should be in the selection stage or elsewhere, such as the setting or type of treatment. Littell *et al*. (2001) determined that research must go beyond the participant selection process and participant characteristics. They argue that evaluation must look to how the treatment programme itself, and those who run it, impact on participant engagement and thus affect attrition. So, it is worthwhile to examine the duration, and severity of participant obesity to determine their impact on participant engagement and attrition in the programme, and to relate these factors to the appropriacy of the setting or

type of treatment. However, factors beyond this to be considered within the treatment programme are treatment type, content, setting, and the level of participant choice (Littell *et al*., 2001). Thus, research requires a definition of the term 'attrition', along with an examination of a wide range of factors at the participant level, in terms of both child and family, the clinicians, relationships and treatment itself (Littell *et al*., 2001) to provide a more holistic approach to analysing the problem of attrition.

1.3 Background: Epidemic of Childhood Obesity

The rapid growth and flourishing of the prevalence of childhood obesity has become an alarming scenario for public health agencies, health-care clinicians, health-care researchers, and the general public (Ebbeling *et al*., 2001; Barlow *et al*., 2007). This problem exists within all age groups, most ethnic groups, and all socioeconomic strata, although primarily the poor in developed countries (Bundred *et al.*, 2001; Strauss & Pollack, 2001). The scale of the problem of childhood obesity is large and persistent. The World Health Organization reports that if current trends continue, 70 million children will be affected globally by 2025 and it is predicted that this will jump to 9.2% (95% CI: 7.3%, 10.9%) or 60m by 2020 (WHO, 2011). In England, recent evidence from the Health Survey for England and the National Child Measurment Programme suggests that the trend for rising prevalence of childhood obesity is now stabilising. Figure (1-0) demonstrates the situation in Scotland.

Figure 1-0: Trend in the prevalence of obesity and excess weight Children aged 2-15 years; Health Survey for England 1995-2014



Levels of obesity peaked in 2004-5 and then levelled out, even declining in recent years for younger children, though absolute levels remain high. There is still some way to go to achieve the government's target of a sustained downward trend in childhood overweightness and obesity by 2020. With regard to the prevalence of obesity in children aged 2 to 15 in Scotland, this rose from 14.3 per cent to 16.6 per cent between 1998 and 2008 but has remained stable since then (16.0 per cent in 2013). The prevalence of overweight, including obese, children of 2 to 15 year olds rose from 29.1 per cent in 1998 to 32.8 per cent in 2008 but has fluctuated since then and is showing a reduction in 2013 (28.8 per cent) (see Table 1)**.** However, further years' data is required to see if this is the start of a decline (NCMP, 2014/5).

Table 1-1: Prevalence of underweight, healthy weight, overweight and obese children, by NCMP collection year

	BMI Category											
	Underweight			Healthy Weight			Overweight			Obese		
NCMP collection year	**Prevalence**	Lower CI	Upper CI	**Prevalence**	Lower CI	Upper CI	**Prevalence**	Lower CI	Upper CI	**Prevalence**	Lower CI	Upper CI
Reception												
2006/07	***1.3***	*1.2*	*1.3*	***75.8***	*75.7*	*75.9*	***13.0***	*12.9*	*13.1*	***9.9***	*9.8*	*10.0*
2007/08	***1.3***	*1.2*	*1.3*	***76.2***	*76.0*	*76.3*	***13.0***	*12.9*	*13.1*	***9.6***	*9.6*	*9.7*
2008/09	***1.0***	*1.0*	*1.0*	***76.2***	*76.1*	*76.3*	***13.2***	*13.1*	*13.3*	***9.6***	*9.5*	*9.7*
2009/10	***0.9***	*0.9*	*1.0*	***76.0***	*75.9*	*76.1*	***13.3***	*13.2*	*13.4*	***9.8***	*9.7*	*9.9*
2010/11	***1.0***	*0.9*	*1.0*	***76.4***	*76.3*	*76.5*	***13.2***	*13.1*	*13.3*	***9.4***	*9.4*	*9.5*
2011/12	***0.9***	*0.9*	*0.9*	***76.5***	*76.4*	*76.6*	***13.1***	*13.0*	*13.2*	***9.5***	*9.4*	*9.6*
2012/13	***0.9***	*0.9*	*0.9*	***76.9***	*76.8*	*77.0*	***13.0***	*12.9*	*13.1*	***9.3***	*9.2*	*9.3*
2013/14	***0.9***	*0.9*	*1.0*	***76.5***	*76.4*	*76.6*	***13.1***	*13.0*	*13.1*	***9.5***	*9.4*	*9.6*
2014/15	***1.0***	*0.9*	*1.0*	***77.2***	*77.0*	*77.3*	***12.8***	*12.7*	*12.9*	***9.1***	*9.0*	*9.2*

(Source: National Child Measurement Programme, 2015)

In addtition, it has been reported that when a mother is overweight/obese, she tends to have overweight/obese children (Scottish Government, 2012). Indeed, a child with one obese parent has a ≥3 times probability of themselves being obese (Birch & Fisher, 2000).

1.4 Causes of Obesity

The myriad multifaceted causes of obesity make treatment difficult. Ultimately, the key causes are the increasing energy content of present-day diets, reduced physical activity and increasing sedentary lifestyles (Ebbeling *et al*., 2002; James *et al*., 2004; Fisher *et al.*, 2005; Summerbell *et al.*, 2005). However, whilst physiological mechanisms help to maintain a balance between an individual's energy intake and the consumption of that energy intake (Ebbeling *et al.*, 2002), commonly in the developed world a complexity of environmental factors combine to promote a pattern of high volume energy intake (French *et al*., 2001) accompanied by low level energy consumption, resulting in obesity (Hill *et al.,* 2003). Despite this recent downward trend UK obesity rates are high (NCNP, 2014) and this is disturbing as it has health consequences starting in childhood and continuing to adulthood (Reilly *et al*., 2003; SIGN 69, 2003; Butland *et al*., 2007). For instance, paediatric obesity substantially raises the risk of subsequent morbidity among adults in the long term, mainly as a result of heart issues and diabetes mellitus (Dietz, 1998). In the

short term, it may lead to other weight-associated conditions commencing in childhood, including diabetes and sleep apnoea (Dean & Sellers, 2007; Lee, 2007; Stanley & Misra, 2008; Stevenson, 2008) as well as reduced quality of life (Schwimmer, 2003).

It also impacts on health-care costs. For instance, it is estimated that the annual direct cost of adult and child obesity in 2000 in the UK was $6.4 billion (Moziak *et al*., 2007), and estimated direct costs in Scotland £1.75 million in 2001(NHS National Services, Scotland, 2007; Keenan *et al*., 2011). In Scotland, when indirect costs of obesity and related diseases are included, an estimated £175 million was spent in 2001 alone (NHS National Services Scotland, 2007; Keenan *et al*., 2011). These costs arise in part due to increased risk and occurrence of chronic disorders such as diabetes; cardiovascular disease and liver disorders (Rudolf *et al*., 2006; Wang & Lobstein, 2006). Apart from the impact to the individual, families and health services, it also reduces the economic efficiency of the nation (McPherson *et al.*, 2007).

1.5 Factors Affecting Childhood Obesity

Factors affecting childhood obesity relate to diet, levels of physical activity and a sedentary lifestyle in combination. Childhood obesity is also linked to secondary genetic, socio-cultural and environmental factors (Ogden *et al.,* 2002). Child behaviour related to food patterns, exercise and sedentary lifestyle influence the extent to which the child is at risk of being overweight or obese (Davidson & Birch., 2001). For instance, children may be subject to unthinking eating, snacking and ongoing non-stop grazing (Matheson *et al*., 2004); or show a preference to watching TV in their bedroom (Dennison *et al.,* 2002); playing computer games or using the computer (Neilsen Media Research, 2000; Ebbeling *et al.,* 2002; Epstein *et al*., 2007) than to exercise. Such sedentary inactive lifestyles promote overweight and obesity. This tendency toward ‘at risk’ behaviour, is then modified by child characteristics, family characteristics, as well as school and community characteristics (Davidson & Birch, 2001). All of these factors need to be considered when developing a child obesity treatment programme (Ogden *et al.,* 2002).

1.5.1 *Child Characteristics*

The relationship between the child's food dietary pattern and their weight status is influenced by rate of growth, gender and the susceptibility to overweight/obesity within the family (Davidson & Birch, 2001). Some research (Perusse & Bouchard, 1999), for instance, has found that those predisposed to obesity may be more responsive to the impacts of excessive energy and fat intake in terms of weight status than those with no familial pattern (Davidson & Birch, 2001). The growth rates and spurts in growth which differ according to gender, may also impact on adolescents, their intake and its relationship to weight status (Davidson & Birch, 2001).

Age and gender influence the chances of the child taking part in sport and physical activity, which in turn differentially impact on health and fitness levels (Sallis *et al*., 2000). Not only is there a decrease in participation with age across both sexes (Antshel & Anderson, 1998), but also girls are less likely than boys at any age to participate (Goran *et al*., 1981). Indeed, Scottish children, like others in developed countries, have been found to often develop physically inactive lifestyles before they start school (Reilly *et al*., 2006).

Rates of sedentary behaviour have also been found to increase with age, although levels tend to be higher for girls compared to boys (Myers *et al*., 1996). This is especially so for TV viewing and may be the case as girls are less likely to balance this lifestyle choice with physical exercise (Davidson & Birch, 2001). Weekly TV viewing has been found to be positively significantly correlated with total child intake (Taras *et al.*, 1989); percentage of child fat intake (Zive *et al.*, 1998); and child requests for, followed by parent purchasing of, foods advertised on TV (Taras *et al.*, 1989). The latter tend to be unhealthy, high-calorie, low-nutritious food and snacks and fizzy drinks (Lewis, 1998).

Little research has explored child and adolescent recognition and concern about their own weight status. However, some research that has occurred suggests that self–recognition of weight issues by adolescents is often under-estimated (Goodman *et al*., 2000; Gillison *et al.*, 2006; Viner *et al.*, 2006; Maximova *et al*., 2008). No study to date has included targeted severely obese adolescents, nor targeted those severely obese teenagers initiating treatment. This self-recognition may be linked to both successful outcome and programme engagement (Zeller *et al*., 2010).

Adverse psychosocial and economic outcomes, such as poor educational attainment, lower self-image, depression, peer relationship issues, and low income have also been linked to obesity (Griffiths, 2006; Williams *et al*., 2010). It has also been suggested that there is an association between child behavioural difficulties and obesity. Vila *et al.,* (2004) discovered that up to 25% of obese children in their 2004 study showed signs of behavioural disorders. This includes children just entering school (echoed in research by Datar & Sturm, 2006), as well as those just entering their teens (Vila *et al.,* 2004).

1.5.2 *Parent and Family Characteristics*

Parents influence a child in their food habits and preferences, but also in their physical activity levels and lifestyle habits (Scaglioni *et al*., 2008). Unsurprisingly, therefore, there have been relationships found between parental and child food preferences (Borah-Giddens & Falciglia, 1993), and also between parental and child dietary patterns (Laskarzewski *et al.,* 1980; Patterson *et al*., 1999; Perusse *et al.,* 1988; Oliveria *et al.,* 1992; Vauthier *et al.,* 1996), which have been attributed to environmental influences rather than genetics (Davidson & Birch, 2001). Further, the child's food preferences and habits even until adulthood are modelled on parental feeding styles (Wills *et al*., 2005; Smith *et al*., 2010). This embraces control of foods and regularity, timing and sizes of the portions provided during the family meals (Birch *et al*., 2001). Parents, moreover, can also affect child behaviours around dietary intake itself as a consequence of parental levels of nutritional knowledge; the kinds of food made available at home; the modelling of their own eating behaviours; in addition to the pattern of family feeding behaviours (Davidson & Birch, 2001). For instance, parental lack of nutritional awareness may result in overfeeding through provision of larger portions, which is also related to higher child food intake (Rolls *et al.,* 2000).

Nutritional knowledge and awareness of related disease prevention are positively related to child fruit and vegetable consumption (Gibson *et al.,* 1998); and negatively related to the child's total energy consumption (Contento *et al.,* 1993). This nutritional knowledge and awareness of disease prevention will impact on parental choice to make such healthy food available, as opposed to cheaper unhealthy processed food with its high sugar and high carbohydrate content (Ebbeling *et al*., 2002). This informed parental choice of food availability also impacts on developing child food preferences (Birch & Marlin, 1982) and intake (Hearn *et al.,* 1998). A greater prevalence of childhood obesity has been found to

occur in deprived areas in Scotland (Lean *et al*., 2006; Luttikhuis *et al*., 2009) where family socioeconomic status (SES) has also been specifically shown to be significantly associated with childhood obesity (Wills *et al*., 2005; NHS National Services Scotland, 2007). It may be that a lack of play and recreational facilities or parks, shops providing fresh and healthy food options may play a role (Dunton *et al*., 2009). This could be compounded by absentee and /working parents, who are less available to the child for exercise and healthy cooking, as well as resultant unsupervised children who determine their own food habits. All of these behaviours contribute to the problem of childhood obesity (Hawkins *et al*., 2009a). Socioeconomic status is also linked to the types of food available to families in deprived areas (Wills *et al*., 2004). These are cheaper, thus more accessible, and longer-lived processed foods that have elevated calories but poor nutritional quality. This has worsened the trend towards obesity (Kantor, 1999), especially for those from lower socio-economic backgrounds who are not only accessing such unhealthy foods, but also consequently developing preferences for them (Moziak *et al*., 2007; NHS National Services Scotland, 2007; Keenan *et al*., 2011).

Parental perceptions of what constitutes a healthy child are also associated with SES (Baughcum *et al.,* 1998). Indeed, research indicates that mothers from a lower SES are more likely to perceive a fat baby as healthy, and a thin baby as evidence of parental neglect (Baughcum *et al.,* 1998). Thus, if the parent cannot perceive that the child's weight status is of concern, it may act as a barrier to change (Rhee *et al*., 2005).

Further, parents can reinforce eating behaviours, as they act as role models and as a result of learned behaviour children tend to like what they see their parents like (Birch & Marlin, 1982). This also applies to behaviour (Davidson & Birch, 2001). For example, evidence indicates that an overweight parent is prone to give high energy dense snacks (Sherman *et al.*, 1992), and that children with overweight mothers tend to consume more fat in a meal than children with normal weight status mothers (Nguyen *et al.*, 1996). Indeed, one UK study revealed that while factors related to low SES areas demonstrated few direct associations with the weight status of a 3-year-old, nevertheless the child's weight was related to maternal overweight (Hawkins *et al.,*2009e). Parents, particularly mothers, who are either overweight or obese tend to have overweight or obese children (The Scottish Government, 2012), and the pattern can become intergenerational (Davidson & Birch, 2001). This reflects an inherited predisposition to increased weight or common

environmental factors influencing weight, and so makes it a major risk factor for childhood obesity (Birch & Fisher, 2000; Epstein *et al.*, 2001). This pattern suggests the need to target the whole family in the intervention, and suggests the inadequacy of treating the child in isolation.

There is also evidence that the child may ignore its normal hunger signals and increase intake as a mechanism for compensating for emotional distress (Davidson & Birch, 2001). This mechanism also occurs in response to excessive, if well-intentioned, parental control, which tends to occur more commonly amongst overweight parents as they have emotional investment in the child's weight status (Davidson & Birch, 2001). Indeed, parental dietary restriction has been linked to higher fat consumption by the child when outside of the restriction (Zive *et al.*, 1998), suggesting that the child resorts to unhealthy eating when outside of direct parental supervision. It also has been linked to elevated child weight status (Fisher & Birch, 1999), suggesting that parents do tend to restrict their child's diet when they recognise and are concerned about their child's weight status. Parental control of diet, ironically, has been found to increase child preference and intake of unhealthy high-energy foods (Klesges *et al*., 1986; Koivisto *et al.*, 1994; Fischer & Birch, 1999). At the same time, the use of such foods as parental reward of children for desired behaviours or goal achievement has also been found to promote preference and intake of these unhealthy food (Birch *et al*., 1980). Equally, those parents who encourage their child to eat may also inadvertently be adding to the development of a child weight issue (Koivisto *et al.*, 1994). This indicates the necessity for high levels of parenting skills around food and eating, and the importance of psychosocial assessment.

Attitudes and behaviours towards physical activity tend to be learned from the parents, with research indicating a positive association between the parent and child in this regard (Gottleib & Chan, 1985; Sallis *et al.*, 1988; Anderssen & Wold, 1992; Wold & Anderssen, 1992; Vilhjalmasson & Thorlindsson, 1998). The influence of parental participation in physical exercise has most impact on those children 'at risk' of being overweight/obese, particularly when the parent is themselves overweight/obese (Klesges *et al.*, 1990). Even from a logistical perspective, parents can influence their children's participation in organised or non-organised physical or sedentary activities (Ventura & Birch, 2008; Huley *et al*., 2011) by facilitating or not transport and funding.

Additionally, partly in response to levels of parental anxiety about child safety, there has been a wider societal move away from parents expecting children to walk or cycle to school, or play outdoors, thus reducing levels of physical activity (Davidson & Birch, 2001). The former has been substituted by the increased popularity of modes of transportation requiring minimal levels of energy expenditure (NHS National Services Scotland, 2007). This trend inadvertently promotes resultant increased risk of a sedentary lifestyle (Taras *et al*., 1989; Durant *et al*., 1994; Duke *et al*., 2004; Epstein *et al*., 2005a). The latter physical activity has been substituted by increased passive viewing activities, which also promotes resultant increased risk of a sedentary lifestyle (Davidson & Birch, 2001).

The level of child sedentary lifestyle with high passive TV viewing and computer use needs to be effectively boundaried by parents (Valerio *et al*., 1997). Moreover, parents themselves need to act as role models in terms of avoidance of a sedentary lifestyle (Baughcum *et al*., 1998; Smith *et al*., 2010; Skelton *et al*., 2012). Families with a lower socio-economic background have also been linked to higher rates of sedentary behaviour (Gordon-Larsen & McMurray, 2000), and so may require more targeted family behavioural intervention than the general populace.

A parent's lack of recognition that their child is overweight/obese means that they are unlikely to either be concerned or provide the child with sustained, positive support towards weight loss (Carnell *et al*., 2005). In their UK-based study of 564 3-5 year old children referred from nursery and primary schools in outer London, with parents of all educational levels, only 1.9% of parents identified their child as overweight and only 17.1% identified them as obese. Nevertheless, 66.2% of parents did express concern over the possibility of their child becoming overweight in the future. This finding is mirrored in The Gateshead Millennium Study of 536 parents by Jones *et al.* (2011), which also found 75% of participating parents expressing concern over the UK's high levels of overweight children, with just 7.3% not expressing concern. This level of concern reflected a growing generic awareness of the national issue of overweight children by parents. The researchers suggest that working with such a generic concern of parents on prevention of future overweight may be a more successful strategy in building trust and establishing motivation for a programme intervention (Carnell *et al.,* 2005). Logically, parents who do not recognise that there is an issue around their child's weight status are unlikely to express

any concern about their child's overweight/obesity, and consequently will not be motivated to attend a treatment programme or make changes to the child's eating, lifestyle or physical activity habits. So, in the event that a child is referred onto such a programme, parental dissonance may impact their motivation to support the programme, and consequently this could impact on attrition (Carnell *et al*., 2005). Such recognition of the child's weight status has found in another study by Rhee *et al*. (2005) to be associated with parental readiness-to-take-action.

Carnell *et al.* (2005) also report that odds for concern rose continuously the heavier the child (overweight: 2.5; 1.6, 3.9; obese 4.6; 2.2, 9.7) and the heavier the parent (overweight: 1.9; 1.2, 2.9; obese 2.5; 1.3, 4.8). Chaparro *et al*. (2011) speculate that an overweight or obese parent may find difficulty in identifying their overweight/obese child due to desensitisation. However, Marloes *et al.* (2013) highlight that the lack of studies which include parental weight status in childhood obesity programmes means that no definitive conclusion on such a relationship between parental weight status and recognition of child weight status exists.

In fact, Marloes *et al*. (2013) in their systematic review went on to examine variation between the child's actual weight and the parent's perception of their child's weight status. They discovered that, of the 35,103 participating children of all studies included in the review, 7,191 (62.4%) of the 11,530 overweight children were mis-identified as of normal weight status by parents. Clearly, there are issues of non-recognition by parents of their child's actual weight status. This review, in particular, found this parental denial occurred most frequently amongst parents of younger children, with 86% of 2–6 year olds not correctly identified as overweight by the parents. In fact, while studies in Australia (Crawford *et al.,* 2006; Fisher *et al.,* 2006), in the US (Eckstein *et al.,* 2006) and in the UK (Jones *et al.,* 2011) found this difficulty to be true for parents, this was particularly true for mothers, especially of younger children. Carnell *et al*. (2005) argue that based on US findings the concept of 'heaviness' in young children is linked with growth charts and infant development, and such an emphasis has confused parental thinking so that overweight is perceived as 'healthy'. This notion is one that was echoed by mothers from a lower socio-economic status (refer to section 1.5.2.). Further, irrespective of the child's age, Maynard *et al*. (2003) and Benson *et al*. (2009) in their respective studies agreed with the findings of several systematic reviews (Parry *et al.,* 2008; Doolen *et al*., 2009; Towns

& D'Auria, 2009) that maternal recognition of the child's actual weight status was more unreliable than other caregivers.

Even so, the review by Marloes *et al.* (2013) did indicate that parents were more able to accurately identify their child's weight status when image scales were utilised rather than verbalising (52.3% vs. 37.6%) (Marloes *et al.*, 2013). Such a discrepancy indicates parental awareness on an unconscious level but resistance to consciously acknowledging the problem on a verbal level, and a distortion in parental thinking (Carnell *et al*., 2005). However, Neumark-Sztainer *et al.* (2008) suggest that this may be due to parental fear of the stigmatization of their child, though this is still a hypotheses as such a limited number of studies have utilised image scales (Marloes *et al.*, 2013). Binkin *et al*. (2011) in their study agree with the hypothesis put forward by Carnell *et al.* (2005) on parental distortion of thinking causing higher parental accuracy with the image scales, but instead postulate that this denial is attributable to the changing societal expectation of what constitutes "normal" weight, and that this may even be culturally defined. Indeed as Marloes *et al.* (2013) point out, it should be noted that the actual normal-weight child is rarely deemed overweight or underweight; whereas the actual overweight child is commonly seen as of normal-weight status. Thus, parents seem inclined to identify their child as of normal-weight status, irrespective of the actuality. The implication from this is that parental reporting of their child's weight status is unreliable and is often unreported and that anthropometric data collection by height and weight, and the attaining of BMI is preferred (Carnell *et al.*, 2005; Marloes *et al*., 2013). Moreover, Jones *et al*. (2011) recommend that image scales and other methods may have some advantage with parents over other parental reporting mechanisms, such as use of extreme cases or verbalisation, especially if researchers are to establish the trust required for such sensitive reporting (Jones *et al.*, 2011).

It must be remembered that issues of definition still occur around 'overweight.' Nevertheless, despite the use of varying cut-off points in definitions of overweight by WHO, IOTF and CDC, the misidentification of overweight appears to be prevalent in developed countries. This is reflected in the aggregated results utilised in the systemic review by Marloes *et al*. (2013), which found no significant variations between sensitivity and specificity outcomes in the varying definitions used (Marloes *et al.*, 2013).

In particular, it has been found that low parental, in particular maternal, education level can also affect their knowledge of healthy eating and exercise habits (The Scottish Government, 2012). It follows that parents with an appreciation of the problem of obesity, and who have insight into healthy eating and recommended physical activity habits that promote and maintain child health and well-being, are more likely to encourage healthy food environments and so support interventions. Equally, those parents who do not have this recognition or understanding of the problem will not do so (Birch & Fisher, 2000; Hughes *et al*., 2008). This implies that there is a need to educate parents not only in the need for healthy eating but in the importance of exercise and keeping fit, and the relationship between these.

The characteristics of the family play a huge role in the development and management of obesity in children. Families that have high cohesion, who eat meals together and make decisions about healthy foods and healthy levels of exercise (Lindsay *et al.,* 2006), are more likely to develop and maintain healthy eating and lifestyle habits (Carnell *et al.*, 2005), and so promote successful intervention. However, it logically follows that families where relationships are distant (Ebbeling *et al*., 2002; Wiecha *et al*., 2001) leads to high levels of uncertainty and stress that can negatively impact on eating behaviours (Epstein *et al.,* 2007). Also, absent parents or those parents who work very long hours or suffer from ill-health are less likely to prepare nutritious meals or regulate the kinds of food that children eat in their absence. Instead children (Anderson & Butcher, 2006) or parents themselves may turn to fast and processed foods (Hill & Peters, 1998; French *et al*., 2001), and so put their children at higher risk of obesity and/or adversely impact on treatment success (Bowers, 2000; NHS National Services, 2010).

1.5.3 *Community Characteristics*

Societal factors outside the home may also have an influence on the child (Birch & Davidson, 2001). For instance, the wider preference for unhealthy convenience and fast food over preparing home-cooked meals contributes to unhealthy feeding patterns within the family (Birch & Davidson, 2001). The health quality of school lunches and the access to fast food outlets during lunch breaks are also factors to consider (Birch & Davidson, 2001). Moreover, longer working hours and parental absenteeism may impact on parental food preparation time as well as the time available for physical activities (Birch & Davidson, 2001). The lack of restriction before the watershed for TV advertising of fast

food, sugary drinks and snacks on TV also contributes towards a wider societal message. For example, one UK-based study of child TV viewing found that 60% of adverts were food-related, and 60% of these were for high-sugar cereals (Lewis, 1998).

Child physical activity levels can also be influenced by factors from the wider community, such as access and availability of safe play areas, as well as the effective integration of PA into school life (Birch & Davidson, 2001). Also attitudes to PA are not only impacted on by peer attitudes and behaviours, but also by the availability and accessibility of safe play low-crime rate neighbourhoods (Birch & Davidson, 2001). Child PA is also linked to the provision of leisure activities and facilities, regular school sport and a range of school sports facilities, along with the provision of safe bicycle routes (Birch & Davidson, 2001).

Clearly, there is a relationship between child and parent attitudes and behaviours that is influenced by society. This presents a dynamic cycle of factors which influence the child, and which can lead to childhood obesity. A model which represents this complex myriad of relationships is required to fully comprehend the problem, and to help develop an effective treatment programme.

1.6 Conceptual Framework

The theoretical framework supporting this study is based on The 'Ecological System Theory' advanced by Davison & Birch (2001) and recommended by Skelton *et al*. (2012). This conceptual model helps to better explain and assess the composite multi-factorial concerns that interrelate with each other to result in obesity. The model encompasses the child, the family; the school environment and the community (see Figure 1-1). It includes already identified risk factors for the development of childhood obesity, such as food behaviour, levels of sedentary behaviour and exercise. However, the model also emphasizes the need to examine the child in wider contexts, such as both family and community in order to reveal the development process of obesity. For instance, this model acknowledges the importance of learned behaviour, so this includes not only parental support of physical activity, but also parental attitudes and their own behaviour in this regard. Equally, the model acknowledges the impact of other key figures so that physical activity patterns also are reliant on the physical education activities provided in schools (Davison & Birch, 2001). This approach is also echoed in terms of family and school impact on eating behaviours (Davison & Birch, 2001). For health-care professionals

designing and implementing family-centred approaches, acknowledging environmental barriers that affect behavioural change beyond unhealthy activity and food environments is helpful.

Moreover, the child does not exist in isolation and the family system and relationships within the community need also be considered. For instance, Stewart (2008) in her qualitative study of families in treatment programmes identified a lack of support from other close and extended members of the family. Skelton *et al*. (2012) argues, therefore, when designing programmes treating childhood obesity, the psycho-sociological dynamics of the family system are relevant, and these interpersonal relationships impact on the eating and exercise behaviours of both the child and family (Skelton *et al*., 2012).

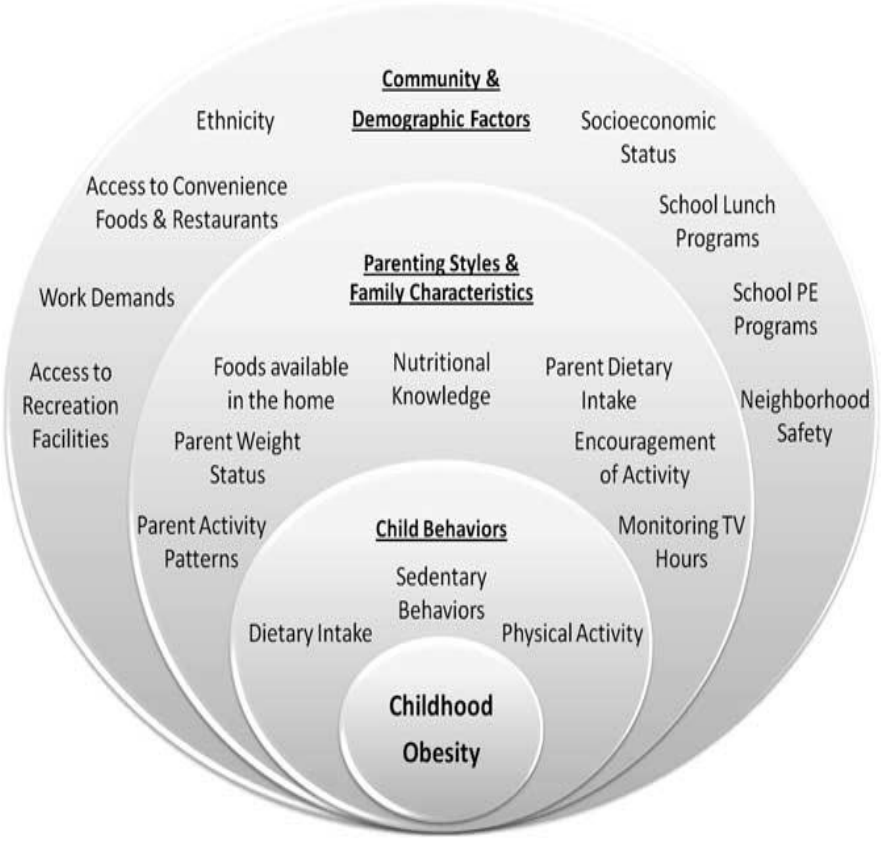


Figure 1-1: Ecological model of predictors of childhood overweight

As described above, articulating the causes of obesity is a complex issue and to tackle it a combined effort between health and other sectors, such as using legislation, is needed. A general political consensus to address childhood obesity plays a crucial part. This evident in the publication of the Food Standards Agency's (FSA) review of research into the link

between food promotion and eating behaviour in children carried out by University of Strathclyde (Hasting et al., 2003). With several caveats to their findings, these researchers suggested that advertising has a negative effect on obesity (Hume, 2004). Indeed, The Royal Society of Public Health has argued that labels should be added to food and drink to indicate the amount of activity that would be needed to burn off the calories consumed. The NHS has imposed a sugar tax in its own facilities and a report by Public Health England recommends taxation of between 10 and 20% on high-sugar foods and drinks in order to meaningfully reduce sugar consumption (Public Health of England Report, 2015). Governments should take further serious legislative steps to help to address the obesity epidemic. In particular, the national curriculum could include more emphasis on teaching healthy lifestyles. Research has found that active children on average become more active and healthier adults (Mackett, 2002). Even children who are obese but who are more active are likely to be healthier (Lee & Jacksone, 1999).

1.7 Effectiveness of Childhood Obesity Treatment

This section will describe different types of childhood obesity programmes and what is known about their efficacy. Several treatment approaches have been assessed to determine those most successful. These include treatment combinations which involve diet, exercise, behavioural change, surgical intervention and medication. None of these, however, have been proven successful independently. Even so, the increasing prevalence of obesity has led to the development and implementation of a number of obesity treatment strategies, the most successful of which (Hughes *et al*., 2008) have seen a shift towards multi-disciplinary programmes that also include the family (Flodmark *et al*., 2004).

Weight management programmes that have primarily been food and physical exercise education oriented have been ineffective. These programmes have been reported to take time, be challenging, frustrating, and costly. In fact, to date there is no research that indicates that treatment programmes which target change in nutritional intake alone have been successful (Spear *et al*., 2007). Instead what has been found as each cause of childhood obesity has been clarified, is that more new intervention routes have been suggested (Ebbeling*et al*., 2002; Epstein *et al*., 2007; Skelton & Beech, 2010; Willams *et al*., 2010). Consequently, this has resulted in myriad varying treatment programme designs.

Effectiveness has been evidenced when children, family, health-care professionals and the wider community work together cooperatively (WHO, 2002; Flodmark *et al*., 2004, Epstein *et al*., 2007). For example, from a wider community-basis, dietary and physical activity in the treatment programme should be supported by environmental factors, such as sport locations, bicycle tracks, healthy food in schools and sports classes in schools to foster successful outcomes (van Avendonk *et al*., 2012). However, many treatment programmes focus on the family as the key influencer of child behaviour. If the family is considered a system then the treatment programme becomes a part of that system (Skelton *et al*., 2012). They work best when active parental involvement occurs throughout the programme. Parental supervision of the child and his/her actions, along with encouragement, have been found to be key to shifting the child's established eating, exercise and lifestyle habits (Borra *et al*., 2003; Kitzmann & Beech, 2006). Indeed, it has been found that parent-child communication regarding lifestyle habits in a supportive and motivational way aids the child in maintaining change (Borra *et al*., 2003).

Whilst behavioural change is a key programme component to treatment success (Wilson 1994), it has been found to be more efficacious with younger children (Braet, 2006; Epstein *et al.*, 2007, Reinehr *et al*., 2010, Danielson *et al*., 2012). For instance, one Swedish-based study highlighted that behavioural change in severely obese children is successful but only at 6–7 years of age. Changing habits for older youths is challenging, particularly in the severely obese. However, it can have a positive impact on adolescents if they are moderately obese (Danielson *et al*., 2012). Thus weight status and age in combination need to be considered in effective treatment.

From a therapeutic perspective, both cognitive behavioural and family therapy have been successful in treating childhood obesity (Wilson, 1994; Danielson *et al.*, 2012). For sustained success Wilson (1994) advises on lifelong therapy whilst Danielson *et al.* (2012) advises on 3 years of therapy with optimal follow-up at 5–10 years (WHO, 2000; Tsiros *et al.,* 2008; Reinehr *et al*., 2010; van Avendonk *et al*., 2012). Thus, both family and CBT therapy have been found to be most efficacious in a community rather than clinical setting (Sargent *et al*., 2011).

Despite some treatment programmes having been identified as having lowered the risk of increased weight gain (Ogden *et al.,* 2002), the outcomes as a whole have been unclear, and it is still not possible to determine which is the most efficacious treatment (Murtagh *et*

al., 2006). In general, results have not met targets and meanwhile child obesity continues to rise (Murtagh *et al*., 2006; Robinson, 2008). This highlights the necessity of identifying more effective treatment programmes, and this also means identifying those that facilitate success by lowering the drop-out rate (Skelton & Beech, 2010). Currently, evaluation of complex multi-strand childhood obesity programmes has tended to focus on the degree of effectiveness of one programme component, and so there is still an unfulfilled need to determine the relative efficacy of each individual strategy as one compares to another (Spear *et al*., 2007). Therefore, although substantial fundings and resources have been allocated to these programmes, there is insufficient evidence of return. Ultimately, such inconclusive or poor results may adversely impact programme sustainability (Skelton & Beech, 2010; Williams *et al*., 2010). Some of the most prevalent aspects of child obesity programmes in the last decade have included cognitive behavioural therapy, motivation around food and intake, exercise programmes, family participation and multidisciplinary approaches (World Health Organization, 2003).

1.7.1 *Long Term Effectiveness of a Weight Management Programme*

A number of studies support holistic and multidisciplinary, family-based programmes that treat childhood obesity (Israel et al 1985, Epstein et al 1990, Golan 2004a,b, 2006a, Luttikhuis et al., 2009, and Whitlock et al., 2010). Many of these programs are group based, offering a more cost-effective approach compared to individual therapy (Goldfield et al.,2001). It is predominantly in the USA (Epstein et al 1990, Israel et al 1985) and Israel (Golan 2004a,b, 2006a) that studies have explored and provided an evidence base for family-based programmes to treat childhood obesity (aged 7 to 11) with parents as the key agents of change.

Epstein et al (1990) found that parents should be involved in the therapy process in order to sustain change. It has been demonstrated that long-term changes in weight are achieved most resoundingly when the parent and child are targeted together. Golan's randomized controlled trial in 60 obese children (6-11 years) reinforces this finding. This parent-focused study found that mean reduction in weight was superior for a parent group (29%) compared with a child group (20%) ($p<0.05$). The format of a number of programmes session reviewed in this research varied slightly between the interventions; Some studies (Sother et al., 1999; Sacher et al., 2010; Coppins et al., 2012; Croker et al., 2011; Towey et al., 2011; Murdoch et al., 2011) targeted the whole family (i.e. those living under one roof)

and sessions were conducted for groups of families. Others (Israel et al., 1985; ; Rudolf et al., 2006; Golan 2004a,b, 2006a; Robertson et al., 2008; Fraser et al., 2010; Pittson & Wallace., 2011) conducted a mixture of sessions which include sessions for a group of families, behavioural change for parents only and some for the child only. Hughes et al., (2008) targeted the whole family but conducted individual sessions for each family (Family center approach). All studies aimed to change behaviour and the most frequently used techniques were education, goal setting and activity sessions

Golan et al (2006a) evaluated the relative effectiveness of parent-based treatment of children, meaning treatments where parents alone are counselled, versus programmes which involve both parents and children in a family group. The researchers highlighted that effective treatment programmes involve family members; however, it was also indicated that little attention has been extended to the active involvement of the child in the treatment. The study was based on 32 families, with children between 6 to 11 years of age. The participants were provided with an extensive programme, the group session included between (10-15) families for an enhanced lifestyle for a period of six months. The groups were randomised into two: one where only parents were involved in the programme, and the other where both parents and children were involved. In both cases, parents were responsible for developing the enhanced lifestyle. The results of the study showed that programmes which only involved interventions with parents yielded greater results, as compared to the programmes where children were included as well (Golan et al., 2006b).

Another meta-analysis which included randomized trials of primary care–relevant behavioural (diet, exercise, lifestyle) and pharmacological (orlistat) interventions for treating overweight and obesity in children and youth aged 2–18 years, assessing changes in BMI and BMI z-scores, found they were significantly lowered in the intervention group when compared to a control group (Perirson et al (2015). In other less resounding studies, there is still a difference noted in the reduction of the BMI and BMI z-scores depending on the target of intervention: treatments focusing on individual children (such as classroom interventions) found significant weight reduction even when family-based approaches (such as active parent involvement) have been less significant. Meta-analysis, though, demonstrates that findings from group-based, family-centered interventions are more positive in terms of weight management, retention, and value for money and efficiency (Kitzmann *et a*l., 2010).

In an RCT treatment programme targeting the whole family but conducted via individual sessions for each family (Family center approach), 134 (5-11 year old) obese children were referred to hospitals in Glasgow and Edinburgh (Hughes et al., 2008). The intervention, delivered over a 6-month period, used counseling and behavioural strategies to change diet and increase childhood activity (Stewart et al., 2005). In a new, intense intervention group, the study found significant increases in physical activity (accelerometer) and significant decreases in sedentary behaviour. Given the reasonably positive findings, the authors proposed a more intense and long-term intervention.

Also, in a clinical setting in London, a group of researchers assessed 'family-based behavioural treatment' (FBBT) for which each family group session included between 6-10 families. For families and their children taking part, the results showed 8.4% reduction in BMI (confirmed at 3-month follow-up) (Edwards et al 2006). However, Croker et al. (2011) who targeted whole family compared FBBT versus a waiting-list control in families with children aged 8-12. In spite of other successes, the between-group treatment effects for BMI, body composition, BP and psychosocial outcomes were not significant.

Another community, group-based programme targeting whole family MEND (mind, exercise, nutrition and do it!), focused on nutrition education, exercise and behaviour modification. Sacher et al. (2010) conducted a study on MEND to test its efficacy. The UK-based research included 116 obese children and the group session consisted of (8-15) families in each. As part of the study, the participants, who included children and their parents, attended a total of 18 two-hour sessions that comprised of both physical and educational activities. The researchers measured different indicators at the inception of the study, as well as at six month intervals. These indicators included BMI, cardiovascular fitness, waist circumference, and self-esteem. Follow-ups of the child participants were made after a period of 12 months from the inception of the study. The researchers measured enhanced indicators after the 12-month period. Among the success factors was high-attendance by families. The BMI z-score at 6 months between the randomised groups and MEND was -0.24 (95% CI: -0.34 to -0.13, $p<0.0001$, n=82) in favour of the programme. The roll-out of MEND is already extensive.

In a recent very large study of theMEND programme described above (Fagg et al 2014) families (N = 21 132) attended two sessions per week for 10 weeks (N = 13998; N = 9563 with complete data from 1788 programmes across England), each group session included

between (8-15) families. MEND was shown to be effective for obese children in a randomised controlled trial (RCT) BMI reduced by mean 0.76 kg m2, zBMI reduced by mean 0.18, self-esteem increased and psychological distress decreased. Generally, outcomes improved less among children from less advantaged backgrounds.

The WATCH IT programme from Leeds also was found to be effective. It had a unique model of delivery utilising non-professional health trainers. The programme was targeted at children and their families, who attended for 3 months but could do so for up to a year if they wished to.The programme include sessions for a group of families, behavioural change for parents only and some for the child only, included between (6-8) child In addition, the programme was piloted with 94 adolescent and preadolescent children with moderate to severe obesity (mean age 12.2 years). There there was only a 15% drop-out rate and low nonattendance (Rudolf et al 2006). However after 6-months the mean changed in BMI z-score was only (-0.07, $p<0.01$).

Therefore, Group-based, family centered interventions seem to be superior to other types of intervention in terms of weight management success, cost effectiveness, family retention and efficiency (Israel et al 1985, Goldfield et al., 2001, Kitzmann *et a*l., 2010). Also, parents' involvement in the programmes ensures that enhanced lifestyles are developed and long-term changes in weight are sustained (Epstein et al 1990, Golan 2004a, 2006a). Individual treatment programmes are known to be more practical to implement in real-world clinic settings as they offer one-on-one consultations with clinicians and assessments and interventions can be tailored according to a family's unique needs, motivations and priorities (De Mello *et al.,* 2004; Ball *et al.,* 2011a). Yet, interdisciplinary interventions may include recommendations for families as a whole (Ball *et al.,* 2011b) which has been found to be successful (Sothern et al., 1999; Woolford *et al.,* 2011). Given the advantages of individualized interventions, it is recommended, where possible, that group interventions should allow families to have one-to-one consultation meetings so that they experience more direct attention and care. The long-term effectiveness of weight management programmes depends, therefore, on the design, facility, implementation and follow-up.

In summary, the family-based weight management programmes that have been reviewed in this chapter were found to be effective with regard to achieving certain weight related outcomes when they focused on the parent and child relationship or on the family's

influence more widely. The research drew on the results of one RCT (Sacher et al., 2010) and a quasi-RCT (Coppins et al., 2011) aimed at families, as well as a couple of cohort studies (Robertson et al., 2008; 2012) in which each group session included between (4-12) families. They all argued that whole family interventions produced significant falls in the BMI z-scores of obese children. However, a number of studies were not strong methodologically lik not having a control group.

Most programmes studied lasted only for 12 weeks (Coppins et al., 2011; Robertson et al., 2012; Sacher et al., 2010) and, with regard to weight loss, they found only some evidence of long-term benefits for children and families. There was evidence in changes in disposition but it was unclear whether or not these were long lasting. Long-term changes in BMI or BMI SDS were found in studies that did not include a control group but had high attrition rates (Fraser et al., 2012; Watson et al., 2011). Robertson et al., 2012 and Sacher et al., 2010 did find positive changes in physiological measures in longer interventions of 12 months.

Thus, family-based weight management programmes implemented in community settings can be effective with regard to certain weight-related outcomes. However, so far studies have been methodologically weak, such as those uncontrolled studies with limited internal validity. Piloting is crucial and study design and the reporting of information both need to be enhanced (Waters et al., 2011). Longer follow-up periods in programmes are recommended and they should address the link between the involvement of parents and the improvement of obese children with regard to weight-related outcomes.

1.7.2 *Behavioural Change and Cognitive Therapy*

Generally, when a programme has incorporated a behavioural change strategy it has been found to have had better and longer-lasting outcomes than those programmes that excluded this strategy (Young *et al*., 2007). Behavioural change interventions can indeed result in permanent changes (Barlow & Dietz, 1998). The psycho-education component has been found able to alter child dietary and physical activity patterns, resulting in reduced weight, enhanced cardiovascular status, and improved fitness (Barlow & Dietz, 1998). However, it is important that the specific techniques utilised can be employed by health-care professionals, and are appropriate to overweight and obese children, and their parents (Barlow & Dietz, 1998). Therefore, Barlow *et al*. (2007), in their report ‘Expert Committee

Recommendations regarding the Prevention Assessment treatment of Child and Adolescent Overweight & Obesity', recommended that programmes actively encourage healthy behaviours, employ both family and child motivation strategies, establish an administrative infrastructure that allows for child-tracking, and utilise a stepped treatment approach, which addresses the individualized needs of each child and of each primary caregiver (White *et al.*, 2004; Wrotnaik *et al.*, 2004; Epstein *et al*., 2007; Jelalian *et al*., 2008; Williams, 2010).

Behavioural change can incorporate several techniques to encourage effective weight management. These tend to focus on the child's diet and dietary intake; as well as the activities and environments related to this. This might include removing unhealthy food from the home; documenting daily dietary intake; monitoring actual related behaviour; setting food intake and exercise goals; and reinforcing family or child dietary changes and increases in physical activity. Such techniques may be supplemented by developing parenting and parental problem-solving skills (Dietz & Robinson, 2005). The emphasis, thus, shifts from the child to the family environment within which the child functions.

1.7.3 *Motivation*

Both the child and parent motivation to change must be assessed before programme commencement, as it signifies the psychological readiness-to-change behaviour and attitudes (Rhee *et al*., 2005). Indeed, some researchers have indicated that self-esteem can be adversely impacted if the child starts on a treatment programme when s/he is not yet ready to change (Barlow & Dietz, 1998).

1.7.4 *Diet and Exercise*

It is the type of food and drink, as well as the quantity of intake that influences weight status. One approach to altering food intake is reducing high-fat, high-energy food and drink. However, with children it is usually preferred to do this gradually and slowly over time. For instance, in youngsters, a balanced intake with a reduction of 20-30% under their usual intake is advised (Beal *et al.*, 2004). Lowering fat and restricting high-energy fizzy drinks will often result in reduced calorie intake (Beal *et al*., 2004). Even so, in order to stabilize lean body mass, the amount of protein intake also has to be monitored. The key aim of treatment with children is to stop any weight increase, and support the child to achieve a suitable weight for their age and height (Beal *et al*., 2004).

It is, moreover, essential to balance intake and activity (Epstein, *et al.,* 1990). Being overweight has been attributed to a lack of physical activity in combination with unhealthy eating patterns (United States Department of Health and Human Services [USDHHS], 2009). A recent large UK cross-sectional study using objective measurements of 7-year-olds' physical activity suggested that levels of objectively measured sedentary behaviour were significantly higher among overweight and obese children (King *et al.,* 2011). An increase in calories combined with a reduction in physical exercise can have a significant impact on child weight status (Epstein, *et al.,* 1990). Therefore, it becomes essential that overweight or obese children participate in activities they enjoy so that motivation and interest in being fit is sustained and weight is controlled (Deckelbaum & Williams, 2001). Clearly, parents and the wider family can inspire children to increase active play and participation in sports through their own attitudes and behaviour and by providing access to community sports and recreational facilities (Deckelbaum & Williams, 2001).

Overweight children are prone to being sedentary (King *et al.,* 2011) and the aim of exercise and sport ought to be to change attitudes and behaviours, so that the child enjoys and, therefore, participates in physical activity. Families should be encouraged to foster enhanced activity levels in part through reducing time spent on sedentary alternatives like TV viewing and playing on the computer (Epstein *et al*., 1990).

1.7.5 *Family Participation*

The lifestyle habits of the family are of significance to a child's eating and exercise habits (Epstein *et al.,* 1990; Ogden *et al*., 2002; White *et al*., 2004; Braet, 2006). For instance, families, apart from acting as role models, demonstrate a strong influence on food availability, food preference and the choices of the child (Golan *et al*.,1998). Treatment programmes can support parental education related to nutritional food. This approach also recognises that obesity runs in families and that it is intergenerational (Whitaker, 1997). Therefore, it has been theorized that targeted changes in eating habits and levels of physical activity in the child and parent, together with teaching parents behavioural skills to encourage child behaviour modification (Young *et al*., 2007), could synthesize family resources to support a drop in childhood obesity (Epstein *et al*., 2007). Additionally, it is seen that treating the child and parent is beneficial to the two, and enhances the parent-child relationship, especially in the context of weight change (Wrotniak *et al*., 2004, 2005). Consequently, family-based behavioural paediatric obesity treatment programmes were

initiated more than a quarter of a century ago, with agreement in short-term and longitudinal findings supporting their efficacy (Epstein, *et al.,* 1990, 1994; Epstein *et al*., 1994, 1998; Jelalian & Saelens, 1999; Epstein, 2007). Generally, family-based interventions have been reported to fall into five differing categories: i) physical activity and health improvement, ii) parent(s) as primarily change agent(s), iii) change programmes with family involvement, iv) behavioural change programmes without parent involvement, v) PA intensive programmes based in the community or leisure centre, which all tend to be non-pharmalogical, non-medicalised in orientation. Whilst community-based settings may allow for better access to change at an ecological level, research is still inconclusive as to which setting is most effective. Even so, some interventions in these clinical and community settings recently carried out in the UK emerge as effective ones (Stewart *et al.*, 2008). These include for children: Mind Exercise Nutrition and Do-It (MEND); WATCH IT, SCOTT, and for adults Slimming World and Weight-World (Stewart, 2008).

Such work with the family that includes a behavioural orientation tends to require the dietician and nutritionist to work with other health professionals in a multi-disciplinary approach that goes beyond food and nutrition. For instance, trials by Anderson and Butcher (2006), Caprio (2006), and Goldberg and Kiernan (2005) concur that weight management programmes with positive outcomes tend to take a multi-disciplinary approach which involves diet, physical activity, parental involvement and behavioural modification (Epstein *et al*., 1994; Royal College of Physicians, 1998; WHO, 1997; Nemet *et al*., 2005). In contrast to behavioural approaches, family-based interventions tend to be community-based with sessions group-based. They are predominantly located locally in, for example, a school.

Indeed, child physical activity levels have been found to be significantly linked to parental exercise rates, with no gender differences reported (Moore *et al.*, 1991; Fuemmeler *et al.*, 2011). Thus, parents need to assume the responsibility for their child's health overall (WHO, 2002), and of being role models in this area (Fuemmeler *et al*., 2011). Child eating patterns, levels of physical activity and the extent of sedentary habits are, ultimately, the responsibility of the parents (WHO, 2002; Stang & Loth, 2011).

It therefore follows that the behaviour and the level and quality of family participation is an influencing factor in treatment programmes. Evidence suggests that educating parents as part of the treatment programme reduces attrition, and supports adherence and success of

the programme (Epstein *et al*., 1990; White *et al.,* 2004). This being the case, it is critical that there is effective communication regarding the child's progress within the programme, including a focus on how the parents can support this progress further. Furthermore, the parents themselves should actively participate in the treatment plan as part of recognising their influence as role models (White *et al.,* 2004). The success of such an approach is evidenced in several studies (Charney *et al.,* 1976; Nemet *et al*., 2005). This research supports that in these circumstances change lasts, and it also reinforces that change cannot happen for the child in isolation. The child needs the support of the family in addition to the intervention if the child is to form new lifestyle habits of healthy eating, and increased physical activity (Carson-DeWitt, 2010). Further, research has highlighted the transformative and positive nature of treatment programmes when families participate in a shared goal with the child (Epstein & Wing, 1987**;** Reinehr *et al*., 2003; Caprio, 2006).

Three family-based epidemiological studies, in particular, demonstrate how critical family participation is to a treatment programme (Epstein *et al.,* 1984; Epstein & Wing, 1987; Epstein *et al.,* 1990). This research was carried out over a 10-year period involving children aged 6-12 years who were 20% overweight. Epstein *et al*. (1984) examined the effect of treating children in comparison to treating the family and the child. The treatment programme was based on a lifestyle exercise programme alongside weight-related behavioural change. The findings support active family participation in interventions as it had a significant association with levels of child change and weight management.

In the second study the focus was on a positive versus negative family weight history (Epstein & Wing, 1987). In this case, the treatment programme itself promoted competency in self-paced learning strategies for the child, including the daily weighing of themselves at home and graphing food intake (Epstein *et al.,* 1990). Results confirmed the significance of family participation and history in effectively implementing and sustaining the treatment programme. In the final study (Epstein *et al.,* 1990) the treatment programme for the family and child revolved around both lifestyle changes and aerobic exercise. The results demonstrated that lifestyle alterations and physical exercise levels were correlated with reductions in weight. To summarise, the results of all three family-based longitudinal studies indicate effective long-term weight maintenance, with participation of the family being significant to overweight children (Epstein *et al*., 1990). Consequently, programme success is an outcome of family commitment.

1.7.6 *Multi-disciplinary Teams*

Recent research has specified programme success as employing a multi-disciplinary approach combining a dietary element, exercise, behavioural change and family participation (Goldberg & Kiernan, 2005; Anderson & Butcher, 2006; Caprio, 2006). These teams are made-up of varying health-care professionals each of whom has an essential role (Connor & Norman, 2006). For instance, one study advised that nutritional advice be provided by a dietician (Lochs*et al.,* 2006). For dieticians and nutritionists involved in family-centred approaches, awareness of environmental factors is required (refer to Figure 1-1). This has meant an extension of partnerships with other health-care professionals who are more directly linked with behavioural change, lifestyle issues and exercise (Skelton *et al*., 2010). Also fundamental to the design of such programmes is the acknowledment and support of family relationships by the health-care team, and the maintenance of effective communication not only within the team but between the team and the family (Skelton *et al*., 2010).

1.7.7 *Commercial programmmes*

Moreover, commercial weight management programmes were found to be more effective than free health services programmes, Clinically useful weight loss and fat loss can be achieved in adults who are motivated to follow commercial diets for a substantial period. Given the limited resources for weight management in the NHS, healthcare practitioners should discuss with their patients programmes known to be effective (Truby et al., 2006). In their radomised controlled trial comparing the effectiveness of weight loss between commercial vs standard care weight managment programmes delivered for adults (aged ≥18 years) with body-mass index (BMI) of 27–35 kg/m2, Jebb et al. (2011) found that the greater weight loss in participants assigned to the commercial programme was accompanied by greater reductions in waist circumference and fat mass than in participants assigned to standard care, which would be expected to lead to a reduction in the risk for type 2 diabetes and cardiovascular disease (Miyazaki et al., 2009; Jacobs et al., 2010). In terms of the effectiveness of engagemnet with the programme at 12 months, study (Jebb et al. (2011) reported that 328 (42%) participants had withdrawn from the standard care programme. More completed the final assessment in the commercial programme group (230, 61%) than in standard care group (214, 54%), but this difference was not significant (p=0·06).

Weight loss in the standard care group in this trial also compared with that from an audit of the Counterweight programme. The Counterweight programme provides intensive training and support for staff delivering weight loss treatment in primary care and recommends at least six appointments or group sessions in the first 3 months, with follow-up appointments every 3 months. After 12 months, mean weight loss was 3 kg in people who completed the Counterweight programme compared with 3·3 kg in those who completed the study. Drop-out rate was also similar, with 45% completing the Counter weight programme and 54% completing standard care (Counterweight Project., 2008)

Moreover, Wing et al. (2006) conducted a study to develop a self-regulated programme for dieters who tended to regain weight after losing it. The study included 314 participants in the Rhode Island area, using three groups of participants: commercial weight-loss groups, exercise groups, and individual-based approach without assistance. The authors concluded that the commercial weight-loss groups were the most effective, as compared to the other two groups. The group following the individual approach, without any help, was the least effective. This was because commercial groups tend to follow a guided schedule supported by experts. There is also little deviation from schedule in the case of commercial groups, as the activities tend to be timed and mandatory for all participants. Therefore, the attendance rate in commercial groups was also higher than in other groups.

1.8 Definitions of Attrition and Adherence

Poor attendance, ultimately resulting in drop-out, has been cited as a common challenge to successful obesity treatment in both research and clinical settings (Williams *et al.,* 2010). Also, drop-out was found to be varyingly defined as not completing an initial phase of the weight management treatment programme occurring within the first 4-6 months (Cote *et al.,* 2004; Zeller *et al.,* 2004b; Kirk *et al.,* 2005) or as a failure to return to a weight management clinic (Tershakovec & Kuppler, 2003; Barlow & Ohlemeyer, 2006; Kitscha *et al*., 2009). However, a barrier to effective research is that in studies undertaken, there is no consistent definition of attrition. This is in part due to the lack of consistency in treatment programmes such that they tend to have varying structure, duration, frequency of sessions across treatment programmes.

Table (1-2) shows that the inconsistency in studies pertaining to childhood obesity treatment programmes is found in their varying definitions of attrition. According to Braet

et al. (2010), there are only a few studies focused on attrition and, therefore, there is lack of consensus over its defining parameters. Hampl et al. (2011), too, emphasise that there is very little knowledge on the methods for the minimisation of attrition, and this is mainly due to the lack of available literature. Table (1-2) groups some reviewed studies by the attrition definition that they adopted. These studies present attrition in many different ways. However, the definitions of attrition in at least some were found to be similar to the criteria adopted in this thesis, by the ACES programme organizer, despite their different backgrounds.

Examining the length of these different interventions, we may say that two types of intervention have attempted to address attrition: these are short and long term interventions studies. Short intervention studies are those delivering programmes between three to 6 months. Long intervention studies are defined as those delivering for 12 months and above (Epstein et al., 2007). Braet et al. (2010) define attrition as "the unilateral decision by the client to stop an intervention whereas the clinic staffs views this as premature" (p. 407). Cote et al. (2004) define it as "premature discontinuations of treatment before completing phase I of a multi-phase treatment programme" (p. 165). Barlow and Ohlemeyer (2006) consider that the failure of 1/3rd of the patients to return for second visits is high attrition. There is therefore a wide range of possible definitions and understandings.

Some studies that have a similar understanding of attrition have been represented in the first row of the table. Short term interventions have been found to more likely concur with ACES in their definitions of attrition than the longer studies shown in the second row in Table (1-2). In terms of the short-term interventions, Braet (2006), for instance, studied an intervention programme that has a number of similarities to ACES and considered a patient attending less or equal to six sessions as a drop-out. Murtagh et al. (2006) studied 20 UK children (aged 7-15) over the course of three months and regarded children who attended less than three sessions as drop-outs. Walker et al.' (2011) studied children for six months and considered those who attended an inital 1-to-1 session but did not return for a follow-up after the initial visit as drop-outs. Conducting their study of 294 German children (aged 6-16), in which intervention lasted for three months, Denszer et al. (2004) considered those attending less than two sessions as dropping out. A US study of 104 children (7-8 years old), delivering three months of intervention, had the same criteria as the ACES programme: it considered those who attended less than 50 percent of sessions as drop-outs.

Thus, the definition of attrition used in this study resonates with some of those used in other short intervention programmes.

In terms of long term interventions, a number of these also adopted 50 percent attendance as the cut-off for attrition in spite of their lengths being one year or above, such as Halverson and Skeleton (2011) in a US study (194 children, aged 2-12 years) which lasted for one year. They considered that missing more than 4 months of an intensive phase (so, making less than 50 percent of sessions) was the marker of attrition; as can be seen in the table above, this approach concurred with that adopted in Kitscha et al. (2009), as well as in Barlow and Ohlemeyer (2006), which studied an individual, open-ended programme in which attrition was measured as missing more than two sessions.

With regard to the factors that may influence attrition, Jelalian et al. (2008) conducted a study focused on its predictors and concluded that initial weight loss during the first four weeks of a programme acts as a reinforcement which encourages the individual to continue the programme. Additionally, parental distress and quality of life are also among the important factors. Yet, according to Skelton, Irby and Geiger (2014), there is very high variation in the levels of attrition reported in different studies as the attrition rates range between 27 to 73%. The researchers also suggested that patient satisfaction influences the rate of attrition and the rate of attrition from treatment programme is also an indicator of the failure of the programme. Zeller et al. (2004) also studied the families who started weight management programmes for their children but withdrew prematurely. The study found that the attrition rate was 55% and the non-completers included individuals who were receiving Medicaid, had lower self-awareness, and had more frequently self-reported experiencing depressive symptomologies.

Essentially, adherence means the retention of participants in the treatment programme, and the extent to which the patient follows instructions given for recommended treatment (Haynes *et al*., 2008) Adherence to an organised treatment for a prolonged period is challenging (Sabate, 2003; Haynes *et al*., 2008). Consequently, one form of non-adherence is attrition. The latter is an extreme form of non-adherence resulting in participant drop-out (Hook *et al*., 1993; Skelton & Beech, 2010).

In conclusion, based on these existed studies, it can be inferred that there is lack of consistency in the definition of attrition and the factors that influence attrition in the currently prevailing literature.

1.9 Correlates of Attrition and Adherence to Treatment

High rates of attrition frequently are reported in paediatric weight management programmes, ranging from 27% to 73% (Skelton & Beech, 2010). Grime-Robison and Evans (2008), in their review of three differing US family-based behavioural interventions, report a 50–65% drop-out rate. For instance, a third of the 90 participants dropped out (mostly between 6 and 9 months) in the 12 month study carried out in the US by Sothern *et al*. (1999). Table 1.2 provides evidence based on recent studies of attrition within child weight management programmes. These findings of high attrition rates were echoed in other studies from table 1.2 by Tershakover & Kuppler (2003) at 49%; Zeller *et al*., (2004) at 55%; Cote *et al*., (2004) at 55%-64%; Deneszer *et al*., (2004) at 62%; Kirk *et al*., (2005) at 55%; Barlow & Ohlemeyer (2006) at 61%; Skelton *et al*., (2008) at 73%; and Heinberg *et al*., (2009) at 27%; and Kitscha *et al*., (2009) at 33%. However, if these figures are examined more closely it becomes apparent that attrition in the first few sessions of the treatment is at higher risk. For example, one study in St Louis, USA records a 75% drop-out rate after the first treatment visit, which then subsequently rose after a second visit, before averaging out at 61% (Barlow & Ohlemeyer, 2006). In another European paediatric programme with a nutritional intervention involving >1300 patients when attrition rates went beyond 90% after 30% of family treatment visits, it was considered to have failed (Pinelli *et al*., 1999). Indeed, research has found that the issue with children is more pressing than with adults (Jelalian *et al*., 2008). In exploring this issue of attrition, it is important to identify those factors that are associated with it, as well as the stated reasons given for attrition.

Table (1 -2) Summary of Attrition Studies Definition

References	Sample Setting	Attrition Definition	
		Attrition Rate	Attrition Cut-off
Barlow & Ohlemeyer, 2006	USA 157, (1-18yrs) Individual open-ended	Attrition: 61%	≤2 visits
Braet 2006	Belgium 72, (4-16yrs) Individual/group, 3 months	Attrition 47%	≤6 sessions
Cote et al., 2004	USA 120, (5-17yrs) Individual, 21 months	Attrition: 55%	Incomplete 3 months of intensive phase
De Niet et al., 2011	Holland 248, (8-14yrs) Group, 12 months	Attrition: 44%	Drop-out from total treatment period
Halverson & Skelton, 2011	USA 194, (2-18yrs) Individual, 12 months	Attrition: 57%	Didn't complete 4 months intensive phase
Hampl et al., 2011	USA 24 Group	Attrition: 32%	Didn't attend scheduled visit without notification
Jelalian et al., 2008	USA 76, (13-16yrs) Group, 4 months	Attrition: 18%	Didn’t complete the 4-month active treatment trial
Kitscha et al., 2009	Canada 152, (2-17yrs) Individual Open-ended	Attrition: 33%	≤ 2 clinic appointments attended
Murtagh et al., 2006	UK 20 7-15yrs, 3 months	Attrition: N/A	Attended less 3 months

Savoye et al., 2011	USA 209, (8 -16 yrs) Group + individual, 24 months	Attrition: 56%	Did not complete the study
Skelton et al., 2008	USA 248, (2-18yrs) Individual, 12 months	Attrition: 73%	Did not complete the programme during the study period
Sothern et al., 2000	USA 73, (7-17yrs) Individual, 12 months	Attrition: 34%	Did not complete the intervention
Tershakovec and Kuppler, 2003	USA 518, (5-17 yrs) Individual, open-ended	Attrition: 49%	Attended initial assessment & intervention session only
Van der Akker et al., 2007	Holland 73, (8-15yrs) Group + individual, 12 months	Attrition: 37%	Did not return after intensive or follow-up
Vignolo et al., 2008	Italy 31, (6-12yrs) Group + Individual, 60 months	Attrition: 36%	Did not complete
Walker et al., 2011	108, (0-7yrs) Individual, 6 months	Attrition: 38%	Didn't return for follow-up after initial visit
Williams et al., 2010	204, (4-7yrs) Group, 24 months	Attrition: 32%	≤ 2 of total sessions
Zeller et al., 2004	USA 212, (6-17yrs) Individual, open-ended	Attrition: 55%	≥ 1 visit but withdrawal before 4mths intensive
Denszer et al., 2004	Germany 294, (6-16yrs) Individual, 3months	27.5%	≤ 2 of total sessions
Heinberg et al., 2009	USA 104, (7-8) Individual + Group, (3months)	27%	≤ 50% of total sessions

1.9.1 *Child Characteristics*

Baseline characteristics of child participants in treatment programmes include: (a) age; (b) sex; (c) ethnicity; (d) baseline weight status, which includes weight, BMI, BMI z-score, percentage over ideal weight, body fat %, body fat mass, and degree of obesity; (e) longitudinal weight status, which includes change in BMI reduction during treatment and mean 10-week weight loss; (f) psychosocial/ behavioural/ lifestyle factors.

1.9.1.1 Age

There have been mixed results regarding age in the eleven studies examined in table 1.2. Six studies have found no association (Sothern *et al*., 1999; Cote *et al*., 2004; Barlow & Ohlemeyer, 2006; Jelalian *et al*., 2008; Vignolo *et al*., 2008; Savoye *et al.*, 2011). However, five of the eleven studies that examined children's age did find a positive correlation between age and drop-out (Zeller *et al*., 2004; Van der Akker *et al*., 2007; Pott *et al*., 2009; Braet *et al*., 2010; de Niet *et al*., 2011; Walker *et al*., 2011). With the exception of the latter, five of these indicated that older age was predictive of attrition. Walker *et al*. (2011) reported that being a young male (< 6 years old) was a predictor of drop-out. However, the composite nature of this combined variable (age + sex) makes it difficult to confirm the independence of these factors. This is especially the case as some research also reports an association by gender with attrition (see Section 1.9.1.2).

These contradictory findings are not easily explained. In part, this is due to the variation in the treatments, with programme components, contents, settings, staffing, impacting on the consistency of results. This could also be due to the studies occurring in varying populations with varying ethnicities, which in turn may have resulted in varying sample mixes. Despite this inconsistency of results, a healthy number of studies do report age as a predictor of attrition.

1.9.1.2 Gender

Gender has not been found to be linked with drop-out in the overwhelming majority of studies in table 1.2. Twelve studies investigated the role of children's sex as a predictor of attrition, with eleven finding no association (Chen *et al*., 1993; Conn *et al*., 2003; Tershakovec & Kuppler, 2003; Cote *et al*., 2004; Zeller *et al*, 2004; Barlow & Ohlemeyer, 2006; Jelalian *et al*., 2008; Braet *et al.*, 2010; de Niet *et al*., 2011; Desborough *et al*., 2012). Only two studies out of twelve did find a positive association between males and

drop-out. The two exceptions include the study by Walker *et al*. (2011) and Sothern *et al*. (1999). The former was a 12 month individualised US-based study with n=1080, and participants ranging from 0-18 years. The latter was a 12 month individualised study in the US over a 12 month period (Sothern *et al*., 1999), with n=73, and age range 7-17 years, mean 11.8 years. Due to the nature of the combined gender/age variable in the former study (Walker *et al*., 2011), little can be drawn from this finding while the latter (Sothern *et al*., 1999) is weak due to its small sample size.

However, in terms of programme design the study by Sothern *et al*. (1999), which was a multi-disciplinary clinical trial though not family-based, was focused on actual diet and on actual progressive moderate aerobic physical activity for the child, rather than just education or psychological interventions about physical activity. The actual level of PA marks out this study from the others as other studies had only education and monitoring about PA (Chen *et al*., 1993; Barlow & Ohlemeyer, 2006; Braet *et al.*, 2010; de Niet *et al*., 2011) or lower levels of activity such as one weekly group PA session (Tershakovec & Kuppler, 2003; Cote *et al*., 2004; Zeller *et al.*, 2004). Only research by Jelalian *et al*., (2008) of 67 13-16 year olds, with a mean 14.5 years, incorporated actual regular PA incrementally into the study, but unlike Sothern *et al.* (1999) found no association between gender and drop-out.

Again, however, the comparison is difficult as each study used differing definitions and measurements or omitted key information. For instance, Sothern *et al.*, (1999, p. 578) defines "moderate intensity as 45–55% of volume of oxygen consumed at maximal exercise effort [VO_2 max]," whilst Jelalian *et al*. (2008) vaguely states that PA increased to a minimum of 30 minutes aerobic exercise, 5 days a week, in their 4 month study. No data is given as to what point in the programme this occurred or what percentage of participants this change affected. Indeed, although participants were separated into two groups – those who participated in the aerobic exercise against those who participated in outward-bound activities – an analysis of attrition by varying type/quantity of PA is not presented. Thus, it may be that further research, which specifically explores the relationship between regular actual exercise and attrition, is required. It, too, has been previously reported that there is an association between PA and gender, with girls least motivated to participate in PA (Goran *et al.*, 1987) and more prone to a sedentary lifestyle than boys (Myers *et al.*, 1996) (see Section 1.4.1). However, future research also must address the issues which Sothern *et*

al. (1999) also explicitly highlight i.e. the need for agreed guidelines on intensity, duration, frequency and type of exercise for childhood obesity interventions, and which in 2015 appear to still be outstanding. So, despite much research, few studies have found gender to be a predictor of attrition.

1.9.1.3 BMI

Children's baseline weight status (e.g.BMI) was examined in thirteen of the studies in table 1.2 (Tershakovec & Kuppler, 2003; Cote *et al*., 2004; Zeller *et al.*, 2004; Van der Akker, 2007; Jelalian *et al*., 2006; Skelton *et al*., 2008; Vignolo *et al.*, 2008; Sothern *et al*., 2009; Braet *et al.*, 2010; Williams *et al*., 2010; de Niet *et al.*, 2011, Savoye *et al*., 2011; Walker *et al*., 2011). Of these, ten determined children's baseline weight status was not predictive of drop-out (Tershakovec & Kuppler, 2003; Cote *et al*., 2004; Zeller *et al*, 2004; Skelton *et al*., 2008; Vignolo *et al.*, 2008; Sothern *et al*., 2009; Braet *et al.*, 2010; Williams *et al*., 2010; Savoye *et al*., 2011; Walker *et al*., 2011).

Three clinical-setting studies did, however, find a relationship. Two were both Netherlands-based (Van den Akker *et al*., 2007; de Niet *et al*., 2011), and after measuring child height and weight reported that children with higher baseline BMI SDS (standard deviation scores) were more likely to discontinue care and had a significantly higher baseline BMI than those who continued with care. In both cases, height and cut-offs were applied using the Growth Analyser 3.5 software (Dutch Growth Foundation). This finding is further supported by the US-based research by Jelalian *et al*. (2006) which measured height and weight and then calculated BMI (kg/m^2).

However, comparison of results in relation to weight, height and BMI is also difficult. This is also due to the lack of standardised definitions and procedures, as well as omissions of these details in reported methodology. First, research highlights the difficulty in comparing study results as there is a lack of consistency in the procedures employed to measure the height and weight of children. According to the Standard Operating Procedures presented by the National Child Measurement Programme, the practitioners are required to follow a standardised guideline for these measurements. Some of the requirements include that measurements should be carried out in a quiet and well-lit room, a Leicester height measure record should be used to the nearest millimetre, Class III weight scales should be used to record weight to the nearest 100gms, and centiles should be calculated and recorded on data collection sheets or on SystemOne. Multiple studies do not clearly

explain whether any standard procedures were adopted. Braet et. (2006) conducted a study to identify the predictors of weight loss among children however the study does not present the methods utilised for measurements. Similarly, de Niet et al. (2011) and Walker et al. (2012) found that the children they studied were measured in terms of BMI but they fail to explain the procedure(s) used for measurement. Among several studies reviewed, the studies by Savoye et al., (2011) and Williams et al. (2010) were among the studies which properly explained the procedure for measurements and it was in compliance with the SOPs presented by NCMP. Zeller et al. (2004) merely mentioned that the measurements were done in accordance with standardised measurement protocols, however they did not mention the details of measurement.

Thus, it has been higlighted that no universal procedure or standardised tools for measuring height and weight have been applied (See table 1.2). This is despite the establishment of guidelines. For instance, Van den Akker *et al.* (2007) used a digital scale (SECA, Germany) to measure weight but do not report on what participants were wearing; whilst Jelalian *et al*. (2006) report using a pean scale to measure weight with participants wearing street clothes minus shoes, and de Niet *et al*. (2011) do not report on the tool used to measure weight nor what participants were wearing.

Secondly, as has been mentioned, the BMI SDS measures vary by national cut-offs for varying national populations. This makes it difficult to compare even when studies in varying national settings use the same measure. So, while Vignolo *et al*. (2008) do use BMI SDS in their research, the cut-offs are based on the UK Reference 1990 Growth Chart (Cole et al., 1998); whereas Zeller *et al*. (2004) uses the BMI SDS based on the cut-offs from the US Centre for Disease Control (2000). Moreover, other studies chose instead to use raw BMI measures, BMI (kg/m^2) (Sothern *et al*., 2009; Braet *et al.*, 2010; Savoye *et al*., 2011; Walker *et al*., 2011) instead of BMI SDS. This again reduces the validity of comparison of results, and creates a difficulty in generalising from these results.

Additionally, there are further methodological issues regarding the competence of those who take these measures with some studies using qualified health-care professionals, and others having lay personnel. Moreover, this inconsistency is further compounded by a reporting omission over who actually took the measurements. For instance, in these three studies due to the clinical setting it may be assumed that it was a health-care professional who took these measurements but again this is an assumption as it is not explicitly stated.

Additionally, there is no measure provided as to the efficacy of training when provided to lay personnel. Overall, though, it can be said that the majority of studies examined found that child BMI was not a predictor of attrition.

1.9.1.4 Psychosocial status

So far no clear psychosocial factors have been identified as essential for programme adherence or specifically attrition. This suggests a complex myriad of interconnecting variables (Dalton *et al*., 2008; Fudlestad *et al*., 2008), though some suggest a prevention focus may foster programme retention over time (Greca, 2007; West *et al*., 2008).

Eight studies in table 1.2 examined the psychosocial factors in relation to attrition (Zeller *et al.*, 2004; Gesell *et al*., 2008; Gray *et al*., 2008; Jelalian *et al*., 2008; Vignolo *et al*., 2008; Braet *et al*., 2010; Williams *et al*., 2010; de Niet *et al*., 2011). Four of these found an association (Zeller *et al., 2004; Gray et al., 2008;* Braet *et al*., 2010; de Niet *et al*., 2011); while the other four did not (Gesell *et al*., 2008; Jelalian *et al*., 2008; Vignolo *et al.*, 2008; Williams *et al*., 2010).

These conflicting findings can be further explained by the lack of standardisation in definitions, measurement tools, procedures and measures of both attrition itself (see table 1.1) and psychosocial factors (Murtagh *et al*., 2006; Skelton *et al*., 2010). For instance, Zeller *et al*. (2004) used the Behaviour Assessment System for Children (BASC_PRS) ages 6-18 years and the BASC-SRP ages 8-18 years (Reynolds, 1992) and the respected Symptom Checklist 90 Revised (Kovacs, 1992), the Children Depression Inventory (Kovacs, 1992), and the Self Concept Scale (Piers, 1984). Researchers then combined child and parental reporting to comprehensively measure psychosocial factors (Zeller *et al*., 2004). In contrast to this battery of assessments, de Niet *et al*. (2011) used only a single parent-rated rating scale for 4-18 year olds, called the Child Behavioural Checklist (CBCL). The latter well-regarded tool was also used by de Braet *et al*. (2010) but in the Dutch version (Verhulst *et al.*, 1990), which showed satisfactory test-re-test, predictive and construct validity. Not only are varying tools used across studies with differing validity but even within the same study differing versions of measurement tools are used to reflect the psychological developmental stage of the child. For instance, Braet *et al*. (2010) uses the Self-Perception Profile for Children (SPPC) (Harter, 1985: Dutch version: Veerman, Staathof, & Treffers, 1994) and the Self Perception Profile for Adolescents (SPPA)

(Harter, 1988) for child self-reporting. So, again, the validity and reliability of measures comes into focus as well as the standardisation of definitions and tools.

As a consequence of this non-standardisation, it is not transparent which variables have been considered when evaluating psychosocial status, with different tools focusing on differing elements and using different terminology. Some research, for instance, indicates there is evidence that the impact of peer pressure influences individual attitudes, and motivation-to-change, especially towards engagement in physical activity, and continuity in the weight management programmes (Gesell *et al*., 2008). This finding was obtained as a result of using a validated self-rating scale in children 8-12 years that had been developed and piloted in an earlier study by Saunders (1997), based on the theory of reasoned action (Fishburn, 1980) and Social Cognitive Theory (Bandura, 1986). However, in a study supportive of this finding a different measurement tool was used. Gray *et al.* (2008) reported that teasing, bullying and exclusion by peers can become barriers to programme adherence. This is because it can result in reduced self-efficacy, lowered self-worth and reduced confidence, which have all been found to contribute to drop-out rates (Gray *et al.*, 2008).This study used the respected 25 item child self-rating Schwartz Peer Victimization Scale (Schwartz *et al*., 2002) in children aged 8-17 years, supported by the well-established ten-item rating scale Child Depression Inventory short-form (CDI-SF) (Kovacs, 1992). However, peer pressure is not directly mentioned in any other research studied in the context of psychosocial status.

Even if issues of standardisation, validity and reliability of measurement tools are set aside, results are still problematic. If research which uses the same tool is examined, then it is evident that other components of the treatment intervention differed, making comparison invalid. For example, Vignolo *et al*. (2008) – like de Niet *et al.* (2011) – used the parental-rating (CBCL); but unlike de Niet *et al.* (2011), they instead found that psychosocial factors were not a predictor of drop-out. In the study by Vignolo *et al*. (2008) the intervention type, sample size and the age range were different from the study by de Niet *et al.* (2011), so even when the same tools are applied different outcomes are possible.

Further, there is no stated standardised practice and procedures for who administers such measures and what procedure is followed. Self-reporting is already questioned in terms of validity due to the dangers of people pleasing, exaggeration or distortion (Donaldson, 2002); due to the social stigma involved, and the sensitivity of the topics, this is

particularly the case in measuring psychosocial factors (Jones *et al*., 2011). Gray *et al*. (2008) report that a researcher in the paediatric obesity clinic was available to support participants in completing questionnaires but it is unclear the exact methodology employed. This omission is problematic as with such a sensitive topic this could have influenced reporting, such as through the extent of privacy availed, the level of researcher training or qualification in counselling, or whether or not the parents were present when the child completed the forms. Procedures for the administration of these psychosocial measurements are often minimal or unreported (Gesell *et al.,* 2008; Gray *et al*., 2008; Jelalian *et al.,* 2008; Vignolo *et al*., 2008; de Niet *et al*., 2010; Williams *et al.,* 2010). The latter point also brings up the further methodological issue of who was actually reporting: the child (Gesell *et al.,* 2008; Gray *et al*., 2008; Jelalian *et al.,* 2008), the parent's perceptions of the child (Vignolo *et al*., 2008; Williams *et al.,* 2010; de Niet *et al.,* 2011) or a combination of child and parental perceptions of the child (Zeller *et al.,* 2003; Braet *et al.,* 2010). This variation also brings into question the validity of results (Spruijit-Metz, 2006). Self-reporting scales are usually not advised before the age of 8 years, and so impact on methodology used (Shaw *et al.,* 2011); thus researchers must make decisions over the age range within the sample, the measurement tools chosen and methodology employed. Again inconsistency of results occurs, with half of the studies identifying psychosocial factors as a predictor of attrition

1.9.1.5 Child recognition and concern

Furthermore, there is some evidence that children may experience an unrealistic optimism resulting in a delay in understanding the health risks they face from being overweight or obese, and a subsequent lack of comprehension of how these risks may affect them. This psychological position is reflective of the child's lack of personal life experience but may result in a lack of motivation to change (Rhee *et al.,* 2005). So, it may act as a barrier to adherence to a treatment programme, and so impact on attrition (Zeller *et al.,* 2010). Also, past experience of unsuccessful weight-management programmes can further inhibit the child's intrinsic motivation and negatively impact on efforts to manage their weight both in the present and in the future (Barlow *et al*., 2002). In fact, adherence, and therefore attrition, is not only impacted by participant insight to the problem and its consequences, but also by degree of overweight/obesity itself (Scoular, 2010). Despite these findings, however, none of the studies which focus on attrition examined recognition by the child of their own weight issue as a possible factor in programme attrition.

1.9.1.6 Child motivation and readiness-to-change

In studies regarding child motivation terminology can vary with some researchers using the term readiness-to-change instead of motivation. Not only do definitions of motivation vary, so too do measurement tools. Obesity, in particular, is linked to distorted thinking and behaviours, this can also result in performance anxiety, especially as regards to PA despite child preferences (Gottleib & Chan, 1985; Sallis *et al.*, 1988; Anderssen & Wold, 1992; Wold & Anderssen, 1992; Vilhjalmasson & Thorlindsson, 1998). Ultimately, these perceptions can reduce maintenance of interventions and so impact on programme adherence, resulting ultimately in attrition (Davison *et al*., 2008; Libbey *et al*., 2008). Variation has also been found, for example, in motivation by gender: with boys being motivated by improved performance while girls usually were motivated by enhanced appearance. These differing motivations among different groups require, therefore, a differentiated approach in developing and selecting participants for interventions, and in promoting adherence and avoiding attrition (Reid *et al*., 2009; de Niet *et al*., 2011). They also suggest the further need to study the relationship of child motivation to attrition. Instead, studies on child motivation have primarily instead focused on how child motivation impacts upon treatment outcome.

Even so, few treatment programmes have reflected on motivation levels, such that one systematic review reports key mismatches by programme designers between child identified PA levels and interests, and the content and structure of many interventions (Brunton *et al*., 2005). In those studies which have examined programme attrition, child motivation was explored in a limited capacity quantitatively. For instance, Braet *et al.*, (2010) found there was no association between child motivation and attrition; while Cote *et al*. (2004), Barlow and Ohlemeyer (2006) and Kitscha *et al.* (2009), respectively, found this association qualitatively

1.9.1.7 Quality of Life (QoL)

Quality of Life (QoL) encompasses physical, emotional, social health and school functioning of the child (Varni, 1998). From meta-analysis (Ui-Haq*et al*., 2013) and another systematic review by Griffiths *et al*. 2010, it has been proved that obesity affects health-related QoL (HRQL) of youths from developed countries. For instance, Hughes *et al.* (2007) in a UK pair-wise comparison study found that a total physical/psycho-social health score was lower amongst 71 severely obese children compared to 71 lean weight

children. This study examined obese children in Scotland (≥98th centile) using the Paediatric Quality of Life (QoL) (UK version 4) self-administered to parents and children 8-12 years; with an interview to children 5-8 years to assess physical, social, emotional and school function. This research suggests that QoL was lower amongst severely obese children. Another UK study (Riazi *et al*., 2010) looked at obesity QoL health impacts using the PEDS QL (UK version) with a clinical sample of 96 obese youths compared to 444 healthy school-age youth aged 5-16 years in a mixed ethnic sample. The obese children had reduced QoL results in all PEDS domains (p-value<0.005) with a mean total PEDSscore of 67.4± 15.3 compared to the healthy children, with a mean total score of 78.3 ± 11.3 This study recommended that QoL be examined in all childhood obesity interventions. However, no study has considered if there was a relationship between QoL and programme attrition.

1.9.2 Parent and Family Characteristics

Generally, studies have found that the involvement of parents in the programme supports adherence (Jackson *et al*., 2005; Mamum *et al.*, 2005; Rice *et al*., 2008; Tyler & Homer, 2008;Paez*et al*., 2009; Pott *et al*., 2009; Thomas & Irwin, 2009; Yackobovitch-Govan *et al*., 2009). Family-based interventions that involve positive reinforcement (small attainable goals and 'victories' are strong motivating tools) and highlight sensible and co-ordinated goals for both parent and child have the greatest chance of success (Sachiko *et al.*, 2002); as well as those parents who bolster child self-and body image in addition to goal attainment (Hertzler, 1981). On a warning note, however, McLean *et al*. (2003) actually note that adverse parental involvement may impact on programme adherence and attrition.

1.9.2.1 SES

The barriers to treatment success and attrition are sometimes related to socio-economic factors (SES), such as race/ethnicity as reported in studies in table 1.2 conducted respectively by Tershakovec and Kuppler (2003), Zeller *et al.* (2004), Jelalian *et al*. (2008) and Heinberg *et al.* (2009). However, when other definitions of SES are examined then the case is not so clear. For instance, parental marital status was found by Zeller *et al.* (2004) to be a predictor, whilst income levels, educational levels and the number of parents to a household were each respectively found to be predictors of attrition in a study by Williams *et al*. (2010).

Four of the five studies in table 1.2 that explored SES indicated that it was not predictive of attrition (Cote *et al*., 2004; Jelalian *et al*., 2008; Braet *et al*., 2010; de Niet *et al*., 2011). Additionally, Skelton *et al*. (2008) determined that there was no association between single or dual parent households and attrition. These findings highlight the difficulties of comparison due to varying definitions of SES. So far, ethnicity seems to be consistently reported as a predictor whilst other definitions are little researched and their findings inconclusive.

1.9.2.2 Parent weight status

It is necessary here to analyse factors behind family attrition in weight management treatment programmes so that real causes may be unearthed. Six of the eight studies in table 1.2 that explored parental weight status with attrition found an association. In fact, Jelalian *et al.* (2008) in their behavioural-intervention in a randomized-control trial of 76 adolescents between 13-16 years found that higher parent and adolescent BMI at baseline were linked with attrition rates, and concurred with findings in studies by Elakim *et al*., (2004), Deneszer *et al*. (2004), Zeller *et al.* (2004), Barlow and Ohlemeyer (2006) and Heinberg *et al*. (2009). Only two studies that examined parent baseline weight status (e.g. BMI) found that it did not predict drop-out (Vignolo *et al*., 2008; Braet *et al.,* 2010). Thus, the majority of studies in table 1.2 concurred that parental BMI is a predictor of attrition.

1.9.2.3 Parental psychosocial status

Only one study in table 1.2 explored the relationship between attrition and parental psychosocial status (Braet *et al*., 2010). This research found an association between parental psychosocial variables and attrition, revealing that parents of children who completed the treatment reported significantly higher motivation for treatment at intake. However, parental psychological distress was reported not to be significantly associated with drop-out in two other studies (Zeller *et al*., 2004; Williams *et al*., 2010). Clearly, this is an area that requires further investigation as it has received so little attention, despite it being identified as a predictor of attrition in this one study.

1.9.2.4 Parental feeding style

Association between child obesity and parental feeding style has already been found in two UK-based studies (Birch *et al.,* 2001; Carnell & Wardle, 2007). It has also been acknowledged that these food-related feeding habits, started in childhood, often are maintained into adulthood and beyond (Wills *et al.,* 2005; Huley *et al*., 2011). The Child

Feeding Questionnaire (CFQ), in particular, is a useful common measure that can determine the nature of a parent's child feeding practices, and the subsequent influence on child feeding habits and weight (Faith *et al*., 2004; Spruiji-Metz *et al.,* 2006)). Its scope encompasses when the child is fed, the frequency, the quantity, the setting, the types of food (Birch *et al*., 2001), as well as the wider family context, such as parental feeding habits, as these inform the child's feeding behaviours (Smith *et al.,* 2010). Despite being identified as a predictor of obesity, however, no study examines this in relation to attrition. Future research into this area is therefore required to explore if such a relationship exists.

1.9.2.5 Parental recognition and concern

In their systematic reviews of differences between parental perceptions and actual child weight status, Parry *et al*. (2008), Doolen *et al*. (2009), Towns & D'Auria (2009), and Marloes *et al*. (2013) found that parental recognition of their child's weight status in particular is weak and unreliable. While parents may have a generalised knowledge of the causes of obesity being linked to a combination of healthy eating, regular physical activity and its psychological dimension (Heskeith *et al*., 2005; Covic *et al*., 2007; Booth *et al*., 2008; Zeller *et al*., 2008; Barry *et al*., 2009; Thomas & Irwin, 2009), some have difficulty relating this to a family context (Fisher *et al*., 2006; Jefferson, 2006; He & Evans, 2007; Godell *et al*., 2008; West *et al.,* 2008; De La O.A. *et al.*, 2009; Doolen *et al*., 2009; Manios *et al.,* 2009). For instance, it has been reported that between a quarter to two-thirds of parents do not recognize overweightness in their child, regardless of their socio-demographic background**,** though focus on BMI monitoring and feedback can address this oversight (Fisher *et al*., 2006; Jefferson, 2006; He & Evans, 2007; Godell *et al.,* 2008; West *et al.,* 2008;De La O.A. *et al.*, 2009; Doolen *et al*., 2009; Manios *et al.,* 2009). Yet parental signposting of the need to change weight status, affirming the need to change, is critical to children's adherence to a programme (Murtagh *et al*., 2006). Despite parental concern, parental readiness-to-initiate change in their overweight children (Rhee *et al*., 2005) can be restricted by parental fears (Bolling *et al.*, 2009; Booth *et al.*, 2009) about undermining self-esteem, even triggering "anorexia", as well as an avoidance of blame and guilt (Jackson *et al.*, 2007). It has also been found that parental response to long-term health consequences for their children are linked to their own health expectations (Reid, 2009) along with their own past experiences of weight issues and treatment success (Murtagh *et al*., 2006). So, emphasis on real life experiences and positive parental and family role models, who have succeeded in weight management themselves, is advised to

tackle child unhealthy weight and promote programme adherence (Murtagh *et al*., 2006; Scoular, 2010). Indeed, children who lack self-belief, and have experienced social exclusion, are even more dependent on the role of family for emotional support to boost motivation, reinforce self-efficacy belief, and so impact on programme adherence as well as an actual successful outcome (Zeller *et al*., 2004; Murtagh *et al*., 2006). For instance, studies indicate that participation of brothers and sisters and friends encourage participation and retention of children and adolescents in healthy weight activities (Paxton *et al*., 1999; Murtagh *et al*., 2006; Thompson *et al*., 2007; Paez *et al*., 2009; Salvy *et al*., 2009).

1.9.2.6 Parental motivation

Only one study in table 1.2 examined parental motivation in relation to attrition. Cote *et al.* (2004) reported that low parental motivation for treatment remained a significant predictor of attrition (p-value<0.005). Murtagh *et al.*(2006); and Braet *et al*. (2010) respectively confirmed this qualitatively. This was further supported in a study by Gunnarsdottir *et al.* (2011) of 84 parents (p-value=0.003) which examined the relationship between motivation and attrition. These findings suggest a need for further research in this area.

1.9.2.7 Parental expectations

Four studies in table 1.2 identified qualitatively that participants in the study dropped-out primarily because the programme did not meet family needs, wants & expectations (Cote *et al*., 2004; Barlow & Ohlemeyer, 2006; Braet *et al.*, 2010; Hampl *et al.*, 2011). However, this predictor has received little research attention and so findings are still inconclusive (Barlow & Ohlemeyer, 2006).

1.9.2.8 Family dynamic

This family dysfunction or lack of cohesiveness can translate into a negative parental predisposition towards the issue and/ the programme, resulting in limited family support for the child in the treatment programme (Epstein *et al.*, 1994; Story *et al*., 2002; Barlow & Ohlemeyer, 2006; William *et al*., 2010) (see table 1.2). Indeed, poor family dynamic may result in or be affected by the psychological state of the child themselves (Barlow & Ohlemeyer, 2006; William *et al*., 2010).

In other research, McQuaid *et al*. (2003) studied the uptake of personal responsibility for treatment in the transition from parent to child as the child grew, and the research

concluded that the complexities of family dynamics have a pivotal role to play in terms of treatment adherence and resultant attrition (McQuaid *et al*., 2003). In fact, research reveals that type of parenting support is also a factor. For instance, hierarchical parent-child relationships, implementation of rules and boundaries, family cohesiveness and a parental fostering of independence and personal responsibility within the child have been found to generate lower attrition and higher retention (Scoular, 2010). In contrast, one review of treatment programme follow-up factors found that family conflict, as evidenced by poor communication and disengagement, resulted in poor treatment outcomes (Fiese & Everhart, 2006). Further, the structure of individual families is also reported to impact on success of interventions, with the traditional two-parent family being able to afford more time and involvement than divorced or single parent families (Muller *et al*., 2005).

The issue of family involvement is significant and the level of involvement may vary, dependent on the structure of the programme. Indeed, Kitscha *et al*. (2009) report from their 6-12 month study of 152 participants that the logistical components of the programme, the location and environment are also linked to attrition rates. This suggests that satisfaction levels with the structure and management are important to maintain attendance levels. Furthermore, Brownell (1984) and Flodmark *et al*. (1993) have shown that raised family involvement in interventions does significantly enhance weight control, maintenance and loss. However, there is also an impact on attrition levels. Irrespective of the structure of the programme, it is generally the case that the parent is needed in giving permission to treatment; transporting the child to and from the treatment programme; preparing and serving appropriate food; and, monitoring and recording child food diaries and other programme documentation. Without such input the treatment programme is more likely to fail and/or patients drop-out (Barlow & Ohlemeyer, 2006; Williams *et al.,* 2010). Drop-out can happen since much of this does not occur or does not occur consistently with all parents in all cases. Goldberg and Kiernan (2005) and Zeller *et al*. (2004), in their respective studies, concur with research by Barlow *et al.*(2002), Reinehr *et al*. (2002) and Cote *et al.* (2004) (refer to table 1.2) that quality of parental care is significant, and for the former, this translated to practicalities, such as family reminders, patient contracts and clinic orientation programmes, all of which result in increased participation.

Other studies have found that family conflict, neglectful relationships, family focus on the child rather than other family attributes, weaker family cohesion and organisation may

inhibit programme participation and result in attrition (Trombini *et al.*, 2003; Golan, 2006; Daltman & Kitzmann, 2008). So, the quality of parenting and of family interactions are significant with several adverse factors being identified in relation to programme attrition including: maternal depressive symptoms, parental weight gain, parental external locus of control and unhealthy attachment dynamics within the family (Mamum *et al*., 2005; Haines *et al.*, 2008; Pott *et al*., 2009.)

1.9.2.9 Family function

Only two studies in table 1.2 examined family functioning in relation to attrition, and found contradictory findings (Williams *et al*., 2010; de Niet *et al*., 2011). De Niet and colleagues (2011) used the valid and reliable Family Adaptability and Cohesion Evaluation Scales (FACES) (Olson, 1986) in its Dutch version (Buurmeijer & Hermans, 1988) and found families who did not report a rigid adaptability structure (characterized by authoritarian parenting, and very strict rules) were more likely to drop-out. Williams *et al.* (2010) used the newer version of FACES (Olson, 2011), which revealed contrarily that family rigidity and chaos were not associated with attrition. Rather, these investigators (Williams *et al*., 2010) revealed family disengagement (characterized by close family boundaries, avoidance, an inability to ask for help from one another, and disloyalty) was associated with drop-out. This measure was not addressed by de Niet *et al*. (2011) due to the differences in the versions of FACES applied. As a consequence, the research in this area is very limited and the findings as yet inconclusive.

1.9.3 *Programme Characteristics*

Adherence is affected by how well the programme matches the needs, wants and expectations of both the participant and their family. Yet this is not always in the control of the programme developer as funding issues impact on the structure of the programme, and its duration. This impacts the ability of the programme providers to provide the range of services and qualified staff which are perceived to be essential by participants and their parents (Po'e *et al*., 2010). Recruitment efficacy also may impact on the programme efficacy and its attrition rates. A variety of sources can refer participants to programmes, including school nurses (Moyers *et al*., 2005), multidisciplinary paediatric care providers (Flower *et al*., 2007) and GPs (Whitaker *et al.*, 2004). Poor participation rates and the effectiveness of the referral process itself have also been factors in the effectiveness of family-based interventions themselves (Po'e *et al*., 2010).

However, beyond issues of programme structure and duration, there is also some evidence that the content and tone of consultations regarding their child's weight issues do not meet parental expectations (Flower *et al*., 2007). Research suggests that programme developers and those who run programmes fear lack of knowledge about employing behavioural interventions and parenting strategies, including conflict resolution, and taking and tracking BMI measurement (Whitaker *et al*., 2004; Hearn *et al.,* 2007; Dettori *et al.,* 2009). Professionals themselves identified lack of counselling skills for motivational purposes as being associated with effective maintenance of interventions and reduced drop-out (Story *et al*, 2002; Perrin *et al*., 2005, Forman-Hoffman *et al.,* 2006; Hammed *et al*., 2010). In practice, there are issues around accessibility to BMI charts, and uncertainty about treatment effectiveness (Scoular, 2010). This ambivalence may communicate to parents who report a wide range of health professional attitudes and levels of emotional support from being sympathetic, to disinterested, to maternal blame. This suggests the need for greater self-awareness, understanding and empathy towards childhood obesity by professionals (Edmunds, 2005) as well as a need to address identified skills and knowledge gaps (Story *et al*, 2002; Perrin *et al*., 2005; Forman-Hoffman *et al.,* 2006; Hammed *et al*., 2010). These challenges may also indicate a resistance to professional participation and a need to improve readiness to deal with the childhood obesity problem (Whitaker *et al.,* 2004).

Attrition reduces when programmes have been designed to consider knowledge and awareness levels, suitability for the parent or child, and sorts of physical activity (Borra *et al*, 2003; Dalton *et al*., 2008 Fuglestade *et al*., 2008; Gesell *et al*., 2008; Jelalian *et al*,. 2008, Goldfield, 2009). It is important that the child perceives the programme to encourage participant autonomy, and views it as a 'fun' experience that promotes socialization with peers (Wilson *et al*., 2005; Deforche *et al*., 2006). In general, coaching and motivational counselling were seen as pivotal, but these terms were not clearly defined (Alm *et al*., 2008).

Further, ongoing support was determined as an effective motivator (Chen *et al*., 2005), which is demonstrated to both parents and children through use of achievable, scaffolded goals as a pathway to success. Following on from this, one simple step has been found to be significant to attrition by Deforche *et al*. (2005) that could be integrated into programme

design to minimize attrition. This is to maintain contact by telephone during the summer holidays or programme breaks. This would ensure more sustained ongoing support.

Five studies from the table of evidence (see table 1.2) found a number of significant programme factors (Cote *et al*., 2004; Zeller *et al*., 2004; Braet *et al*., 2010; Halvorson & Skelton, 2011, Walker *et al*., 2011) resulting in inconsistent findings. Investigators (Walker *et al*., 2011) determined that enrolment during the summer months and a larger travel distance from the patient's residence to the clinic was predictive of attrition. However, Zeller and colleagues (2004) found that travel distance was not associated with attrition.

Cote *et al.* (2004) revealed that lower caregiver-rated quality of care of their child from the programme predicted attrition, suggesting a mismatch in parental expectations to that of programme personnel. Furthermore, having more missed appointments (Halvorson & Skelton, 2011) was significantly associated with drop-out. This pattern of non-attendance was attributed to low interest as a result of mismatches between the programme and parent/child needs, wants and expectations (Halvorson & Skelton, 2011). However, expectations of group treatment and treatment history were found not to be predictive of drop-out (Braet *et al.*, 2010).

1.9.4 *Qualitative Research on Perceived Reasons for Attrition*

Based on past research, only 5 out of 22 studies in table 1.2 explored the stated reasons for attrition (Cote *et al*., 2004; Barlow & Ohlemeyer, 2006; Kitscha *et al*., 2009; Braet *et al.*, 2010; Hampl *et al.*, 2011).

1.9.4.1 Child-related reasons

None of the studies obtained in this research were found to include stated reasons for drop-out directly from the child's perspective.

1.9.4.2 Parent and family-related reasons

Family reasons can be summarised as falling into the following three categories:

(a) Physical barriers: distance to the programme, transportation difficulties, scheduling, parking, location, and time;

(b) Family needs, wants, and/or expectations: including perceived need of treatment, child's desire to continue with the programme, expectations of programme services, and satisfaction with the care received;

(c) Motivation/readiness-to-change: family readiness to make healthy lifestyle changes.

For instance, Kitscha *et al*. (2009) conducted a qualitative telephone survey to assess reasons for drop-out in a dietician-led paediatric weight management programme. From this sample, 79% (n=11/14) of caregivers identified scheduling, parking, and location as reasons for attrition. Barlow and Ohlemeyer (2006) explored parental reasons for attrition from weight management care, showing that 21% (n=9) of caregivers outlined scheduling conflicts in general as a barrier to care. This study also revealed that 28% (n=12) of parents expressed concern over children missing too much school, and 23% (n=10) said the programme was too far from their home. Cote *et al.* (2004) completed a telephone survey of caregivers to explore their clinical experiences. Overall, 18% (n=12) of participants described transportation difficulties as significantly impacting their continuation of care. Similarly, Hampl *et al.* (2011) interviewed clinic administrators and indicated that children missing too much school (55%; n=13), transportation difficulties (59%; n=14) and the inability of caregivers to miss work (65%; n=16) were all commonly perceived barriers.

Equally, the five studies in table 1.2 that explored reasons for attrition investigated family needs, wants, and/or expectations (Cote *et al*., 2004; Barlow & Ohlemeyer, 2006; Kitscha *et al*., 2009; Braet *et al*, 2010; Hampl *et al.*, 2011). For instance, 37% of participants (n=16) described that the programme was not what they were looking for (Barlow & Ohlemeyer, 2006) and 12% (n=8) of parents indicated that the clinic did not meet family expectations (Cote *et al*., 2004). Hampl and colleagues found that clinic administrators (n=7; 36%) perceived that families experienced little benefit from the clinic programmes (Hampl *et al*., 2011). The perceived relevance of treatment was also outlined as a barrier by parents who did not complete the intervention (Braet *et al*., 2010). Furthermore, 33% (n=22) of parents reported that their child wanted to leave the programme (Cote *et al*., 2004) and 7% (n=1) described no longer needing support from the clinic as a reason for dropping-out (Kitscha *et al*., 2009).

Motivation/Readiness-to-change was addressed by two of the five studies that explored reasons for attrition (Barlow & Ohlemeyer, 2006; Kitscha *et al*., 2009). Caregivers

surveyed by Barlow and Ohlemeyer (2006) reported that they withdrew from care because their child was not ready to make changes (16%; n=7) or the family was not ready to make changes (5%; n=2). Additionally, 7% (n=1) of caregivers described motivation in general as an impediment to continuing care (Kitscha *et al*., 2009). These findings support the need to determine motivation of child and parents prior to programme commencement in order to support effective recruitment and minimise attrition.

1.9.4.3 Programme-related reasons

Five studies only from the 22 studies in table 1.2 looked at programme factors. Reasons stated fall into two categories:

(a) Costs: clinical visit costs;

(b) Programme factors: length of programme, length of visits, clinic environment, relationships with clinicians, and programme educational content.

Three US-based studies (Cote *et al*., 2004, Barlow & Ohlemeyer, 2006; Hampl *et al*., 2011) reported that the cost of clinical visits was an important reason for drop-out. In two studies, 33% (n=22) (Cote *et al*., 2004) and 21% (n=9) (Barlow & Ohlemeyer, 2006) of parents reported that they had difficulties with insurance coverage and resultant costs, which contributed to their discontinuing of care. Similarly, 23% (n=6) of clinic administrators in hospitals surveyed by Hampl*et al.* (2011) outlined that the cost of clinic visits was a perceived barrier for families. Additionally, programme structure, setting, logistics and content were mentioned in four out of the five studies that did explore reasons for attrition (Cote *et al.,* 2004; Barlow & Ohlemeyer, 2006; Kitscha *et al*., 2009; Braet *et al.,* 2010). For example, 14% (n=2) of caregivers outlined the clinic environment (lengthy appointments, lack of entertainment for children, small rooms), and 7% (n=1) described programme educational content (patient-focused counselling rather than family-focused, previously learned information and skills) as reasons for drop-out (Kitscha *et al*., 2009). Additionally, Barlow and Ohlemeyer (2006) revealed that 12% (n=5) of caregivers described clinic visits were too infrequent, whilst 7% (n=3) described clinic visits to be too frequent. Problems with appointment times were outlined as a reason for attrition by another study (Braet *et al.,* 2010). Lastly, 6% (n=4) of caregivers in the study conducted by Cote *et al.* (2004) reported that programme participation took too much time, and an additional 6% (n=4) reported that appointment times were inconvenient.

1.9.4.4 Summary of predictors and correlates of attrition in the literature

Consistently, adherence has remained problematic, and attrition is high (Cote *et al*., 2004; Zeller *et al.*, 2004; Saelens *et al*., 2004; Skelton & Beech, 2011). So far research has provided little insight into how to reduce attrition and improve retention. The following Table 1.3 provides a summary of predictors and correlates of attrition as identified in the literature.

Table 1-3: Predictors and correlates of attrition in the literature

Consistently predictive	Parental BMI Child Psychosocial Child Age Parental Psycho-social Family Dynamic (structure) Coaches Knowledge, Attitudes and Skills Programme Logistical factors e.g. setting, duration , timing, transport Ethnicity (SES)
Predictive in a minority of studies	Child BMI
V. limited/not researched	Gender Child/Parental Motivation Child/ Parental Recognition Parental Concern Parental Feeding Style Parental Expectation Parental Fears, blame & Guilt Family Cohesion (function) SES* (income, parental marital status, no. of parents in households, parental education levels) Programme structure Programme content and consultation

* whilst SES has been consistently found to be a predictor of attrition, when examined in more detail each study has been found to use differing definitions of the term as is listed in the table. When these sub-factors are examined then SES moves to the very limited category, except for ethnicity.

1.9.4.5 Current research study limitations

Since obesity is an ever-growing issue in many societies, non-adherence, lack of follow-ups and attrition are all required to be controlled for better intervention and to regulate obesity.

A number of factors have been consistently found to be linked with attrition in the treatment of childhood obesity. Even so, there are still methodological issues that prohibit useful comparison of results. For instance, there is a lack of standardisation of tools, procedures and methodology employed in the assessing of both child and parent psychosocial status, further complicated by differing versions of tools being used and differing participants involved in the reporting process. This tentativeness of psychological assessment is also seen in the measuring of factors such as family dynamic. This also suffers from confusion of definition dependent on the tools used. Factors related to the programme personnel and the logistics also suffer from a lack of effective reliable reflective evaluation. It may be that this requires a more in-depth qualitative approach than current studies have employed.

The challenges to any review are that there is a wide range of diverse definitions used which makes comparison difficult. This is the case with BMI where differing national cut-offs, measurements, tools, and methods of attaining measurements all conspire to make reliable and valid comparison of results ineffectual, and where procedural guidelines are not necessarily followed or reported. While a minority of studies in table 1.2 have examined BMI with attrition, none have focused on a UK population. Further, none of the studies in table 1.2 focused on severely obese children as occurs in this research. Indeed, none focused on severely obese children commencing a treatment programme. Parental BMI has been consistently reported as being associated with attrition but the same reservations to generalisation of child BMI results must equally apply to parental BMI. This is compounded as in some instances parental BMI unlike child BMI was obtained by self-report.

Socio-economic status has also reflected consistent association with attrition. However, closer examination has identified that outside of ethnicity, definitions in each study in table 1.2 have varied. Thus comparison of results is not possible. These definitions to date include income, parental marital status, number of parents in households, and parental education levels. This research seeks to include all of these factors (except ethnicity) as

well as the Scottish Government's reliable measure of SES, called SIMD code. Although child age has been found to be associated with attrition, it should be noted that most studies target a narrow and predominantly younger age group.

In addition to the reservations on generalisability and reliability on the above factors as predictors of attrition, an extensive number of variables has been found to be little researched or found to be associated with attrition in a limited number of studies. These factors all need to be explored to help determine a conclusive finding. For instance, the following have been associated with obesity only, but still require research to determine if there is any relationship to attrition: child/parental recognition and concern: Quality of Life (QoL) and parental feeding style. There is another category of factors that have been identified in a small number of studies to be associated with attrition but where the evidence is inconclusive and further research is required to support or negate these findings. These include gender, child/parental motivation; parental expectation; parental fears, blame & guilt; family cohesion; programme structure and programme content and consultation.

Moreover, varying research approaches with a multiple of variables across structure, content, setting, modality, intensity and duration make current research comparisons almost impossible. Sample size of studies varies, making the generalisability of the results at population level poor, and studies' statistical powers are consequently poor in some instances. One consequence of such a range of programme structures is that parent dissatisfaction with weight management programmes as being key to attrition rates is difficult to pin down. The little research that has been undertaken has not found definite conclusions; and this has in part been due to the difficulty in the range of programme approaches taken (Cote *et al*., 2004; Barlow & Ohlemeyer, 2006; Kitscha *et al*., 2009). In terms of programme content, structure & logistics, there have been no studies which have considered these factors prospectively, and as a consequence interpretation is hindered (Skelton & Beech, 2010).

In summary, from the current literature, there is no clarity on which families are in danger of dropping-out of weight management programmes, the factors leading to drop-out and what changes might elevate retention.

1.9.4.6 Rationale and significance of the current study

Evaluating this community-based weight management programme is crucial to identify the return-on-investment of the programme, and to identify if the programme should be supported by the government in the future. This is especially the case as this is the first evaluation of the programme since it was established in 2009. The research seeks to inform how this programme's recruitment, design and implementation can be further improved in order to increase programme retention. This research will for the first time obtain direct feedback from families about the intervention, and reasons for attrition. This will aid in evaluating the programme and provide feedback for programme improvement and sustainability. This evaluation in turn will aid in reducing the prevalence of childhood obesity in society.

Other quantitative research has tended to concentrate on either child or parent characteristics. Noticeably, there are some areas of omission in previous studies, specifically in obtaining feedback directly for participants with satisfaction levels and with family perceptions of programme quality of care. Additionally, most of the quantitative studies addressing attrition factors have used a small sample size, when in fact a larger sample is required for a wider population study to address attrition factors. This research has been carried out across varying periods, with both large and small samples. Although it is primarily quantitative, survey open-ended questions in the exit study (see Chapter 5) have allowed for some qualitative parental feedback. This research has incorporated those key factors previously identified with child weight status but not previously researched in terms of attrition, specifically parental recognition and concern, Quality of Life and parental feeding style.

Whilst current research findings are undoubtedly useful, more needs to be revealed regarding the interaction of child and parent baseline characteristics and their perception of the treatment programme. This is to promote the development of a design model that ensures that the programme adequately addresses child/parent expectations, needs and wants. Such a model requires a shift away from family treatment programmes where the child alone is the focus of the intervention towards a more sophisticated, dynamic, holistic assessment. Such a model must reflect the psycho-social aspect and the interaction between participants (child and parents), treatment programme, and the inter-relationships

of those involved, to understand the reasons treatment is successful for one family, while not so for others and indeed resulting in drop-out.

This study will utilise appropriate large-scale quantitative approaches and will employ the recommended Ecological System theory (EST) conceptual model (Skelton *et al.*, 2012). This will aid in addressing the gaps identified in terms of direct family feedback, and in so doing provide a better understanding of child and family characteristics, and parental perception of their experience with the treatment programme and so determine why some families drop out despite having the necessary resources and knowledge.

1.10 Research Purpose and Objectives

This study aims at developing a better understanding of family (child and parents) and treatment programme characteristics associated with attrition. This study will include identifying reasons therefore, in a multi-disciplinary weight management intervention. In order to address this, the research objectives are as follows:

1.10.1 *Objective (1)*

To measure family attendance patterns over the 12 week programme in order to estimate attrition and to evaluate association (if any traced) between individual level characteristics (child) and attrition by using routine data collected between June 2009 and February 2012.

1.10.2 *Objective (2)*

To determine association between familial level characteristics, specifically those related to the child's parents, and predicting attrition among families who attended between April 2012 and April 2013.

1.10.3 *Objective (3)*

To analyse family satisfaction with the treatment programme and perceived barriers in order to identify programme level characteristics which influence attendance patterns (attrition).

1.11 Design of the Research

The design of this research is based on the results of three studies over a period from (June 2009 - August 2013). The data used is collected from ACES, a family-based lifestyle change weight management programme to treat paediatric obesity in Scotland. It was developed by NHS Greater Glasgow and Clyde in partnership with local authority leisure services community. They introduced this family-based intervention programme in 2009 in different locations, with a target of accessing 650 healthy children into the programme by March 2011. During this timeframe, 477 families were enrolled and started on the ACES programme but, in fact only 286 (60%) successfully completed. Next section will give a brief background about the development of ACES.

1.12 Research Methods

The design of this research is represented in Table 1-4.

Table 1-4: Research Design

Study	Date Collection	Research Design
Study 1: NHS Routine data	June 2009 - March 2012	Retrospective (Quantitative)
Study 2: Baseline 'Entry '	April 2012 - April 2013	Parental Survey (Quantitative)
Study 3: Follow up 'Exit'	November 2010 - April 2013	Parental Survey (Quantitative)

In October 2011, ethical approval was optained from the West of Scotland Research Ethics Services Committee to conduct this research (see Appendix1). In order to generalise the findings from the research, a survey quantitative research design was developed to address the three objectives of the research, and their questions. As previously mentioned in this chapter's 'Background' and the 'Significance of the Research' sections respectively, there is little quantitative research on the influencing of child, family (parent) and programme characteristics on families (dis)engaging with family-based weight management interventions in the UK. Thus, the three studies employed in this research are based on the results of questionnaires distributed to families who registered in the ACES programme and have had one-to-one assessment with the programme coaches, for children aged 5-15 years, with a BMI in the 91-99.6th percentile. The family data (child and parent/caregiver) was collected from different CH(C)Ps: Glasgow, East Renfrewshire, East Dunbartonshire, West Dunbartonshire and Inverclyde. Each of these NHS & GGC health authorities & partnerships involved a range of different types of venue where the programme was delivered after school time. These included schools, leisure centres and /or community venues. Each individual study that forms part of the overall research has a dedicated chapter that illustrates in detail the relevant study design. Included in each chapter is further information on the study population, data collection, the development of the questionnaire and content.

1.13 Thesis Chapter Structure

1.13.1 *Chapter (1): Introduction and Literature Review*

This introductory chapter aims at setting the scene for the following chapters by giving an overview of the effectiveness of family-based lifestyle change, weight management programmes treating childhood obesity. This chapter presents a 'review of the literature' around epidemiology of childhood obesity and its etiology and consequences. A section on treatment interventions is included, with a focus on family-based interventions and changing behaviours related to obesity. This is followed by a critical analysis of the factors behind attrition according to different levels of ecological theory. Finally, the research aims and objectives are considered.

1.13.2 *Chapter (2): Introduction to the ACES Programme*

This chapter provides a background to the aims and objectives of the ACES treatment programme and an overview to its history and development. This includes examining its structure and design.

1.13.3 *Chapter (3): Study One: Routine Data Analysis*

This chapter uses routinely collected data extracted from the ACES programme database, collected during the period 2009-2012. The data analysis provided in this chapter is used to explore family attendance patterns and to determine individual characteristics that may predict attrition, using multi-level modelling techniques. This has relevance to obesity treatment, as family background is a major setting for treatment interventions targeting overweight and obese children in the community, and thus these findings can influence the effectiveness of the future design and delivery of community-based intervention.

1.13.4 *Chapter (4): Study Two: The Entry Survey*

This chapter identifies the influential factors regarding attrition by focusing mainly upon parental aspects (familial level). Data used in this chapter was collected prospectively from children and their parents who joined the programme during April 2012 to April 2013. This data was focused on parental characteristics, which can be used to achieve a better holistic understanding of the connection between different levels of ecological framework (child and parents level). These factors are divided into two main categories:

1. The larger group related to parent-level factors; and
2. A smaller group related to those at the child level. The discussion is further extended in chapter four which will also highlight the influential factors that emerged from data analysis and suggest the association between them and attrition.

1.13.5 *Chapter (5): Study Three: The Exit Survey*

This chapter identifies the influential factors on attrition, focusing upon the treatment programme aspects (Programmatic level). The goal of this chapter is to evaluate the satisfaction level over the programme, the perceived barriers, and the reported usefulness of the programme for lifestyle change, from parents' own experience of the programme. Data analysis included families who had a baseline data collected between 2010 -2013. The data collection was conducted to compare this information with family attendance (grouped into attrition categories) to help identify reasons for missing sessions or not completing the programme. Discussion of the interactions between the programmatic aspects, family satisfaction level and their baseline characteristics is important for the intervention to better meet families' expectations and to identify factors that predict family successful continued participation.

1.13.6 *Chapter (6): Discussion*

This chapter integrates the key findings predicting attrition of the three studies and analyses these in the context of the literature review and the EST model. The purpose is to gain insight into the factors predicting attrition in the UK weight management programme. Moreover, a summary of limitations and strength of the study are presented.

1.13.7 *Chapter (7): Conclusive Recommendations*

Chapter seven outlines and presents the conclusions derived in the light of data discussion and analyses. Another significant component of this chapter is a series of recommendations for the improved effectiveness of this weight management programme, including important lessons that need to be addressed to improve family engagement in obesity intervention. Suggestions for future research in this area are also provided.

Chapter 2. Introduction to the ACES Programme

2.0 Introduction: The Scale of the Problem

Globally, Scotland has one of the most pronounced childhood obesity problems (Keenan *et al.*, 2011). Reports highlight that there is a significant relationship between parental overweight/obesity and child overweight/obesity. Additionally there is a relationship between SES and the prevalence of obesity/overweight in children, although this is not deemed to be a major contributing factor. This problem poses challenges to the Scottish Government in terms of costs. For instance, obesity and related disease cost the NHS in 2001 an estimated £175 million (NHS National Services Scotland, 2007; Keenan *et al.*, 2011). These costs occur because of the co-morbidities that go along with obesity from childhood into adulthood. These include elevated risk and occurrence of chronic disorders, such as diabetes, cardiovascular disease and liver disorders (Rudolf *et al.*, 2006; Wang & Lobstein, 2006).

2.1 History of ACES

In 2009, ACES (Active Children Eating Smart), a community-based intervention, was developed and delivered by NHS Greater Glasgow & Clyde (GGC); it aimed to address the needs of overweight/obese children and teenagers aged 5-15 years.

It was devloped in response to a new HEAT (Health, Effectiveness, Access to Services and Treatment) target introduced in December 2007, aiming to tackle childhood overweight/obesity in Scotland. HEAT is an internal performance management system used by NHS Scotland (Child Healthy Weight Interventions, 2011). It sets targets that were designed to support the National Outcomes of the National Performance Framework (Scottish Executive). NHS Boards have responsibility for achieving these targets and are accountable to the Scottish Government. This HEAT target sought to address rising levels of overweightness/obesity in Scotland, both in the general population and specifically in children. This was recognised as a priority due to its association with immediate and long-term health risks (Scottish Executive). This came with funding provided by the Scottish Government to Health Boards that was used to set-up the ACES programme.

2.2 Rationale for Intervention

The Scottish Government's National Performance Framework sets out national outcomes to deliver their five strategic objectives: a healthier, wealthier and fairer, smarter, safer and stronger, and greener nation. A reduction in the prevalence of obesity is recognised as a factor influencing several of these outcomes. As there is a positive correlation between childhood obesity and obesity as an adult, the Scottish Government deemed that action must be taken to assist children and adolescents, both to avoid excess weight gain and facilitate treatment for weight gain that has already developed. Early intervention is also recognised by other policy drivers, such as "Improving Maternal and Infant Nutrition: A Framework for Action and the Early Years Framework", and a national indicator exists regarding childhood obesity. In order to tackle this growing and alarming public health issue, the Scottish Government has developed the *Route Map towards Healthy Weight*, laying out their strategy towards enabling the Scottish population to maintain a healthy weight range throughout adult life and therefore avoid the associated negative health factors of overweight/obesity. The Scottish Government's "overweight and obesity route map" (Scottish Executive, 2010) contains guidance on awareness and reduction of childhood obesity. This highlights the importance of support for families, and of community and educational contexts for positive action, in addition to preventative measures at prenatal and infant stages, such as advice relating to maternal weight during pregnancy and infant feeding. These recommendations build on existing initiatives to target child obesity, which have focused on diet and physical activity.

2.3 Guidance for Treatment Programmes

The Scottish Governement developed guidance for the new proposed weight intervention programmes in each Board area, principally based on NICE Clinical Guideline 43 Obesity: Guidance on the prevention, identification, assessment and management of obesity in adults and children'. Guidance from other sources was also utilised, such as SIGN 69 Management of obesity in children and young people, and NHS Health Scotland's Draft Commentary on NICE Public Health Guidance 6 Behaviour change at population, community and individual levels

The resulting guidance (Child Healthy Weight Interventions, 2011) defined both the components of an "approved" healthy weight intervention programme and the measures of success, in order to assist NHS Health Boards in the implementation of fresh services, or the improvement of existing ones. It recommended that treatment programmes should be designed to incorporate the following characteristics: consist of multiple components; be designed to encourage long-term behavioural change; involve the support of family and peers; be age-appropriate, recognise differences between children and adolescents; be conscious of other differentiating factors, such as gender, age, ethnicity and socio-economic background; be developed, where possible, in consultation with the target population, in order to be locally relevant; be based on solid theoretical frameworks; and focus on positive outcomes of healthy lifestyles, rather than negative impact of overweight/obesity. In order to measure the efficacy of these programmes, the guidance makes the following recommendations: goals should be set over the long term; assessment should be made in the short term, and again in the longer-term (e.g. after 1 year) following completion; a generic successful effect size (weight loss) should be avoided, due to differing sizes and growth of subjects, changes to quality of life and behaviour should be assessed; and sustainability and economic viability of programmes need to be evaluated (Child Healthy Weight Interventions, 2011). Finally, additional recommendations from the National Obesity Observatory state that all programmes should be thoroughly evaluated; should be representative of stated Scottish Government policy; and should be "enjoyable, engaging and easy to access".

2.4 Scottish Government Targets for Treatment Programmes

The design of the individual components of these interventions, and the proportion of diet and physical activity interventions, was left to the discretion of policymakers within individual Health Board areas, based on their local evidence and experience (Child Healthy Weight Interventions, 2011). However, in order to meet the HEAT target, Child Healthy Weight Interventions team were required to meet the following minimum qualifying criteria: incorporate behavioural change components, employ a family-based strategy, aim to decrease overall dietary energy intake, increase levels of physical activity and decrease the amount of time spent in sedentary behaviours (such as screen time) **(**Child Healthy Weight Interventions, 2011**).** Data collection requirements for monitoring purposes and

evaluation were also defined in the guidance (Child Healthy Weight Interventions, 2011). Success was defined as: "achieving agreed completion rates for child healthy weight intervention programme by 2010/11, [measured by] the number of children completing Scottish Government approved healthy weight intervention programmes" (Child Healthy Weight Interventions, 2011). The ambitious target required health boards to deliver approved interventions to 4% of their child overweight/obese population, equivalent to some 1400 children in GGC alone..

An integrated systems approach to child obesity prevention and management is set out in Figure 2-3. The requirement of the new Child Healthy Weight HEAT target is that NHS Health Boards deliver interventions within the context of Tier 2 above. NHS Health Boards were also encouraged to promote and support child healthy weight in the other Tiers in Figure 2-3, although this is not considered to form part of the HEAT Target (Child Healthy Weight Interventions, 2011).

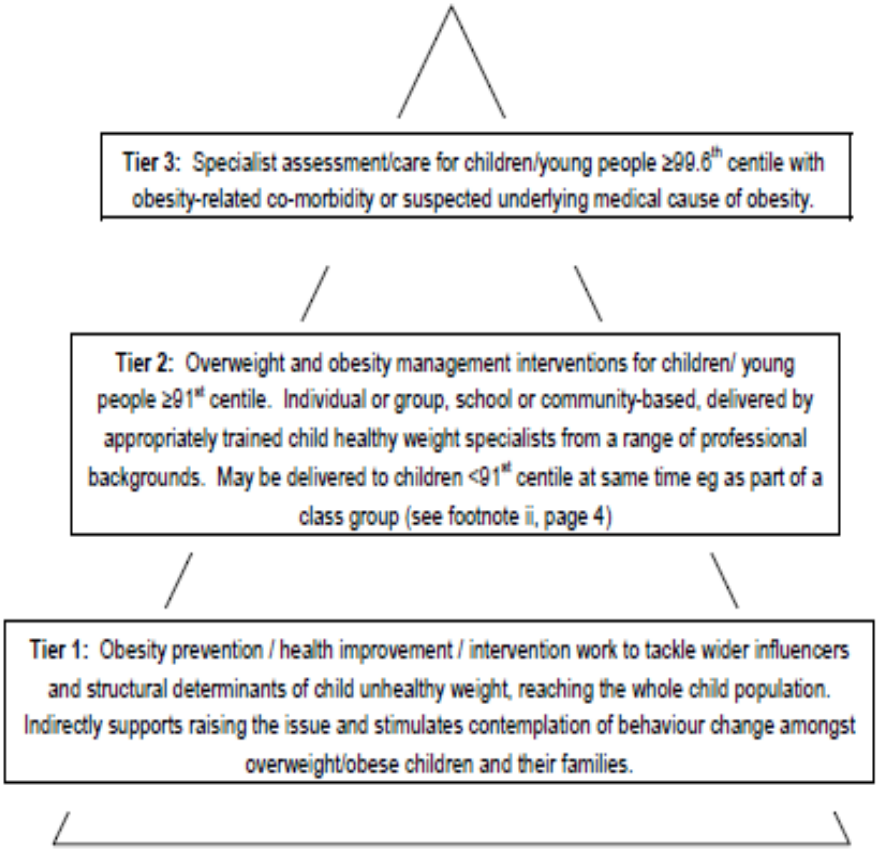


Figure 2-1: An integrated systems approach to child obesity prevention and management

2.5 The Treatment Programme Background

ACES (Active Children Eating Smart) s a community-based intervention first developed in 2009 by NHS Greater Glasgow & Clyde (GGC) to address the needs of overweight/obese children and teenagers, in line with the Tier 2 recommendations in Figure 2-3. ACES was a family-based programme; it involved at least one parent/carer and incorporates behavioural change, diet and physical activity, and the measurement of a range of parameters (height, weight, birth month and year, postcode) for each child at entry in and exit from the programme.

The programme, therefore, included components of behavioural change, diet modification and physical activity, and was developed to be family-centred. NHSGGC took the decision to initially target the most obese children (BMI persistently over 3SD) as the group most urgently in need of a service. Following HEAT guidelines (Child Healthy Weight Interventions, 2011), the key components of this programme included:

1. Delivery to children aged 5-15 years with a BMI at or above 91st centile.
2. A family-based programme, involving at least one parent/carer, that comprises a minimum of 6-8 sessions
3. Incorporation of behavioural change, diet and physical activity.
4. Measurement of a range of parameters for each child at entry in and exit from the programme (height, weight, birth month and year, postcode)
5. An attendance record for each child with a 50-75% participation rate required to qualify for completion.

2.6 Programme Development

At the time of the development of this local intervention, there were few known programmes and the evidence from which to draw learning was sparse. Therefore, individuals perceived to have expert knowledge and experience were contacted and asked to contribute to the development of NHSGGS's childhood obesity intervention. A multi-disciplinary steering group was established to track programme performance, delivery and outcomes, with representation from CH(C)P Directors (Glasgow/Non-Glasgow), CH(C)P Head of Planning & Health Improvement, GM Paediatric services, a Consultant in Paediatric Endocrinology, a Professor of Community Child Health, a Community Dietetic Team Leader, School Nursing, the Team Leader of GCWMS, the East CHCP Head of

Children's Services, a Community Children's Service Planning Manager, and a Head of Health Improvement and Inequalities Acute Planning. The team was accountable for making sure that the intervention met the NHSGGC child healthy weight target (Child Healthy Weight Interventions, 2011).

2.7 Components of the Treatment Programme

The treatment programme was developed according to Scottish Governments evidence based guidance (Child Healthy Weight Interventions, 2011) to include the four elements: assessment of lifestyle, co-morbidities and willingness to change; behavioural change; diet modification; and physical activity. It was decided that a sustainable improvement in diet and activity level should be the principal objective of the programme. The goal was not so much to lose weight, but rather to stabilise or reduce child weight as the child's height increases, causing a reduction in a child's BMI centile towards the healthy weight range. ACES programme goal was meant to educate families with the principles of healthy eating lifestyle, how to make healthier food choices and get more active. Thus, it was expected that the longer these families attended and were retained in the programme the more likely they will get confident about these healthy lifestyle skills, This will help families to help their child at least to maintain his/her weight (Child Healthy Weight Interventions, 2011).

The programme aims to aid and empower the child and their family, using a family-centred approach, to become confident in weight management. Monitoring activities (food intake and level of physical activity), educational sessions regarding food literacy and practical cooking skills, and participating in physical activity were deemed to be the vehicles for achieving the programme aim (Child Healthy Weight Interventions, 2011). The delivery of these sessions was underpinned by a family-centred approach and behavioural change methods (Child Healthy Weight Interventions, 2011). The associated resources were designed by the Director of Health & Well-Being Department along with the HEAT Target team, to provide interactive ways of delivering the sessions themselves and to fully integrate behavioural change techniques (Child Healthy Weight Interventions, 2011).

2.7.1 *Step 1: Assessment of lifestyle*

Initially, a child's lifestyle was assessed, including the diet and physical activity levels of the child him/herself and the family. Psychosocial factors such as low self-esteem and whether the child was suffering from bullying were also considered, as well as the

anthropometric measurement of physical growth and pubertal status being carried-out. Risk factors and co-morbidities were also assessed with referral to secondary care an option if this was felt to be appropriate. The child's and family's willingness to consider changing these lifestyle factors was also gauged through the Peds (UK version) Quality of Life Assessment, and later reviewed if it was determined that they were not yet ready for the intervention (Child Healthy Weight Interventions, 2011).

2.7.2 *Step 2: Behavioural change*

Underpinning this programme are interventions that encourage and assist children and their families to modify certain patterns of behaviour that exacerbate their high BMI. To this end, children and their families are therefore encouraged to reflect on the consequences of their actions in the short- medium- and long-terms, and to consider the benefits of changes to this behaviour (Child Healthy Weight Interventions, 2011). They are given support in planning an individualised strategy to gradually enact these changes, and in recognising potential situations in which these changes could be comprised and taking appropriate action to minimise this. They are also encouraged and supported in setting clearly defined goals and recording these over specific time periods, and sharing these goals with others (Child Healthy Weight Interventions, 2011).

Goal-setting was incorporated at two main points. The first goal-setting session occured at the initial one-to-one (1:1) appointment with a coach, and during the session delivery (refer to Appendix 2). The family was asked to set two goals, one for physical activity and one for food. The initial goal set at the 1:1 appointment was mainly a way to engage with the families through the discussion of their expectations and desires relating to outcomes. This discussion provided an opportunity to explore whether the initial goal expressed by the family was realistic, and at the same time encouraged a focus on adherence throughout the programme (ACES Intervention Report, 2008). They were further asked what they thought would help and the session challenged them to meet their goal. A discussion about rewards was also linked to the goal-setting (ACES Intervention Report, 2008). The goal-setting at the initial 1:1 was followed up at the second 1:1 appointment. The discussion at the second 1:1 included some reflective learning relating to what supported/challenged the families with regards to their initial goal-setting (ACES Intervention Report, 2008). The goal-setting during the session delivery focused on SMART goals. The acronym SMART can

be lengthened to S - Specific & simple, M - Measurable, A - Achievable and practical, R - Relevant to the primary goal, T - Timescale is realistic (ACES Intervention Report, 2008).

2.7.3 *Step 3: Diet modification*

Diet modification is a fundamental aspect of this programme, with a reduction in caloric intake allowing weight maintenance or loss. Dietary recommendations need to be consistent with other age-appropriate eating advice, as strict diets are not deemed to be suitable for children and adolescents under normal circumstances. Foods are not described as "good or bad" and food treats and rewards are not prohibited under the programme but are to be incorporated into a healthy and moderate diet. In addition, children and their families are encouraged to take more responsibility for the way in which they eat, through the reading of food labels, the planning of meals, shopping, and through greater understanding of food preparation and cooking methods (ACES Intervention Report, 2008).

2.7.4 *Step 4: Physical Activity Modification*

Another critical goal of the intervention was to influence change in a child's activity levels by minimising sedentary behaviour and promoting physical activity. The recommendation was 60 minutes of moderate physical activity for children and adolescents (NICE, 2007; SIGN Guidelines 2010), and the ACES programme is designed to aid participants in achieving this target (ACES Intervention Report, 2008). Gradual change was encouraged to reduce sedentary behaviours (such as TV viewing and other screen time) with the aim of reducing this time to below the recommended limit of 2 hours per day (NICE, 2007; SIGN Guidelines 2010). The programme aims to encourage active play, walking and cycling for recreation and as modes of transport, participation in sports and other active pastimes at school and elsewhere as well as raising awareness of locally-available activities and facilities (ACES Intervention Report, 2008).

2.7.5 *Step 5: Cookery*

The cookery sessions provided by ACES involve three lessons which are designed to build skills encouraging family participation i.e. under adult supervision the child follows a simple healthy recipe (ACES Intervention Report, 2008). Recipes and information during these sessions were also anchored in the traffic light system (Epstein *et al*., 2007). The food practical session focused on a different aspect of healthy eating through interactive activities and discussion, which was followed by a practical cooking session where

participants make a delicious and healthy recipe and sit down and eat together (ACES Intervention Report, 2008). The programmes have been designed by qualified dieticians and nutritionists and this aspect of the overall programme was primarily delivered by community nutrition assistants.

2.8 Treatment Programme Structure

2.8.1 *Duration*

The formal evidence-base on the optimum duration of programmes is limited (Child Healthy Weight Interventions, 2011). It draws mainly on the experience of the first phase of HEAT Child Healthy Weight interventions, on the evidence-base generated by the one-to-one SCOTT programme (Hughes *et al*., 2008), and is informed by the evidence-base underpinning the MEND programme (HEAT). The first interventions by ACES were delivered between 2009 up to 2011, sessions initially occurred over 24 weeks. The attendance data from this first target period, and those observational outcomes selected by professional and coaches who delivered ACES programme sessions, suggested a 12 week programme may improve programme engagement, and so suggested that 6 - 8 sessions of the programmes could have a significant impact on reducing BMI-SDS, improve families' understanding of a healthy lifestyle and help families to have better engagement with the programme as a result of a shorter programme duration (HEAT Team Minutes). Each individual participant's attendance had to be recorded manually by the coach, and data was later sent to the central administration office for analysis. Attendance of at least 50% - 75% of sessions mean (6-8 wks out of 12 wks) was required to enable an individual's participation to be recorded as a completion for HEAT (Child Healthy Weight Interventions, 2011). Session length is at the discretion of those designing the programme at a local level (ACES Intervention Report, 2008). However, a weekly session length of at least one hour would ordinarily be expected (ACES Intervention Report, 2008).

2.8.2 *Setting, Location and Venue*

Secondary schools were initially chosen as the most appropriate venues for programme delivery, as they could meet the needs of ACES. This was because the venue is known in the community and is a non NHS setting. Furthermore, it is available outside of school hours, with a wider range of rooms and facilities available to book to allow for programme flexibility (ACES Intervention Report, 2008). Most particularly these secondary schools would provide cooking facilities that could allow for preparation and cooking lessons as

part of the programme and there would also be a large space and other facilities/resources to allow physical activity to take place (ACES Intervention Report, 2008). However, some areas managed to locate the delivery of the programme in local leisure centres where the same conditions applied. Others managed to locate in a school close to a local leisure centre, so that the physical activity component could be carried out in the nearby facilities (ACES Intervention Report, 2008).

2.8.3 *Workforce: Coaches*

The workforce identified to deliver ACES was sport coaches (ACES Intervention Report, 2008)). It was viewed as easier to add-on nutritional training to sport coaches than sport qualifications to staff with a nutritional background. It was further believed that sport coaches were equipped with strong communication skills relating to motivation and encouragement (ACES Intervention Report, 2008). Job descriptions were developed and apart from obtaining the appropriate sporting qualification, experience working with children was essential. Advertisements were placed in mainstream newspaper (see Appendix 2) and coaches were formally recruited by Local Authorities or Culture and Sport Trusts (ACES Intervention Report, 2008).

2.8.4 *Training*

The coaches were required to undertake a 70-hour training programme. Topics addressed in the training included: the background to obesity; the extent of the problem; the challenge and evidence; behavioural change techniques and how these underpin the delivery of the components; food and diet modification based on programme content (Traffic Light System, food labelling, TOP activity, walking, sedentary behaviour); how to measure BMI and transfer to growth charts (Cole et al., 1998); child protection; IT systems and what data and information was to be collected; motivational interviewing; qualitative methods of delivering content; and, qualitative data collection (ACES Intervention Report, 2008). In addition, a three-day 'Training for Trainers' certificate addressed group facilitation skills, consisting of a three-way assessment (self, peer and facilitators) ensuring competence and suitability of coach delivery. Ten coaches completed the initial 70-hour training programme in March 2009. An additional 20 coaches undertook a second round of training in June 2009. A total of 30-40 coaches were trained between 2009-2010. Additionally, nutritional and cookery sessions were primarily carried-out by nutritionists and dieticians.

Each area had a range of 1-2 dieticians involved with coaches (ACES Intervention Report, 2008).

2.9 Recruitment and Participation

2.9.1 *Referral System*

ACES was developed for children within the age range of 5-15 years, as specified by the HEAT target. Children could be referred to the intervention through a number of sources, including identification at the general school health check during Primary 1; screening by GPs, school nurses and other healthcare professionals; however self-referrals by family or the child him/herself was mainly the source of families who joined ACES. Due to the observed association between child overweight/obesity and area deprivation an increased targeted approach at SIMD quintiles 1 and 2 was emphasised (Child Healthy Weight Interventions, 2011). Raising awareness amongst health professionals and promoting the programme in the wider community was a priority to ensure recruitment into ACES. However, communication about obesity was perceived to be a potentially sensitive and complex topic for a number of reasons. For example, professional and personal perceptions vary greatly on how to best tackle this issue as an area of intervention. As it is poorly evidence-based, policy-makers and healthcare decision-makers were aware that any intervention is, therefore to some degree, experimental in nature and achieving any sustainable lifestyle change is notoriously difficult. A communication plan, therefore, was developed centrally by the steering group, with the aim of influencing practice and experience across disciplines, to support and monitor the ongoing implementation of ACES, and to promote the ACES treatment programme in a sensitive manner to the wider community.

Information regarding the programme with associated recruitment information was developed for school nurses and General Practitioner (GP) practices. BMI centile charts using the UK 1990 Growth Reference (Cole *et al*., 1998) were included in information provided to all GPs. Schools were further informed about the programme through different local education authorities. A letter informing the parents was developed centrally through the HEAT target group, and locally amended at a school level before being distributed to all parents to children within the target age band. For instance, the numbers for Glasgow schools only totalled 64,000 letters (Child Healthy Weight Interventions, 2011).

Promotional material was developed in the form of posters, leaflets and business cards (refer to Appendix 2). This material was distributed to schools, leisure services, council buildings and GP practices. In addition, information was posted on websites of relevant public sector organisations (NHS and relevant Councils). Additionally, a DVD was developed containing four films. Two of these were aimed at families with children in primary and secondary schools, one film was aimed at GP practices and one shorter cartoon was for general use. Finally, quarterly newsletters were produced focusing on programme information, local events and motivational articles to schools and school nurses, GP Practices, and other local health and activity-related centres throughout the local area for general use (Child Healthy Weight Interventions, 2011).

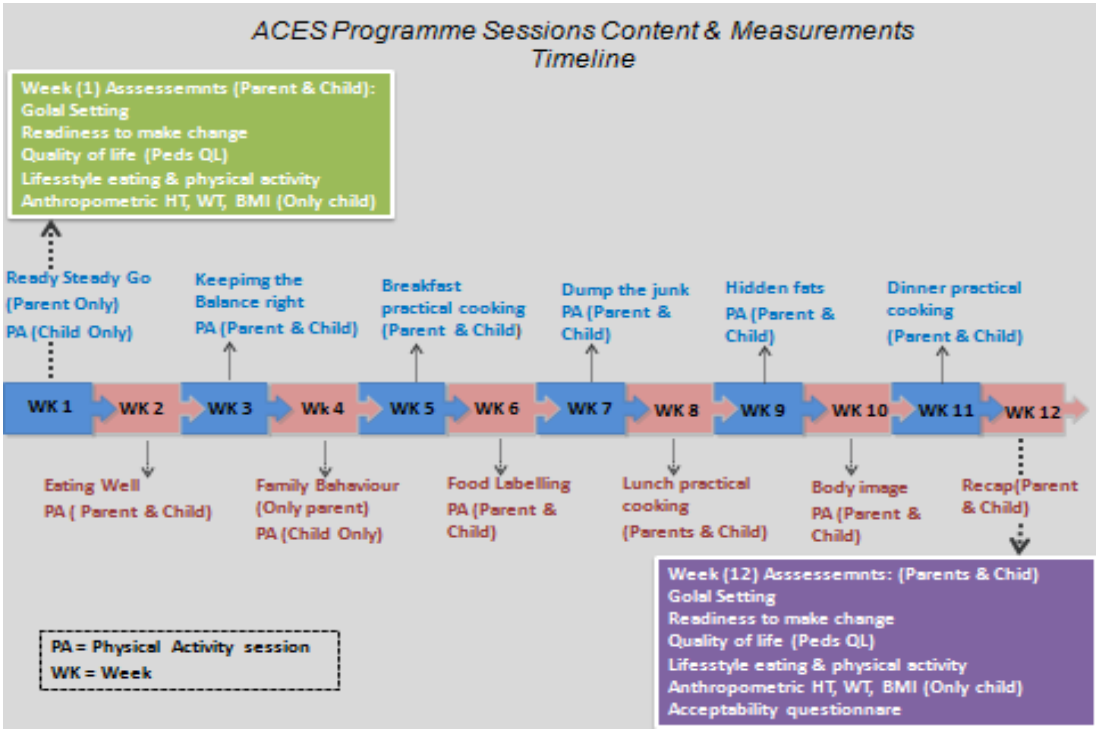
2.9.2 *Assessment and Classification of Children's Weight*

Children are considered to be eligible for enrolment in the programme if their BMI, as recorded by a trained professional such as a School, GP Nurse or GP him/herself or upon referral by the trained treatment programme coach, falls within the 91st centile or above. The latter is based on the UK 1990 age- and gender-specific growth charts (Cole *et al*., 1998). In cases where a child presents a BMI at or above the 99.6th centile (or 98th in the case of co-morbidities), the intervention is not considered to be suitable; a recommendation of referral to paediatrics is to be considered (Child Healthy Weight Interventions, 2011). Following identification of an eligible child, the intervention is then discussed with the child and his/her family. A decision is then taken for each child involved in the programme as to whether weight maintenance or reduction is suitable and realistic outcomes are identified, based on biometric, demographic and other factors (Child Healthy Weight Interventions, 2011).

2.9.3 *Contacting the Service*

ACES operated a free number service to ensure that the cost of a phone call to them was not a barrier when seeking support. Some initial personal details were collated and those contacting the programme were offered and scheduled the initial 1:1 appointment with a coach. At this meeting, they then completed the first assessment form for each family (see Appendix 2).

Figure 2-2: ACES Programme Sessions Content & Measurements Timeline



2.9.4 *Initial and 12 Week Follow-up Appointments*

All families referred to ACES were given an initial booked appointment with the coaches. The family was then given a quick introduction by the coaches, in which the coaches gave information about the programme, provided a hand-out for further reading and answered any questions (see Appendix 2). A DVD was shown (implemented autumn 2010) to demonstrate what happened during the sessions and to hear other children and adult shares their experience.

Additional and more detailed data was collected by coaches (such as a record of the child's height, weight and BMI) (see Appendix 2) within this 45-60-minutes appointment. Included in the appointment was the completion of several questionnaires. PEDS QoL (see Appendix 2), family behaviour questionnaires (see Appendix 2) and readiness-to-change questionnaires were all filled-out by the parent and child respectively (see Appendix 2).

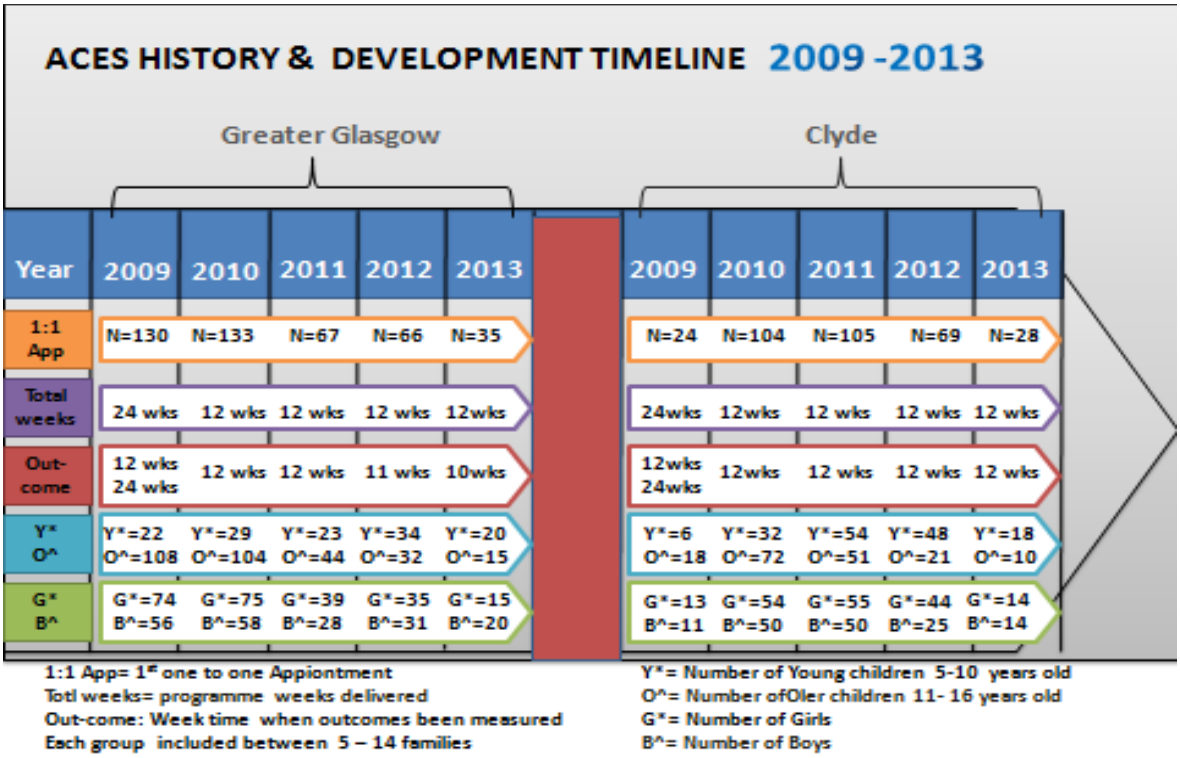
Consent was sought from the supporting adult regarding any known allergies, child participation in physical activity, adult support in physical activity, and the parental provision of supervision during practical food sessions. In the final session all children were weighed and families asked to fill the accessibility form (see Appendix 2) to give their feedback on how they felt about the services, and to record if there had been any changes in their lifestyle since they had joined the programme (ACES Intervention Report, 2008).

2.9.5 *Weekly Sessions*

Following the first 1:1 assessment, families then commenced the first 12 week programme. Each weekly session consisted of 2 x 45 minute slots (see Appendix 2). The first 45 minutes focused on informative and interactive nutritional information. This included "food labelling", the "Eatwell plate", "Eating balance", "Traffic Light System", "hiding fat and sugar" and "food size proportion". The second 45 minutes were dedicated to physical activity such as games, swimming and many other activities which were combined with the delivered healthy eating message. The supporting adult was expected to participate in the physical activities. The twelve weeks include a total of 12 sessions, and two 45-minute time slots. These sessions were augmented by weekly homework which consisted of completing the lifestyle diary, as well as by a final 1:1 assessment at week 12.

2.10 Evaluation

Figure 2-3 ACES History Development Time-Line



The programme began in 2009, covering only some areas in Glasgow. The programme was substantially modified after experience in the the first year, before the surrounding districts began to recruit. Early changes included the introduction of a DVD to show to families at the 1 to1 interview and offering only a 12 week programme, without the planned second phase of 12 weeks maintenance.

By the beginning of 2010, ACES was expanded to cover more areas in Glasgow and Clyde (Renfrewshire, Dunbartonshire and Inverclyde) (see diagram 2-3). In 2011 and 2012, when it became obvious that the number served by ACES would not meet the HEAT target, another very brief intervention programme was developed for delivery in schools (Active Choices) and this led to a relative decline in support for ACES delivery (personal communication CM Wright). However, in 2012-13 it was relaunched and the numbers joining increased again, with 63 children recruited in the first three months of 2013 alone, at which point recruitment to this study – but not the programme itself - ceased (see Figure 2-3). In addition, when we looked at the number of children who joined ACES in the first three months Jan - March of each year, we found that numbers recruited was actually increasing, compared to the year before, with 48 recruited Jan-March in 2013 compared to

26 in the same period the year before 2012. ACES continued to run in Glasgow till 2015 and in other districts to the present, but this evaluation covered families recruited only until the end of March 2013.

Between 2010 and 2011, the programme successfully targeted children age between 5-15, of both genders, and their families. These children were the most obese children (BMI persistently over 3SD) from families within the most deprived SIMD quintiles 1&2, given that these groups were most urgently in need of service (Child Healthy Weight Interventions, 2011).

Between 2009 and 2011, older children aged 11-15 were recruited. Between 2012-2014 there was a shift to more actively target younger children.

The majority (more than 50%) of the families who joined ACES were self-referred. Other referring pathways include GP doctors, school nurses and other social and community centres.

There are many study designs to choose from with which to evaluate interventions (McKee et a., 1999) but randomised trials are inappropriate for community-based programmes (Ukoumunne et al., 1999; Eccles et al., 2003; Walwyn & Wassely et al., 2005). The Medical Research Council (MRC) has developed a framework for evaluating interventions by RCTs (Medical Research Council 2000, Campbell et al 2000). The piloting of an intervention is required before commencing a more definitive RCT.

An evaluation study can be "before-and-after" in structure; this is 'a study in which characteristics of a population or a group of individuals are compared before versus after a particular event or intervention, for example the introduction of a new healthcare service, to gauge what the effects of the event or intervention have been' (NHS Choices 2009). In this model, The intervention group before the introduction of the intervention act as the controls and change following introduction of the intervention is measured to explore the effectiveness of the intervention. This design has not been highly rated for its effectiveness (Britton and Thorogood 2004). Its main restrictions are due to the lack of a control group with which to compare the changes. This absence makes it difficult to know if changes for patients result from the intervention or other changes in their lives (Britton and Thorogood 2004). Secondly, if participants with extreme values take part then 'regression to the mean'

is a potential threat to validity (Unauthored 1999; Stephenson and Imrie 1998). Regression to the mean is meaningful here as children with a high BMI z- score are often selected and their outlaying weights may have more of a propensity for regression.

Process and outcome indicators are also useful to measure intervention programmes. Nutbeam (1998) describes three levels of outcomes: 'Health Promotion Outcomes' are the most immediate results from an intervention (these are known as "proximal"); secondly, 'Intermediate Health Outcomes' include alterations to personal behaviours and access to health services; thirdly, 'Health and Social Outcomes' – which are more "distal" -- include changes to quality-of-life. Intertwining these "distal" outcomes into studies – which may include mortality, etc. – is a challenge and they are not always or necessarily included (Coombes 2004).

In addition, a logic model is useful for focusing on an intervention's likely impact. A logic model describes the relationships between each element in a project or intervention and the likely direction of change. This model should be developed before a project begins and set out a range of expected actions with their expected impact and outcomes. It provides a logical roadmap that anticipates how each project element will work, what the result will be, and how the sequence of elements will lead to the expected outcomes. This, in turn, can be related to more complex models that map the relationships between obesity and its determinants (Butland et al., 2007). With ACES it was possible to use such as model, however it was not easy to apply it through each stage, due to the lack of follow-up measurements.

2.10.1 *Barriers to successful NHS evaluation of ACES*

The ACES data collection process and electronic database design were complicated. In each area, data were collected by many different coaches and entered by them into the ACES Meta-frame database and there was a lack of dedicated staff to work on and extract data from the database. The design of the ACES Meta-frame (electronic Database) meant that complex data extraction and linkage was required to gather evaluation data sets. For example, each of the ACES baseline and follow-up outcome measurements were collected and entered in different data-sheets in the Meta-frame. This made it hard to track the extent of data for individual families and who had missed their follow-up. An attendance record for each child was taken, with a 50 - 75% (6-8 sessions) attendance rate out of 12 weeks participation required to qualify for completion under the HEAT target. However, the

attendance record data was collected separately using hard copy and Microsoft Excel spreadsheets and these were not entered into the ACES main Meta-frame database on a regular basis.

This made automatic linkage between families' attendance records with baseline data impossible without additional input. In addition, much of the information on the main ACES database was incomplete, especially the follow-up data, which was not collected till later in the programme when many families had already dropped out.

One of the weaknesses of the programme was a lack of comprehensive data on its impact on weight. Follow up data on weight were collected at a session 6-8 weeks into the programme, which missed many children who had already dropped out or did not attend that session, but in any case it was also too early to detect any major change. No provision was made to measure weight at a later stage as suggested in the Scottish Government guidance. Only a minority of patients (145, 25%) had weights recorded.

2.11 Conclusion

It is evident that childhood obesity is a particularly pressing and expensive problem in Scotland that policy-makers are seeking to address. The development of the ACES treatment programme is the first NHS weight management programme that is family-based in approach in Scotland. This is problematic in that the programme requires feedback in order to establish continued performance improvement to ensure outcome success, and to provide the evidence-base to justify continued funding. However, after launching the programme in 2009, in an initial assessment by coaches, it was noted that there was only 46% attendance, and that there was a specific problem with programme engagement. This research seeks to explore the issues of attrition in relation to ACES programme engagement. Further chapters will study those factors related to participating families in order to gain insight to why some chose to continue whilst other chose to discontinue.

Chapter 3. Study One: 'NHS Routine' Data Analysis

3.1 Introduction

This first stage of the research was carried out in 2010, and it was one of three different studies that sought to evaluate attrition within the ACES treatment programme. This chapter examines the findings relating to attrition from this first study based on routinely gathered health services data utilised in ACES. Coaches collected the data from baseline information sheets requiring background details. These were completed by parents or children during their 1:1 initial programme assessment. This study uses the context of Ecological Theory (Davidson & Birch 2001) and draws on relevant evidence from the literature review to discuss its significant findings.

3.2 Purpose of the Routine Data Analysis Study

The purpose, therefore, is to use the data routinely collected by the ACES programme to determine the baseline characteristics of families and the programme that resulted in non-completion. Further, although the data had been previously collected, no analysis has occurred until this point. So, the efficacy of the programme had not been explored. However, an evaluation of the programme became expedient as reporting was required by the Scottish Executive Child Health Programmes to explore the sustainability of funding. Moreover, the analysis from this study was useful in helping to structure the measurement tools used in the 'Entry' and 'Exit' studies in the following chapters.

3.3 Aims and Objectives

This study aims to develop a better understanding of child, family and programme characteristics that are associated with attrition in a family-based weight management intervention. To accomplish this, the following questions will be addressed in this chapter:

1. Are child and familial baseline characteristics of overweight and obese children and their families predictive of attrition in the programme?
2. Is programme timing or other programme characteristics predictive of attrition?

To address these research questions, health service data which is routinely collected from the ACES weight management programme is analysed in order to determine the significant impact of a range of characteristics from programme-based characteristics (location, venue, timing and stages) to parental characteristics that examine attitude and beliefs, as well as behaviours, including willingness to change, goal-setting, quality of life (PEDS score) and behavioural and lifestyle change. It also considers child characteristics that mirror those of the family, as well as assessing anthropometric data.

3.4 Methodology

3.4.1 *Ethical Approval Procedure*

In October 2011, the researcher obtained ethical approval from the health services Ethics Committee to conduct the first phase of this research (see Appendix 1). This involved accessing routine data collected by the ACES programme in order for the researcher to perform a preliminary analysis. Permission was obtained from the Health Improvement Department at Gartnavel General Hospital for the extraction of ACES family baseline information collected between 2009 and 2012.

Subsequently, as a result of needing to source missing data and additionally cross reference data with weekly attendance records, an application was submitted to the health services GG & C, Directorate of Health, Information & Technology Department, for "Caldicott Guardian" status. Approval was given to access additional child and mother information, particularly first and surnames. The latter was required to link with attendance records and to aid in completing missing data.

3.4.2 *Participants*

Families were referred to the ACES programme through a variety of mechanisms: a GP referral; school referral; community-setting referral; however self-referral was the main source of the majority of families who joined ACES. At this stage, most participants had received an information brochure about the treatment programme. There was a local free telephone hotline to the ACES administration head office which acted as the first point of contact. Informed consent for data gathering was obtained with the ACES coaches and stored locally, and it was then kept centrally and securely in the ACES administrative office in Gartnavel Hospital.

This observational study involved the quantitative analysis of retrospectively collected data relating to all families who registered and started the ACES programme between 2009 (programme initiation) and March 2012. According to the ACES recruitment policy, children with BMI ≥ 91st percentile, age between 5-15 were considered eligible to join the programme, although those who were at BMI ≥ 99.8th percentile, or with associated health conditions, were recommended for referral to a hospital before enrolment in the programme (NHS GGC, 2008). This analysis included 39 children aged more than 15 years old, of whom 17 were aged 16 years old, 17 were aged 17 years old and 5 were aged 18 years old.

3.4.3 *Data Management*

3.4.3.1 Data collection

Coaches collected data at the initial scheduled 1:1 appointment, approximately two weeks before the commencement of treatment programme sessions. For those who did not attend the scheduled appointment, a follow-up phone call occurred to ascertain the reason for the no-show and to organise a new appointment time**.** Coaches distributed information sheets at this scheduled appointment, and informed the family about the purposes, length, and content of the treatment programme. This was followed-up by the informed consent form. This included agreement to participate and another section obtaining permission to use gathered data for health improvement analysis purposes.

At the end of the programme those participants who had completed the 12-weeks and/ or those who attended the final session completed an ACES accessibility questionnaire which explored aspects of programme usefulness and outcomes, such as eating and physical activity lifestyle change.

The child attendance record data was provided separately by the ACES main administration office. Attendance sheets were normally collected by all venues for storage at this office and entries were then recorded on separate spreadsheets. For the purposes of this research project, however, merged attendance records were prepared by a health services assistant worker, employed on a short-term contract to review missing data, which were then provided to the researcher. Identification codes were not provided on the attendance record. Instead, the format used was child first name, surname, mother's name,

and weekly attendance record. In order to match attendance with the identification codes from the health service data, it was necessary to connect the names on the weekly attendance record data to the numerically ascending identification codes manually, and merge data by the child's name.

3.4.3.2 Data entry and coding

Coaches in each location entered baseline and accessibility data into the NHS meta-frame database developed for ACES data collection purposes. Each coach held a NHS user name and password to gain access to this shared database. The database was subdivided into varying spreadsheets according to the type of data collected (see Table 3-1). Attendance data was recorded in hardcopy by coaches, and was later transferred by them onto Excel spreadsheets. This data was then held securely by each respective Coach Manager in each respective location, and was then ultimately stored in the ACES main Administration Office in Gartnavel Hospital. Each participant was assigned an ascending number within the meta-frame database. Participants were referred to by this code number, assigned by the IT Service, who designed the meta-frame database. Each of these separate Excel spreadsheets that included varying fields of information, utilised the same allocated participant code.

3.4.3.3 Data extraction

This section describes the data extraction procedure undertaken. Initially, the researcher was provided with a secure Excel spreadsheet by the IT Services Department of Gartnavel General Hospital containing anonymised data relating to children who attended the ACES interventions between 2009 and 2012. For ease of analysis, this dataset was subdivided by the researcher on the basis of related variables, into five separate datasets. Each anonymised participant was assigned a unique identification code by ACES, which was maintained consistently throughout the analysis and in each dataset. The contents of the four datasets were as in Table 3-1.

Table 3-1: Routine Dataset Contents for Analysis

Data set 1	Contained baseline demographic information (1:1 assessment data, child date of birth, gender, Areas, venue name, postcode, initial contact number).
Data set 2	Contained the baseline measurements: Only children's anthropometric, Children and parent's quality of life (PEDS) score respectively, child and family responses to goal-setting, challenging and support questions respectively, both child and family responses to the readiness-to-change scale respectively.
Data set 3	Contained (week '1' - baseline) parent and child responses respectively to lifestyle, diet, physical activity and quality of life (PEDS: which is a 25 statement questionnaire).
Data set 4	Contained a record of weekly attendance based on data gathered in situ by coaches and collated in ACES' main administrative office.

3.4.3.4 Data anonymity and confidentiality

The ACES ascending code number was assigned to each participant and this was used to maintain confidentiality of all demographic information. No names were used or other identifying demographic details to maintain participant anonymity. Instead, data was stored in three different sources but all utilised the same unique meta-frame ascending code in order to maintain anonymity. This data was then merged utilising the unique ascending code number to then be examined in the routine data analysis study. A username and password was assigned to the temporary NHS assistant worker to complete the merging process. In order to uphold Data Protection Laws (1998), all data used the unique identifier code, No names were used or other identifying demographic details to maintain participant anonymity. This data was saved on one USB used encrypted software and the USB was kept securely. It was available only to the researcher and authorised personnel. A backup accessible for the data with no names or other demographics which can identify the participants' identity; this was saved for another research member who used a secure encrypted university network locked by personal Id and password.

3.4.3.5 Missing, duplicate, observation and data linkage

It is well-recognised in this type of research, particularly in health services evaluation research, that missing data can affect the power and reliability of data analysis and its results. Therefore, in order to minimize missing data in this analysis, an attempt was made to obtain information pertaining to variables missing from the electronic data.

Upon approval by the health services GG & C of 'Caldicott Guardian' status access to participants' personal identifiable data (e.g. full names) held by ACES on hard copy, was granted to improve the data quality for analysis. A request was then sent from the leader of the Health Improvement Department, Gartnavel General Hospital to each area coach manager to collect and send hard copies to the main ACES administrative office of all ACES weekly records for those who attended between 2009-2012.

The resultant final merged single spreadsheet was analysed as follows. Firstly, the main health services meta-frame database, containing the ACES database was accessed from a Gartnavel Hospital computer desktop, using the researcher's health service ID account and password, through the main health service shared folder, named (HEAT H3), in order to locate and complete the missing variable data. Secondly, where variables were still unavailable hard copies of ACES participant records were accessed by the assistant. Thirdly, further missing details, such as postcodes, were found through online research. Fourthly, hospital records were consulted for other key missing data including address and date of birth. Participants who were not contactable or had no contact info on file, and had multiple variables missing were excluded from the study as the data was considered insufficiently complete for final analysis. As a final step, a check was made to locate missing hard copies, which had been misfiled.

During this process, a small number of discrepancies were identified in the dataset, including several duplicate records, and patient records for which one or more recorded variable was missing. These duplicate records were identified by cross-referencing patient identification codes with gender, age, postcode and initial weight and height, in order to establish whether the identification codes contained data from the same or a new individual. A decision was made as to which of the duplicates would be retained for further analysis, based on the proportion of completion of variables, i.e. if two records were found to refer to the same individual, the more complete record was retained, and the other was

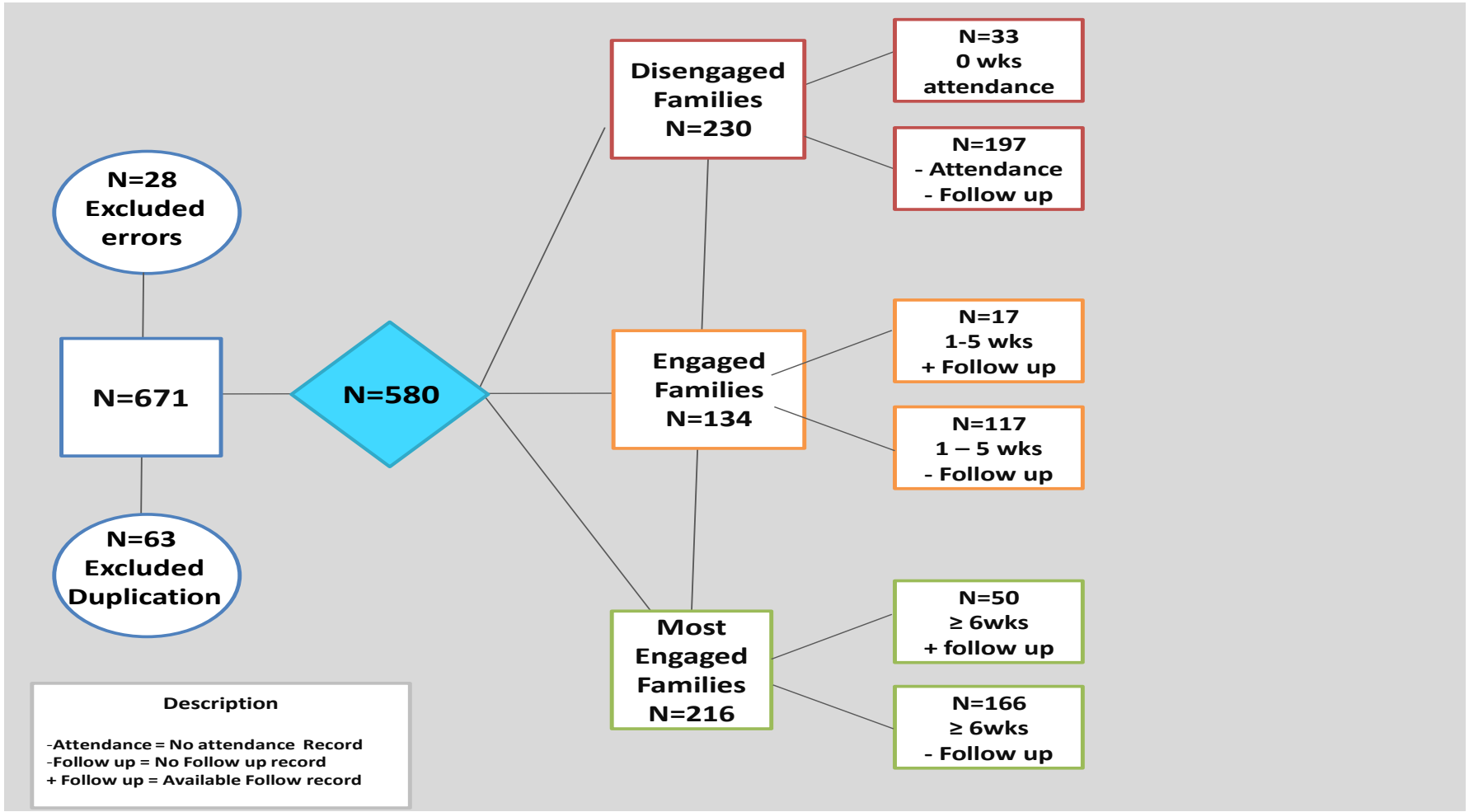
discarded. The researcher then merged the datasets using the same identification codes associated with other variables and obtained a single spreadsheet.

3.4.3.6 Inclusion and exclusion criteria

Following the obtaining of the maximum quantity of data available, the inclusion/exclusion criteria were applied to the records to obtain a useful sample for analysis.

After checking for duplication, and following-up on missing data, the researcher determined the final analysis of this first study after the inclusion/exclusion criteria summarized were applied (see Figure 3-1). A total n=671 records were initially extracted from the electronic health services meta-frame records. Of these, n=63 were excluded after being identified as duplicate records, leaving 608. Then a further n=28 of these records were excluded as n=7 were found not to contain baseline weight, height, and/or date of birth; these variables were unobtainable through the missing data completion procedure; n=9 further records were excluded as they did not fulfil ACES criteria as they were of normal weight and n=2 were underweight. It is probable that these outlining records belonged to siblings of participants or had been recorded wrongly, and finally n=10/21 cases were removed due to suspected errors in measurement or reporting of those children's height measurement. These included two individuals whose recorded height z score SDS appeared to decrease after 12 weeks, a further n= 8 cases in which the z score of height SDS changes was increased by more than +0.7 SDS during the period of the study. In these cases the change in height was considered atypical or exceptional, and therefore an error in either measurement or reporting was suspected. After removal of these cases the normal distribution of the data was improved, leaving a total number of n=580 child records for further analysis in the results section.

Figure 3-1: Inclusion/exclusion criteria summarized of the baseline data



3.5 Measurements

3.5.1 *Child Characteristics*

The following characteristics focus primarily on the child and family feedback, when asked for, was used in order to verify data and improve the validity of results.

3.5.1.1 Anthropometric measurement

Overweightness and obesity were measured in terms of Body Mass Index (kg/m2). Standard Deviation Scores (BMI-SDS) are BMI scores corrected for age and gender using the UK 1990 growth reference curves for BMI (Cole *et al*., 1998). BMI-SDS greater than 1.999 (91-98th) indicates overweight, BMI-SDS greater than 2.00 (98-99.6th) indicates obesity, and greater than 2.667 (≥99.6th) indicates severe obesity. The child's weight and height were measured at the venue during the 1:1 assessment before starting the 1st week session. BMI-SDS was calculated using LMS software by the Child Growth Foundation (Pan & Cole., 2008).

3.5.1.2 Socio-Demographic data

ACES coaches asked parents and their children to complete a baseline questionnaire. Information on child demographics was collected, including the child's date of birth (age), gender, ethnic group, postcode, address, the supporter's name and their relation to the child, and their contact number. A medical declaration was also signed by parents.

3.5.1.3 Social Economic Status (SIMD) code

For the purposes of this study, the socioeconomic status of participating families was determined by using the SIMD code (2009), the Scottish Government's official assessment tool for identifying small area (or "datazone") concentrations of multiple deprivation across Scotland. This has been used to target policies and resources towards the areas where they are most needed. The SIMD provides a relative ranking for each of 6,505 small areas, or datazones, across Scotland. These areas are ranked from 1 (most deprived) to 5 (least deprived). SIMD is formulated by using data from seven different subject areas (or domains), including: income, employment, health, education, access to services, housing and crime. Each domain is subdivided again by between two and eight indicators, chosen because they are relevant to an aspect of deprivation. These indicators are statistically robust, and data on the indicator is available at the datazone level throughout the country.

3.5.1.4 Quality of Life (QoL)

Child quality of life was measured using the PedsQL Paediatric Quality-of-Life Inventory version 4.0 (UK), for different age groups: 5-7 years, 8-12 years and 13-15 years old respectively (Varni, 2001). Children completed a 23-item self-report version and the parents completed an almost identical parent-proxy version about their child's quality of life to improve result validity. This measures four domains of health-related quality-of-life: physical health (8Qs), emotional health (5Qs), social (5Qs) and school functioning (5Qs). The latter three domains were summarised to obtain a single psychosocial health score (15Qs) (Varni, 1998). All questions were scored on a 5-point Likert scale from 0 (Never a problem) to 4 (Almost always a problem), which were then transformed in reverse to 0=100, 1=75, 2=50, 3=25, 4=0. These figures were then totalled and divided by the number of questions answered. This overall total score was derived from all the questions answered with a high score indicating a higher quality. Varni *et al*, .(2001) have demonstrated the validity of the Peds tool in a validation study involving 963 children aged 5-18 years, and 1629 parents, which showed an internal reliability for the total score version α=0.88 (child, 0.90 parent report). The reliability of the UK version of the PedsQL was also assessed in a sample of 1399 children and 970 parents from South Wales, and shown to have similar internal reliability with all sub-scales on both the child- and parent-reports reaching α=0.70 (minimum standard), and exceeded α=0.90 for the total score (Upton *et al*., 2005). They recommended the UK version of PedsQL for assessment of quality of life in UK children (Upton *et al*., 2005).

3.5.2 *Parent & Child Characteristics*

There were several areas where data was gathered to measure independently the child and the family's respective responses. This was in order to identify possible relationships in terms of behaviour, attitudes and beliefs between the child and the parent/caregiver.

3.5.2.1 Lifestyle, eating and physical activity questionnaire

A self-report of lifestyle changes, eating and activity behaviour for both parents and children was assessed. The physical activity and eating behaviour questionnaire was designed by a group of health professionals who worked on the development of ACES programme material. The parents' behavioural questionnaire included 8 items for the parent/caregiver self-report and 25 items for the child. All questions were scored on a 5-point Likert scale from 1 (Never) to 5 (Always), which were then re-scored: 1=0, 2=25,

3=50, 4=75, 5=100. Parents' questions were divided into three sub-themes: Q1-9 related to behaviour of the family as a whole, Q10-20 were about the child, and Q20-28 were about the parent/s themselves. Each of these themes contained statements reflecting positive or negative lifestyle behaviour, regarding family eating, sedentary behaviours and physical activity (see Appendix 2).

3.5.2.2 The 'Readiness-to-Change' questionnaire

Self-reports of both the parent's and child's respective level of motivation to make changes, using Likert scale questions, were also assessed (see Appendix 2). Four questions measuring their level of commitment to making changes were included: two questions on the importance of eating healthily and being more active; and two questions about their level of confidence of eating more healthily and being more active. All questions were scored on a 10-point Likert scale from 0 (not at all important/sure) to 10 (extremely important/sure). The parent-targeted questions asked for opinions about the importance of and confidence about the whole family eating healthily and being more active, while the child-targeted questionnaire referred only to the child him/herself.

3.5.3 *Programme Characteristics: Attendance pattern and drop-out*

As mentioned in Section 2, the attendance record cross-referenced with identification codes identified 305 children from the total 580 with an attendance record. The researcher categorised participant attendance/drop-out into three groups, based on total weekly attendance records, into the following: 1) Disengaged families (n=230): made up of those who had zero attendance, that is, those who did not attend any session after the 1:1 assessment and those who had no follow up records. 2) Engaged families (n=134): those who attended between 1 and 5 sessions, that is, those who attended less than 50% of the total 12 weeks. 3) Most engaged families (n=216): those who attended between 6 and 12 sessions, attended >=50% of the total 12 week. The cutoff of 50% was chosen because the HEAT Target Committee agreed that families who attended 50% of the total attendance (6 weeks out of the 12 weeks) should be considered as the cutoff for completion and noncompletion.

3.6 Data Analysis Procedure

In order to address the study objectives mentioned in section (1.13.3), the following study analysis plan focuses on the routine data analysis study results. These are presented in four main parts.

3.6.1 *Descriptive Analysis*

First, a descriptive analysis was used in the results to describe participant demographic and baseline characteristics, and attendance data was used to explore programme characteristics. Categorical data was described using frequencies and mean and standard deviation (Mean ± SD) was considered in order to describe the continuous data.

Some categorical variables that were considered are demographic, such as gender, area (location) from which families were recruited and had their 1:1 assessment, and socioeconomic status. This approach was also applied to reporting on family programme expectations; as well as child and parent respective goal-setting. Programme characteristics included an analysis of data related to programme venues, programme dates and timings

Also, age was divided into three groups for the children (aged 5-7 years, aged 8-12 years and aged 13-18 years). Mean and standard deviation (Mean ± SD) was considered in order to describe the continuous data. The continuous variables analysed were age, height, weight, BMI z score, child and parent's PEDs score, and family readiness-to-change mean scores. Height was measured in metres and weight in kilograms. BMI was calculated using the formula (weight in kilograms/height in metres squared). Height, weight and BMI z-scores also were calculated using theLMS software by the Child Growth Foundation (Pan & Cole., 2008).

Baseline results were utilised to investigate differences between participant baseline characteristics according to gender, BMI categories, socio-economic status using the Chi-square test for categorical data and t-tests for continuous scales. Using information of duration of attendance, the association between the number of weeks of attendance and year, area, season and session venue was also identified.

Family readiness-to-change mean scores were calculated by counting data collected with a specially designed Likert scales questionnaire. Data on lifestyle eating and physical activity and behavioural change was also collected and analysed using the mean and the standard deviation of the respective child and parent Likert scale behavioural change questionnaires.

Weekly attendance of participants was measured alongside participant follow-up weight records in order to determine the attendance pattern and factors influencing drop-out from the study. Family attendance records were used to describe participant attendance patterns during different stages of the programme using frequency and percentage descriptive analysis. This was followed by descriptive analysis of the total number of weeks of attendance by each family in order to identify the number and percentage of family who were present/ absent, and the accumulative number of those who dropped out. In the drop-out analysis, available data on family weekly attendance records and follow-up weight records was used in order to compare family drop-out levels during different stages of the programme, and then to predict which of the baseline characteristics were associated with dropping out.

3.6.2 *Comparative Descriptive Analysis of Completers v. Non-completers*

In Part 2 of the results a comparative analysis is also made between those who were present at baseline and those who dropped out during different stages of the treatment over the 12 weeks. The total number of weeks attended by each family, in addition to the cumulative number of families who dropped out of each session was calculated. Accumulative attendance per participant, along with the child's follow-up record was used to determine the three main groupings previously described: 1) n=230 disengaged families; 2) n=134 engaged families; and, 3) n=216 most engaged families. Independent t-tests for continuous and Chi-square analyses for categorical data were conducted among these attendance groupings and baseline characteristics to find out if there were any differences or associations between level of attendance, and socio-demographic variables or anthropometric measurements. In terms of attendance, a comparison between those who dropped out and those still in the programme was made using the three groups of children from (1) "disengaged families", (2) "engaged families" and (3) "most engaged families".

3.6.3 *Logistic Regression Analysis*

Binary logistic regression was used to identify the factors related to the drop-out between two groups: completers versus non-completers. This binary group consisted of those who attended or did not attend the programme sessions: (1) first group (Dropped out, n= 230) represents those families who disengaged; (2) completers include n= 134 the engaged families plus n=216 the most engaged families. Initially, a univariate analysis was carried out using a number of baseline characteristics.

A multivariate analysis was conducted to identify the predictors of attrition. This required adjusting for the effect of all variables simultaneously in a logistic multivariable regression model. A backwards elimination procedure was used to select the best predictors in the model. Categorical age was used in order to investigate differences in influence by age group, but there was no significant difference between the categories. Hence, the continuous age was adopted in subsequent analysis. A thematic analysis of questions on parental expectations of the programme related to goal-setting, challenges-faced and sources of support was carried out using a re-coding system to quantitatively analyse family responses. A Pearson correlation analysis was used to check if there was a linear relationship between children and parents' responses on readiness-to-change. The assessment of a self-reported questionnaire on family motivation and readiness to make change was based on how much importance children and parents placed on readiness-to-change or their confidence to make change. Participants responded to questions using a 10-point Likert scale ranging from 1 = not at all to 10 = very. The participants' readiness-to-change measurements were collected based on the following questions: 1) How important is it for them to eat healthily?; 2) How confident are they in eating healthily?; 3) How important is it for them to do physical activities?; 4) How confident are they in doing physical activities?

3.6.4. Data Regrouping

In order to improve the power of statistical analysis some variables were re-categorised into fewer groups due to the small cells numbers. The following regroupings were undertaken: In table 3-5, the BMI data was re-categorised into two groups (overweight & obese ≥2.00SD to 2.66SD, and severely obese ≥ 2.67th). The SIMD (2009) was used as a proxy for the socioeconomic status of the children and their families. This was re-categorised, areas were ranked from 1 (most deprived) to 5 (least deprived). The 'Most

deprived' & 'deprived' were combined and designated as 'deprived' and 'most affluent' & 'affluent' were also merged into an 'affluent' grouping. Age data was re-categorized into two groups: (5-12 years-old) named 'the young age group' and second (13-18 years-old) referred to as 'the old age group'.

In table (3-7), using a 10-point Likert scale, importance and confidence to make change were based on how much importance children and parents placed on their readiness to change or their confidence to make change. Responses to questions on the importance of eating healthily, physical activity, confidence to eat healthily, and confidence to do physical activity were also coded using the Likert scale of 1 to 10. The mean response and the corresponding standard deviation were obtained for each of these items as shown in (Table 3-7). The importance to change was derived by combining the means of importance to eat healthy and that of physical activity. Confidence to change also was obtained by combining the corresponding responses on confidence to eat healthy and physical activity. The readiness to make change score was calculated by averaging the means of importance to make change and the confidence to make change. The same approach was used to calculate the readiness to eat healthy and readiness to do physical activity.

In table (3-9) on Child and Parental Lifestyle, a self-reporting of lifestyle changes, eating and activity behaviour for both parents and children was computed by taking the mean of responses on a 5-point Likert scale from 1 (Never) to 5 (Always).

3.7 Results

Data on 671 families was extracted from the health services Meta-frame. After the exclusion and inclusion criteria were applied, data for 580 individuals was used in the analysis.

3.7.1 *Results: Descriptive Analysis*

The descriptive analysis of ACES includes demographic and socioeconomic data on participants, child anthropometric data, and child and parent's respective PEDs quality of life scores. Family expectation (i.e. goal-setting, challenges and support), family readiness-to change and finally family lifestyle (eating habits, levels of physical activity and sedentary behaviour data) were also analysed. This analysis explored baseline factors associated with overweight or obese children attending the ACES weight management programme. It also dealt with the number of families recruited to join ACES by year, area and season (see Table 3-2).

3.7.1.1 Family baseline characteristics

Table 3-2 shows the mean age at baseline for both genders combined was 11.9 ± 2.6 and there was no statistically significant difference between the average age of male participants at baseline 12.03 years ± 2.5 and females 11.9 years ± 2.8. The proportion of males and females were similar among different age categories (p-value=0.395) **(**refer to Table 3-3**).**

Table 3-2: Child baseline demographic, socioeconomic, anthropometric and PEDS quality of life score characteristics

Total number of participants	Total Sample	580
Age at baseline, mean ± S	580	11.94±2.59
Height z score, mean ± SD	580	-0.13±1.26
Weight z score, mean ± SD	580	2.25 ± 0.86
BMI z score, mean ± SD	580	2.82±0.60
Age at baseline, (categories)	580	
Age 5-7,		34 (6.0)
Age 8-12,		301 (52.0)
Age 13-18		245 (42.0)
Gender, n (%)	580	
Male		318 (54.8)
Female		266 (45.2)
BMI z score (categories), n (%)	580	
Overweight 91st - 98th		51 (8.8)
Obese > 98th - 99.6th		188 (32.4)
Severely obese ≥ 99.6th		341 (58.8)
Socio-economic (SIMD), n (%)	573	
1 Most Deprived		270 (47.1)
2 Deprived,		109 (19.0)
3 Middle		68 (11.9)
4 Affluent		53 (9.3)
5 Most affluent,		73 (12.7)
Child PEDS score, n=516	516	73.38±16.08
Parents PEDS score, n=530	530	63.75±18.63

The results in Table 3-2 show that almost half (270/580) of those who attended the 1:1 interview were from the most deprived areas (SIMD 1) and (341/580) were severely obese. However, that results in Table 3-4 of a chi-square test of association between BMI z score group and SES status (SIMD score) was not statistically significant. Only the association between age and BMI z score was found to be statistically significant. Also, Table 3-2 shows that the mean values of quality of life score for children and their parents (the UK 0.4 Peds score) were (73.4 ±15.1) and (63.9±18.6), respectively.

Table 3-3: Baseline characteristics by gender groups

Characteristics	Baseline - 1st Assessment			P-value
	Total	Female	Male	
Total number of participants, n (%)		318 (54.8)	262 (45.2)	
Age continue, mean ± SD	580	11.82 ± 2.71	12.08 ± 2.44	0.275
Height z score, mean ± SD	580	-0.25 ± 1.26	-0.02 ± 1.53	0.007
Weight z score, mean ± SD	580	2.22 ± 0.85	2.28 ± 0.88	0.245
BMI z score, mean ± SD	580	2.85 ± 0.57	2.78 ± 0.62	0.447
Child Quality of life (PEDS score)	516	N=281	N=235	
Child, mean ± SD		74.27 ± 14.99	72.31 ± 17.27	0.169
Parent Quality of life (PEDS score)	530	N=285	N=245	
Parents, mean ± SD		65.41 ± 18.18	61.81 ± 19.01	0.027
Age (categories), n (%)				
Age 5-7	34	22 (6.9)	12 (4.6)	
Age 8-12	301	167 (52.5)	134 (51.1)	0.395
Age 13-18	245	129 (40.6)	116 (44.3)	
BMI z score (categories), n (%)				
Overweight 91st - 98th	51	23 (7.2)	28 (10.7)	
Obese > 98th - 99.6th	188	102 (32.1)	86 (32.8)	
Severely obese ≥ 99.6th	341	193 (60.7)	148 (56.5)	0.300
Socio-economic (SIMD), n (%)				
1 Most Deprived	270	148 (47.1)	122 (47.1)	
2 Deprived	109	57 (18.2)	52 (20.1)	
3 Middle	68	43 (13.7)	25 (9.6)	0.527
4 Affluent	53	30 (9.5)	23 (8.9)	
5 Most affluent	73	36 (11.5)	37 (14.3)	

Table 3-4: Descriptive comparison between children's BMI z score group at baseline

Characteristics	Baseline BMI Categories		P-value
	Overweight/Obese 91st - <99.6th	Severely Obese ≥ 99.6th	
Age (categories), n (%)			
Age 5-7, n=34	7 (3.0)	27 (7.9)	
Age 8-12, n=301	127 (53.1)	174 (51.0)	0.042
Age 13-18 n=245	105 (43.9)	140 (41.1)	
Socio-economic (SIMD), n (%)			
Most Deprived, n=270	101 (43.0)	169 (50.0)	
Deprived/Middle, n=177	79 (33.6)	98 (29.0)	0.591
Affluent/Most, n=126	55 (23.4)	71 (21.0)	

3.7.1.2 ACES delivery characteristics by year, area and season

The ACES programme commenced in January 2009 and initially was delivered in three areas in the West of Scotland: Glasgow, Renfrewshire and Inverclyde, and this was subsequently extended in 2010 to cover Dumbartonshire. ACES participants from Glasgow (63%) were consistently more than those recruited in the other areas. This is in part as Glasgow is much the largest population centre involved, and additionally it was the first to instigate the programme. Table 3-5 shows that recruitment was consistently highest in the summer and lowest in winter. From Table 3-5, it is evident that with each additional year the programme ran, the participants got younger. There were significant differences in younger versus older age groups by cohort year (p-value≤0.001). Also, it is evident in Table 3-5 that while the participants were mostly severely obese throughout the 3 years examined, with each year the programme ran it became increasingly successful in targeting the most severely obese children. The number of participants recruited was significantly different between areas and years. Changes in the number of recruitments over the years also differed across areas.

Table 3-5: Descriptive comparison of the child baseline characteristics by the of the programme cohort

Baseline characteristics	Cohort by 'Year'			
	2009	2010	2011	P- value
Age continues, mean±sd	12.96±2.42	12.08±2.43	10.89±2.65	
Age categories, n (%)				
Age 5 - 12,n=314	61 (39.9)	135 (56.9)	118 (68.6)	
Age 13 -18,n=248	92 (60.1)	102 (43.1)	54 (31.4)	≤0.001
Gender, n (%)				
Male,n=310	87 (56.9)	129 (54.4)	94 (54.7)	
Female,n=252	66 (43.1)	108 (45.6)	78 (45.3)	0.883
BMI z score, n (%)				
Overweight/Obese, n=229	80 (52.3)	92 (38.8)	57 (33.1)	
Sever Obese, n=333	73 (47.7)	145 (61.2)	115 (66.9)	0.002
Socio-economic (SIMD), n (%)				
Most Deprived, n=264	74 (49.0)	124 (53.0)	66 (38.8)	
Deprived/Middle, n=173	47 (31.1)	62 (26.5)	64 (37.6)	
Affluent/Most, n=118	30 (19.9)	48 (20.5)	40 (23.6)	0.067
Delivered sessions by season				
Winter, n=77	8 (5.2)	41 (17.3)	28 (16.3)	
Spring, n=109	11 (7.2)	60 (25.3)	38 (22.1)	
Summer, n=223	76 (49.7)	81 (34.2)	66 (38.4)	≤0.001
Autumn, n=153	58 (37.9)	55 (23.2)	40 (23.2)	
Areas				
Glasgow, n=330	130 (85.5)	133 (56.1)	67 (39.2)	
Renfrewshire, n=147	22 (14.5)	71 (29.9)	54 (31.6)	<0.001
Dunbartonshire, n=83	-	33 (14.0)	50 (29.2)	

Results indicate that there is a significant association (p-value< 0.05) between the number recruited in each year by area, and season (p-value< 0.05).

3.7.1.3 Child & parent expectations

This section provides a descriptive analysis of child and parent expectations (i.e. goal-setting, challenges faced and sources of support) data. Families were asked to answer open-ended questions and they were allowed to give more than one goal between (1-3) so as to explore the types of goals mentioned by families as preliminary reasons for joining the programme. The questions also sought to determine the challenges faced which act as barriers to achieving those goals. Also, they aimed to determine the source and type of

support required to assist them in reaching their goals. In terms of children's and parent's expected goals in attending the ACES programme, a thematical analysis of these questionnaire answers were explored and five classifications of the answers were indentified: weight loss, improved eating habits (healthy eating), improved levels of physical activity, improved knowledge and improved confidence. Child and parent goals were different and these reflected differing expectations (see Table 3-6).

Table 3-6: Expectations of ACES (Goal-setting, Challenges and Support)

Expectations of ACES	Family Reports N (%)	
	Parents	Child
Goal-setting	**N=265**	**N=243**
Lose weight	58 (23.2)	84 (35.9)
Healthy eating	32 (12.8)	20 (8.5)
Doing physical activity	40 (16.0)	56 (23.9)
Improve knowledge	90 (36.0)	43 (18.4)
Improve confidence	30 (12.0)	31 (13.3)
Challenges	**N=209**	**N=188**
Do physical activity	63 (30.1)	88 (46.8)
Healthyeating	47 (22.6)	54 (28.7)
Keep attending	37 (17.7)	10 (5.4)
Confidence to make change	31 (14.8)	23 (12.2)
Stay motivated	31 (14.8)	13 (6.9)
Support	**N=96**	**N=86**
Family	24 (25.0)	39 (45.3)
ACES & Coaches	52 (54.2)	25 (29.1)
Knowledge & Activities	20 (20.8)	22 (25.6)

Results on parental and child expectations found that both groups (children, 46.8%; parents 30%) agreed that doing physical exercise seemed to be the biggest challenge. Also, parents reported ACES and coaches as the major expected sources of support. Children, however, stated that they considered family to be their principal support.

3.7.1.4 Children and parents readiness-to-change

The assessment of a self-report questionnaire on family motivation and readiness to make change was based on how much importance children and parents placed on readiness to change or their confidence to make change using 10-point Likert scales. The readiness to make change mean score calculation was described in section 3.6.4. Results in Table 3-7

show a descriptive analysis (mean and SD) of child and parent motivation to change. In general, parent and child mean levels of readiness-to-change were (8.1±1.1) and (8.1±1.4), respectively, indicating both were ready to make lifestyle changes. The correlation coefficients in Table 3-7 are all positive, indicating that the responses were similar for both groups in each sub-category.

Table 3-7: Child and parent baseline report on motivation to change

Motivation to change	Child n=429	Parents n=402	Correlation	
	Mean ± sd	Mean±sd	R	*P value
Importance to change	8.83 ± 1.41	9.08 ± 1.12	0.174	<0.001
Importance to eat healthily	8.91 ± 1.63	9.16 ± 1.16	0.146	0.004
Importance to do physical activity	8.77± 1.71	9.01± 1.20	0.149	0.003
Confidence to change	7.27 ± 1.82	7.05 ± 1.62	0.153	0.002
Confidence to eat healthy	7.37 ± 2.21	7.22 ± 1.82	0.102	0.045
Confidence to do physical activity	7.18 ± 2.16	6.90 ± 1.91	0.142	0.005
Readiness-to-change	8.05 ± 1.43	8.06 ± 1.11	0.187	<0.001
Readiness to eat healthily	8.14 ± 1.63	8.19 ± 1.22	0.139	0.006
Readiness to do physical activity	7.97 ± 1.62	7.9 ± 1.22	0.154	0.002

*Bivariate Correlation

3.7.1.5 Descriptive analysis of attendance pattern over 12 weeks

The weekly attendance records for ACES were available for only (n=305; 52.6%) children out of (n=580) who registered for the 1:1 assessment visit and had their baseline measurements before starting the 12 weekly follow-up sessions.

Table 3-8 describes the dramatically declining number of attendees over time. Attendance continued to fall in subsequent sessions, with major drop-out rates in the first two weeks. Of the 308 families who attended the 1:1 sessions, 33 (10.8%) dropped out immediately afterwards and never joined the follow up sessions. The drop-out after the 11th week was appreciable. Of the 28 families who made it to the 11th week only 7 stayed till the end of the 12th week. Only 81 children (26%) attended the programme for 12 weeks.

Table 3-8: Number of families present, absent or dropped-out through time

Session number	Present n (%)	Absent n (%)	Dropped* n (%)	Accumulative number of dropped out
Attend 1:1 appt	305 (100)	-	-	-
Session 1	224 (72.7)	84 (27.3)	33	33
Session 2	205 (66.6)	103 (33.4)	23	56
Session3	177 (57.5)	131 (22.2)	17	73
Session4	162 (52.6)	146 (47.4)	16	89
Session5	149 (48.4)	159 (51.6)	17	106
Session6	124 (40.3)	184 (59.7)	21	127
Session7	119 (38.6)	189 (61.4)	5	132
Session8	137 (44.5)	171 (51.5)	7	138
Session9	94 (30.5)	214 (69.5)	35	172
Session10	86 (27.9)	222 (72.1)	18	190
Session11	84 (27.3)	224 (72.7)	13	203
Session12	81 (26.3)	227 (73.7)	22	225

*Dropped: those who did not attend any following sessions

3.7.1.6 Comparison between (disengaged, engaged and most engaged) at baseline characteristics

Table 3-9 shows a comparison between the three groups of families: disengaged (n=230), engaged (n=134) and most engeged (n=216). A chi-square test of association between age and the three groups of families indicated that family engegement was significantly dependent on the age of the children (p-value <0.001). There was no significant gender- or BMI Z score-related difference between the three categories. There was a significant association with socioeconomic status (SIMD) (p-value <0.001). Those from the lower socioeconomic class were more likely to have less enegegemnet with the programme.

Table 3-9: Attendance level categories vs baseline characteristics

Baseline Characteristics	Disengaged families	Engaged Families	Most-engeged families	P-value	
Total number, n (%)	230 (39.7)	134 (23.1)	216 (37.2)	*Trend	Chi-square
Age at baseline, mean ±SD	12.28 ± 2.82	11.82 ± 2.43	11.90 ± 2.65	<0.001	
Age at baseline categories, n (%)					
Age 5-7,n=32	14 (6.1)	9 (6.7)	9 (6.5)		
Age 8-12,n=262	99 (43.0)	68 (50.7)	95 (68.8)	<0.001	<0.001
Age 13-18,n=208	117 (50.9)	57 (42.5)	34 (24.6)		
Gender, n (%)					
Girls,n=318	128 (55.7)	73 (54.5)	76 (55.1)		
Boys,n=262	102 (44.3)	61 (45.5)	62 (44.9)	0.976	0.895
BMI SDS,n=502	2.84 ± 0.58	2.82 ± 0.62	2.79 ± 0.58	0.715	
BMI z score categories (%)					
Overweight 91st - 98th,n=42	21 (9.1)	12 (9.0)	9 (6.5)		
Obese > 98th - 99.6th,n=160	70 (30.4)	47 (35.1)	43 (31.2)	0.604	0.760
Severely obese ≥ 99.6th,n=300	139 (60.5)	75 (55.9)	86 (62.3)		
Socio-economic (SIMD), n (%)					
1 Most deprived,n=242	124 (54.9)	63(47.7)	55(40.1)		
2 Less deprived,n=97	43(19.0)	25 (18.9)	29 (21.2)		
3 Moderate,n=54	19 (8.4)	17(12.9)	18 (13.1)	0.006	0.252
4 affluent,n=42	18 (8.0)	12 (9.1)	12 (8.8)		
5 most affluent,n=60	22 (9.7)	15(11.4)	23(16.8)		
Child PEDs score	73.64 ± 16.72	72.18 ± 16.51	74.34 ± 15.13	0.056	
Parents PEDs score,n=460	62.20 ± 19.13	61.31 ± 18.52	66.31 ± 17.63	0.069	
Child behavioural change,n=41	3.11 ± 0.22	3.13 ±0.25	3.03± 0.23	0.285	
Parent behavioural change,n=116	2.95 ± 0.21	2.99 ± 0.33	3.04 ± 0.26	0.410	
Parent Important to change,n=358	9.11 ± 1.11	9.13 ± 1.12	9.11 ± 0.91	0.881	
Parent confidence to change,n=359	7.01 ± 1.73	7.14 ± 1.62	7.31 ± 1.44	0.471	
Child important to change,n=375	8.72 ± 1.62	8.75 ± 1.41	9.01 ±1.43	0.485	
Child confidence to change,n=375	7.21 ± 1.94	7.33 ± 1.92	7.52 ± 1.81	0.453	

* P-value for Trend is used to test for linear trend between the variables in the table

Table 3-10: Family attendance level by year, area, season and venue

Baseline Characteristics	Total number	Disengaged families	Engaged Families	Most-engeged families n	P-value	
					Trend	Chi-square
Total	580	230 (39.7)	134 (23.1)	216 (37.2)		
(Each year), n (%)	562	227(40.4)	129(22.1)	211(37.5)		
Jan - Dec 2009	153	100 (44.1)	13 (10.0)	40 (19.0)	<0.001	<0.001
Jan - Dec 2010	237	80 (35.2)	58 (44.9)	99 (46.9)		
Jan - Dec2011	172	47 (20.7)	35 (27.1)	72 (34.1)		
Areas, n (%)	578	230(39.8)	133(23)	215(37.2)		
Glasgow	330	166 (78.3)	67 (20.3)	97 (29.4)	<0.001	<0.001
Renfrewshire	147	24 (11.3)	26 (17.6)	79 (53.7)		
Dunbartonshire	101	22 (10.4)	40 (39.6)	39 (36.6)		
Seasons of years, n (%)	526	227(40.4)	124(22.1)	211(37.5)		
Winter	77	30 (13.4)	17 (13.7)	30 (14.2)		
Spring	109	30 (13.4)	21 (16.9)	55 (26.1)	0.065	0.521
Summer	223	96 (42.9)	56 (45.2)	71 (33.6)		
Autumn	153	68 (30.3)	30 (24.2)	55 (26.1)		
Session's venue , n (%)	576	226(34.2)	134(23.3)	216(37.5)		
High School	245	89 (39.4)	68 (50.7)	35 (21.5)		
Secondary school	133	80 (35.4)	15 (11.2)	38 (23.3)	0.071	0.600
Sport and leisure activity	189	57 (25.2)	51 (38.1)	90 (55.2)		

* P-value for Trend is used to test for a linear trend between the variables in the table

3.7.1.7 Comparison between (Disengaged , engaged and most engaged) by years, seasons, areas.

Table 3-10 indicates that Glasgow had the highest proportion with more than half (78.3%) of disengaged families. A formal analysis using chi-square tests indicated that level of engagement depended significantly on the year of the sessions, and area where the session was conducted. However, there was no strong evidence that it was dependant on season or venue. Even so, analysis suggests that participants were more likely to have better engagement (55.2%) when the programme was conducted in sports and leisure centres than in schools.

3.7.1.8 Logistical Regression Analysis: Factors predicting family drop-out

In Table 3-10, the baseline characteristics that predicted attrition (drop-out) from the weight management programme were identified and modelled including: age, gender, socioeconomic status, baseline BMI, child and parent's PEDs score, year of session, place of session, season and variables that measure readiness-to-change, goal-setting and challenges. The influence of each family's baseline characteristics as a baseline predictor of attrition was examined using univariate logistic regression, with drop-out as the dependant variable. To adjust for the effect of all the variables, the variables mentioned above were entered into a multivariate model, and a binary backwards logistic regression (LR) was conducted to identify the significant predictors obtain the adjusted odds for predicting drop-out (see Table 3-10). Only age, areas and years of session, had significant unadjusted odds (p-value <0.05) for predicting drop-out.

Results as shown in Table 3-11 indicated that attrition in the earlier days of the programme (2009) was at least 3 times higher than was obtained in the later years. Also, age had a significant odd ratio (OR=0.54, CI 95 0.33-1.088, p-value=0-014), indicating that the older the child, the higher the drop-out. Attrition was also less likely in Renfrewshire (OR = 0.59, CI 0.37–0.94, p-value=0.027) and Dunbartonshire (OR = 0.53, CI 0.28 – 0.97, p-value=0.042) than in Glasgow.

Table 3-11: Factors predicting attrition

Characteristics	Adjusted odds ratio* (95% Confidant Interval)	P-value
1st App year 2009	1	0.000
1st App year 2010(1)	0.31 (0.19 - 049)	0.000
1st app year 2011 (2)	0.26 (0.15 - 0.44)	0.000
1st app year 2012(3)	0.22 (0.05 - 0.96)	0.044
Age, continuous	0.54 (0.33 - 1.88)	0.014
Location (Area)		
Glasgow areas	1	0.069
Renfrewshire areas(1)	0.59 (0.37 - 0.94)	0.027
Dunbartonshire areas(2)	0.53 (0.28 - 0.97)	0.042
Inverclyde areas(3)	0.00 (0.00 - 0.04)	0.999
Constant		0.004

* Odds ratio presented after mutual adjustments of all the covariates presented in the table

Socioeconomic, Anthropometric, Location (Areas), 1st assessment set year

3.8 Discussion

3.8.1 *Introduction*

This discussion sets out the key findings of the routine data study within the context of the recommended conceptual model EST (Skelton, *et al.,* 2011). It also frames these key findings against the backdrop of the literature review on attrition. A more holistic discussion of the key findings of the thesis as a whole occurs later in Chapter 6.

The binary groups used to define attrition in this study were determined between those who attended and those who did not attend the weekly programme sessions over a total of 12 weeks. This, in turn, was based on the total number of weeks of attendance plus the follow-up weight record. (1) the first group represents those families who dropped out, defined as the number of families who had 0% total weeks of attendance plus the number of families who had missing attendance records with no follow-up weight record. (2) The second group included the active and the most active families who had attended either ≤ or > 50% of the total number of 12 weeks plus families who had missing attendance record but had follow-up weight records.

3.8.2 *Key Findings*

There was a dramatic decline in attendance over time, with 73% dropping out at some point. However, the most substantial drop was in the first two weeks. This study found that child age, programme location and year showed significant unadjusted odds ($p<0.05$) for predicting drop-out. Older children were positivly prone to dropping-out and attrition was more likely in Glasgow areas (even if the highest proportion of recruits came from Glasgow).

3.8.3 *Contextualising Key Findings*

EST is the conceptual framework applied to contextualise the results of the routine data analysis study (Skelton *et al*., 2011). From the literature review, a wide variety of factors have been highlighted as impacting on the attrition rate of child weight management treatment programmes. The findings above provide a statistical overview of the way in which these factors impact on attendance and attrition. EST takes into account the following three levels which interrelate to affect child behaviour:

3.8.3.1 The self: child characteristics

The literature review identified a wide range of factors that previous studies have stated impact on attrition from the child's perspective. These include: (a) age; (b) sex; (c) ethnicity; (d) baseline weight status, (which refers to weight, BMI, BMI z-score, percentage over ideal weight, body fat %, body fat mass) and degree of obesity; (e) Longitudinal weight status (which is defined as changes in BMI reduction during treatment and mean 10-week weight loss); (f) health status, which is defined as the overall health status of the child accompanied with cardio-metabolic health measures; and (g) psychosocial/behavioural/Lifestyle factors. The latter are disparately defined and include motivation, self-reported depressive symptomology, self-concept issues, behavioural issues, and poor participation in activities. This study data does not focus on all of these child characteristic factors as the information gathered was determined in advance of the research and is outside the control of the researcher. The entry study and exit study allowed for the researcher to more specifically explore these child characteristics. Nevertheless, this study collected data which did focus on a) age, b) gender c) SES d) BMI e) quality of life, f) child expectations of the treatment programme (which includes motivation, challenges faced and support), g) readiness-to-change, h) eating and physical activity lifestyle). The findings highlighted that none of these factors were associated with attrition.

In the analysis that was conducted, it was found that baseline characteristics such as age (refer to Table 3-9) were relevant predictors of attendance rates. This confirms findings of other researchers (Zeller, *et al.,* 2004; Braet *et al.,* 2010; Walker *et al.,* 2011); although there are some studies which contradict this finding (Cote *et al*., 2004; de Niet *et al.*, 2011).

The results showed that older participants were more likely to drop-out from the programme, concurring with the work of Zeller *et al*. (2004) and Braet *et al*. (2010). This may be due to the fact that older individuals are often less malleable and are more distracted by external issues (He *et al*., 2010). When people who suffer from weight issues reach more mature ages, they become less open to the idea of losing weight and they are dissuaded by the idea of attending a programme that overtly labels them as having weight problems (Forhan & Salas, 2013). Such a reality means that initiatives have to be carried out to better engage older participants and to provide the necessary social support, tailored to their age, to allow them to continue with the programme.

This study concurs with several other studies (Tershakovec & Kuppler, 2003: Cote *et al.*, 2004; Zeller *et al*., 2004; Barlow & Ohemeyer, 2006; Jelalian *et al*., 2008; Braet *et al.*, 2010; Williams *et al*., 2010; de Niet *et al*., 2011) that gender independently is not associated with attrition (see Table 3-9). Although there is one study which combined variables (age and gender) such that the study did find an association between young men and attrition (Walker *et al.*, 2011); however, the combined nature of variables means that gender cannot be said to predict attrition.

Another study also reported that there was variation found in motivation by gender: with boys motivated by the prospect of increased capability while girls usually were motivated by improved appearance (Reid *et al.*,2009). These differing motivations among different groups require, therefore, a differentiated approach in selecting and developing participants for interventions (Reid *et al.*, 2009).

The SIMD was not found to have a significant impact on attrition in this study. Despite the note of caution that SES definitions vary across studies making comparison difficult, this finding affirms findings of other research studies that have also shown the relationship of the efficacy and reach of health programmes with economic position (Singh *et al.*, 2010). The impact of socioeconomic status using SIMD score was perhaps not clear because other data was collected (progarmme areas and location) which might act as confounding (Table 3-9 & 3-10).

This study does not concur with the results of Wills *et al*. (2005) and NHS National Services Scotland (2007) that there is a statistical relationship between childhood obesity and SES. These results may be due to data distribution as well as the majority of families who joined were from most deprived. In fact, from Table 3-4, it is evident that the majority of recruits from all areas were from the severely obese category, showing that the programme has recruited the right population. These families were often affected by issues external to the programme itself, such as the need to accrue enough money for transportation or the inability to allocate time for the programme due to responsibilities at home or at work (Singh *et al*., 2010).

The disproportionality across socioeconomic status was also quite problematic because it emphasised how current healthcare programmes may be more attuned to the needs of the economically well-off (Grow *et al.*, 2010). In this study this observation may not apply

possibly due to the predominance of recruits from Glasgow (see Table 3-5), who reflected the dense and mixed population of the city in terms of its socioeconomic compositions and which were catered for in extensive provision. This emphasises the need to carefully analyse at the planning stages the nature of the provision in order to ensure that recruitment reflects need and diversity of SES. The danger is that where provision is limited then recruits may be accessed more by the middle classes (Grow *et al*., 2010). This should be another point of adjustment that the programme leaders can address.

Other studies have identified that higher BMI is associated with attrition (Denzer *et al.*, 2004; Barlow & Ohemeyer, 2006; Heinberge *et al*., 2009; de Niet *et al*., 2011), with children with higher baseline BMI SDS (standard deviation scores) being more likely to drop-out of treatment. However, other research concurs with the findings in this study that this is not the case (Tershakovec & Kuppler, 2003; Cote *et al.*, 2004; Zeller *et al.*, 2004; Jelalian *et al*., 2008; Braet *et al.*, 2010; Williams *et al*., 2010;Walker *et al.*, 2011).

In this study no association was found between attrition and QoL in obese children. However, the mean total Peds score for obese children in this study was 73.4 ±16.1 in comparison with other UK studies total mean score 71.5± 16.9 of obese children; the pair comparison t-test total mean Peds score for obese children was 73.6 Cl (63.8-82.8) versus total mean Peds score of healthy children 78.6 Cl (67.5 -86.9) (Hughes *et al*., 2007). The total mean Peds score of obese children in the second study was 67.4± 15.3 compared to the healthy children, with a mean total score of (78.3 ± 11.3 64.8) (Riazi *et al*., 2010). The findings in this study, therefore, are consistent with the findings of two other UK studies indicating that obese children have a reduced QoL than those healthy children evaluated in these other UK based studies. Further, this study did show an association between parental and child QoL (p-value <0.005) suggesting an intergenerational pattern of perceived low QoL, with parents projecting their own low QoL on their children. This reflects the findings in the study by Hughes *et al*. (2007) which showed a total mean Peds score pair comparison t-test total mean Peds score of parents of obese children 64.7 Cl (54.1-75.8) versus total mean Peds score of parents of healthy children 85.2 Cl (80.3 -90.8) (Hughes *et al*., 2007).

3.8.3.2 The family: parent characteristics

In the literature review, the following factors were identified as parent or family characteristics associated with attrition: a) age; b) marital status; c) ethnicity; d) parent/sibling baseline weight status, which includes BMI, mean BMI, weight status, and number of overweight parents; e) psychosocial factors, which encompasses parental motivation, self-reported psychological distress, and degree of marital satisfaction; f) family functioning; g) householder status**.** However, this study of health services' routinely collected data does not centre on all of these parent characteristic factors due to the advanced nature of the data collection. The later Entry study and exit studies which form part of this research allowed for the researcher to more specifically explore these parent characteristics**.** Nevertheless, the study did focus on the following parent characteristics: a) parent expectations of the treatment programme (which includes motivation, challenges faced and support, readiness-to-change, and lifestyle change). None of the factors related to parent characteristics were found to be associated in this study.

In this study parental expectations were defined as goal-setting, challenges faced, and sources of support (see Table 3-6). Both the children and their parents attached great importance to the three motivational factors (see Table 3-7), but the parents seemed to consider the importance of these factors slightly higher than did their children. Overall, however, this research found that concurrence was high between child and parents. Kendall's coefficient of concordance agreement between the children and their parents on goal-setting was significant but weak (Kendall's $W = 0.027$, $p = 0.014$). This study, therefore, supported the findings of Barlow & Ohlemeyer (2006) who equally found high concordance between child and parent. The consequences of this are that treatment programmes to support motivation need to consult with the parents and child to conduct a needs analysis, to ensure the programmes are designed to meet the needs, wants and expectations of each of the respective parties as Barlow (2007) also recommends. It follows on that programme developers need to view this liaison as a partnership to ensure needs, wants and expectations are met, and that ultimately attrition is reduced (Barlow & Ohlemeyer, 2006). Another strategy to support this may be an analysis of reasons stated for drop-out at the exit stages in order to address child and parent concerns, and build in a cycle of ongoing evaluation of the programme which includes review, assessment, reflection and improvement (Barlow & Ohlemeyer, 2006; Skelton *et al.,* 2011).

3.8.3.3 The community: the programme characteristics

In terms of family attendance patterns, the ACES study found that the drop-out rate increased after the first visit and rose again after the second visit and then drop-out rates gradually declined over time (see Table 3-8). This pattern also occurred within two other studies: Tershokovec & Kuppler (2003) found 49% attrition rate amongst 518 children aged 5-17 years within ≤ 2 visits to a monthly clinic; and Barlow & Ohlemeyer (2006) found 61% attrition rate amongst 157 children aged 1-18 years within ≤ 2 visits to a monthly clinic. This peaking of drop-out rate so early in the programme may hint at an initial poor match between child and parent expectations and programme structure and delivery, which have been found to be linked to attrition in several studies (Cote *et al*., 2004; Barlow & Ohlemeyer, 2006; Kiitscha *et al*., 2009; Braet *et al.,* 2010).

Indeed, the programme has improved its recruitment criteria over time, it has been able to more effectively identify more severely obese than obese and overweight children from the target population (refer to Table 3-5). This required a pro-active promotion strategy that involved distributing leaflets and providing information sheets in different key places that are involved in the referral process, such as hospitals and GP surgeries, schools and health centres. This strategy is supported by the findings of another study which found that monitoring and improving programme recruitment and the referral system will increase the number of families' who enrol over time (Elizabeth & Skelton, 2011).

Moreover, results as shown in Table 3-10, reported that attrition in the earlier days of the programme (2009) was at least 3 times higher than was obtained in the later years. This may be explained by different factors. For example, this may link back to the earlier discussion on the need to effectively identify and meet both child and parent's respective needs, wants, and expectations to support motivation and limit potential drop-out (Barlow & Ohlemeyer, 2006; Barlow, 2007). From the researcher's observation, it was noted that materials and activities evolved as the programme progressed over time, suggesting that on-going feedback and review was ensuring a qualitative improvement in delivery to better meet needs, wants and expectations of participants**.** Of course, this trend could also be explained by the fact that at programme start-up there were low levels of awareness of the programme and its aims. This could have had implications in terms of establishing clear and realistic expectations of child and parents before the programme started, as well as ensuring that healthcare professionals themselves had sufficient awareness of the

programme itself to ensure the correct target group were effectively recruited. One study has suggested that a way forward to limit misalignment of expectations is through an orientation session (Germann *et al*., 2006). The exit study here will provide more answers.

Evidence suggests that the intensity of session visits (e.g. biweekly, monthly, or yearly) and the length of treatment most likely contribute to level of attendance and drop-out. For example, three studies (Denzer *et al*, 2004; Germann *et al*, 2007; de Niet *et al.*, 2011) have identified variables that predict drop-out at different stages of paediatric weight management interventions (e.g. during the intensive phase or after a specified number of clinical visits). So, another explanation that might address why the ACES programme improved over time is due to the intensity and duration of the programme. At the initial phase of ACES in 2009, the sessions were delivered weekly over 24 weeks between August 2009 - March 2011. However, between March 2011-2014 the programme target changed to weekly sessions over 12 weeks. This decision was taken in order to encourage family engagement with their sessions, and seemed to be based on child and parent feedback as well as other research. For example, the US-based Braet *et al.* (2010) study of 4-16 year olds held over 3 months with a 44% attrition rate found matching parent and child expectations to be a stated reason for attrition, while low motivation was positively associated with attrition. Indeed, mirroring these findings both the children and their parents in the ACES programme attached great importance in this study to the three motivational factors (see Table 3-7), and so ignoring negative feedback may have a cost in terms of attendance and attrition.

For instance, Van den Akker *et al*. (2007) reported the lowest attrition level from the research at (4%). This was after three months of intensive treatment – and children had a significant reduction in weight persisting until the one-year follow-up**.** Therefore, this seems to suggest that shorter, intensive interventions, such as the ACES programme, may be help to create positive outcomes and engagement for families. The intensive phase programme could be combined with later longer maintenance follow up phase for better evalaution and improvement. It is conceivable that keeping families engaged in short-intensive interventions may be more feasible and cost-efficient than keeping families committed to long-intensive interventions and at the same time be more successful in maintaining family engagement. Feedback from the Exit survey study (refer to Chapter 5)

may help to inform on how the influence of programme structure, specifically duration and intensity, impacts on attrition.

This study also found that there was a significant association (p-value< 0.05) between the number recruited each year by area and the season (see Table 3-5) respectively. The ACES programme has largely spread-out across GG & C, and has subsequently been delivered in further areas beyond Glasgow than when started. Perhaps because GG & C were the initial developers of the programme, provision in the major city of Glasgow is greater than elsewhere. The predominance of recruits from Glasgow may also be because of the need to address the socioeconomic diversity of the city, and ensure effective recruitment of targeted groups. However, Glasgow also had the highest percentage with 0% attendance (refer to Table 3-10), suggesting that this area has the biggest challenge in successfully recruiting, overcoming barriers and maintaining the interest of participants. It is not to be forgotten that those from the most deprived areas had the poorest attendance (see Table 3-9) and that Glasgow was effective in at least enrolling, if not maintaining, these participants.

Another interesting finding from a planning perspective is that Table 3-10 shows that venue can have an impact on attendance, with higher attendance at sports and leisure facilities than elsewhere. This may link with the options available for family members while they wait for the child to complete an individual session or the availability of follow-up activities. The Exit study here will seek to clarify the factors influencing venue preference. This is important if higher attendance and less attrition are future goals of programme developers.

Additionally, the observed trends in Table 3-8 might be explained by several factors which include the extent of programme publicity in different regions, the recruitment strategy, the targeted family characteristics, socio-demographic characteristics, interest in the programme, facilities and the number of trained coaches available, and realistic expectations of families. It is not possible to measure the extent to which all these factors influenced recruitment in this present study. However, further findings may serve to explore some of these factors further in the entry study (chpater 4) and the exit study (chapter 5).

3.9 Conclusion

This routine data analysis study has highlighted possible areas for further research to uncover both relationships and reasons for attrition. 'Entry' survey (see Chapter 4) and 'Exit' (refer to Chapter 5) studies were an opportunity to obtain actual input from parents about their children to clarify their perceived needs, wants, and expectations of the programme. In addition, it was an opportunity to get feedback on perceived child levels of motivation about weight loss as well as some of their own attitudes and beliefs towards food, physical activity and related lifestyle issues.

Chapter 4. Study Two: Baseline 'Entry Survey'

4.1 Introduction

This chapter examines the baseline characteristics of the families including child and parents baseline characteristics entering the treatment programme and how this relates to attrition. The entry study data was collected based on a new structured piloted questionnaire to gather more in-depth information about families who attended the ACES 1:1 assessment, which occurred prior to commencement of the ACES weight management programme. This was carried out between April 2012-2013, across different locations in Greater Glasgow & Clyde. The context of Ecological Theory (Davidson & Birch, 2001) also was used to discuss the significant findings regarding those factors that were more related to parental characteristics.

4.2 Background and Purpose of the Entry Study

Previous studies have highlighted the importance of comprehensive behavioural intervention in the limiting of attrition in treatment of paediatric obesity. The parental role in this type of intervention is also recognised (Whitlock *et al*., 2010), especially as they act as role-models (Golan *et al*., 2004; Ritchie *et al*., 2005; Janicke *et al*., 2008) from directly controlling type and quantity of food available, and controlling the type of activities available to children (Stang *et al*., 2004; Ritchie *et al*., 2005); to indirectly modelling of eating and physical activity behaviours (Stang *et al*., 2004; Ritchie *et al*., 2005). Previous studies emphasise the significance of the relationship between parenting background (socioeconomic status, recognition and concern about child weight, awareness of health effects of obesity and overweight, perception of their child's body image, feeding practices) and childhood obesity (Skelton *et al*., 2012). Other factors, such as the role of family cohesion/structure (e.g. family weight history, family cohesion) and child emotional/psychological issues (e.g. behavioural problems) have also been found to correlate with obesity/overweight problems in children. However, still very few studies have linked these factors to rates of family drop-out from weight management programmes (Skelton *et al*, 2012).

The present study will investigate factors which may affect family drop-out. This is because there is a lack of evidence in the literature from which to form the basis of an investigation into the extent to which identified factors can improve retention. The expectation was that the study results would aid in identifying areas of programme improvement. The latter would occur as a result of obtaining a better understanding of each family. This in turn would allow for a more effective development of an individualised approach to each family that can better address that family's needs wants and expectations and so maintain motivation and ultimately retention.

4.3 Aim and Objectives

This study aims to prospectively determine associations between parental perceptions of child characteristics, child baseline characteristics, and attrition among families who joined the treatment programme. To accomplish this, the following objectives will be addressed in this chapter:

1. Describe child baseline characteristics and parental soci-economic status.
2. Describe families' perceived reasons for joining ACES and their expectations.
3. Explore how child baseline characteristics impact on programme attendance.
4. Explore how much parent's recognition of their child's weight status and health impact on programme engagement.
5. Explore how much parent's concern over their child's status and health impacts on programme engagement.
6. Explore whether family structure (cohesion) is associated with family attendance.
7. Explore how much does parental feeding style impacted on programme attendance.
8. Explore how the child's behavioural difficulties affect the family engagement through attendance in the treatment programme.

4.4 Methodology

In order to address these objectives an entry survey was conducted between April 2012-2013.

4.4.1 *Ethical Approval*

In October 2011, the researcher obtained ethical approval from the NHS Ethics Committee to conduct the entry study of this research. This involved submitting a first draft of the entry questionnaire, and resubmitting the amended (post-pilot) version for approval. Approval with substantial amendment was subsequently granted in the same month.

4.4.2 *Location*

This study was carried out over several areas across Greater Glasgow and Clyde, East Renfrewshire, West Renfrewshire, East Dunbartonshire, West Dunbartonshire and Inverclyde in Scotland (see section 2.9.2.).

4.4.3 *Participants*

All participating families who joined the programme between April 2012 and March 2013 were invited to join the ACES baseline entry survey. Families who attended their 1:1 appointment received information and consent forms (see Appendix 3), before then being asked to fill out the baseline entry questionnaire. This survey included aspects on the child, such as child socio-demographic, anthropometric, behavioural difficulties, family cohesion and the parents. The latter included parental socioeconomic information, parental beliefs and expectations, recognition and concern about their child's weight, and parental feeding style.

4.4.4 *Entry Survey*

4.4.4.1 Questionnaire development

Questionnaires are a popular, cost effective means of obtaining information on participants' backgrounds, such as socio-demographic & economic knowledge, beliefs, attitudes and behaviours from participants over a wide geographical area (Sim & Wright, 2000: Wall *et al.*, 2001; Boynton & Greenhalagh, 2004). A review of the literature to identify a suitable validated questionnaire that could be utilised to explore the factors to be examined in this study was carried out. However, no such single useable tool was

identified that could adequately address the study objectives and address the research questions. Thus, the instrument used in this entry survey was a self-reporting, research questionnaire. Its questions were structured in Likert-type scales. The scales ranged from 4 to 6 scales, with options from "not satisfied" to "very satisfied"; "not confident" to "very confident"; "not at all" to "always"; and "strongly disagree" to "strongly agree"; only one question was open-ended.

Due to limited responses in some categories, some of the Likert categories were compressed to a lower Likert number of options in order to improve the power of statistical analysis. For instance, three groupings in Q.7 were created from 4-point Likert scales (Poor, Fair, Good and Excellent). Family responses were re-categorized into 3 groups (Poor & Fair = dissatisfied), (Good=satisfied), (Excellent=very satisfied). Dawes (2008) has explained the impact of using different Likert scales on results. According to the author, different Likert scales may be effective, depending upon the characteristics of the research, the participants, and the data required. In the case of a customer satisfaction survey, a 5 to 7-point Likert scale may be more effective. According to Murray (2013), the type of analysis performed on Likert data does not have any impact on the results. Thus, not with standing the type of Likert scale used, the results are expected to be the same. Therefore, it can be said that the use of 4-6 point scales for this research is the best choice, as it includes questions regarding the satisfaction of participants.

A pilot questionnaire study was carried out in January 2012 with 7 existing ACES participating families. Amendments were made based on their feedback on question length, language level and layout, and content appropriacy. This pilot took place between November 2011 and January 2012 with randomly chosen families already in the ACES programme from West Glasgow, East Glasgow, and East Renfrewshire who consented to help with analysing the questionnaire. Piloting was informal as the researcher had not asked for consent prior to the families beginning the programme and they only gave this during their ACES journey. When the study commenced consent was sought prior to families beginning the programme. After discussions between the researcher and the supervisors, the questionnaire was refined by addressing the central advice of those who were piloted. Those who participated suggested, at various stages, that the questionnaire had too many repetitions, that it was too long and that some areas of the questionnaire mirrored other parts too closely. These views were gathered in three stages: 2 families

looked at an inital version of the questionnaire and gave feedback; it was then refined and 2 different families made comments on this new, amended version. These comments led to further changes before a once more newly refined questionnaire was piloted further to 3 more families. These families found the content and variety of the questionnaire interesting but felt that it was still slgihlty too long. This concern was addressed in a final version of the questionnaire that during the piloting process had been reduced from 16 to 12 pages. The questionnaire (see Appendix 3) design stemmed from two sources of information:

1. Characteristics covered in the literature review, particularly in terms of family structure and parental influence on the development of childhood obesity based on the EST model (see Figure 1-1).
2. Standardised measurement tools, including the following questionnaires: Parental Feeding Style Scale (CFQ) (Birch *et al.*, 2001), Adaptability and Cohesion Evaluation Scales (FACES III) (Olson *et al*., 1983), Child Strength and Difficulties (SDQ) (Goodman, 1997) and Child Body Image Size (CBIS) (Truby & Paxton, 2002). The study questionnaire was a self-completed, structured questionnaire that utilised 4- or 5-point Likert scale items and multiple-choice questions.

Studies have consistently shown that low response rates are due to participants being unable to read or follow the questionnaire (Boynton & Greenhalgh, 2004). Therefore, it is recommended to pilot the questionnaire on participants who are representative of the sample (Boynton & Greenhalgh, 2004). Piloting the data collection tool on a small sample ensures it is effective (Payne, 1999) and provides feedback about the wording and clarity of questions, appropriateness of the questions for the target population and the presence of redundant or unnecessary items (Wall *et al.*, 2001). In this study the entry questionnaire was piloted on 7 families who had attended the ACES 1:1 assessment visit (see Appendix 3). Their feedback was used to develop the final questionnaire versions.

4.4.4.2 Questionnaire implementation

Families participating in the current programme were given an introduction leaflet to explain the study and its purposes to them during their 1:1 appointment visit (refer to Appendix 3). Families were allowed to ask the researcher or coach any questions about the study before participating. If the family was happy to take part in the study, then they were asked to complete the consent form (see Appendix 3). It was difficult for the researcher to be on site during all the 1:1 assessments due to scheduling conflicts, which resulted as a

consequence of a standardised fixed timetable across all programme areas, which meant assessment sessions occurred at 5:00-6:30pm. Thus, coaches were advised in advance-scheduled meetings by the researcher on how to administer and to collect back the questionnaires in such cases.

The parental self-reported questionnaire usually took between 30-40 minutes to complete. In locations where the researcher was not available during the 1:1 assessment, coaches securely stored completed questionnaires in the coach manager's locker, and they were collected the following day.

4.4.5 *Data Management*

This section describes the data collection, entering and coding system, checking (missing & duplication) and analysis procedures undertaken in this study.

4.4.5.1 Data collection

Agreement to administer the final structured version of the entry questionnaire was given by the HEAT steering group, ACES NHSGGC organiser in March 2012. The study questionnaire distribution commenced in April 2012 across all ACES locations. The baseline data collection for the entry questionnaire was performed over four 12 weekly blocks of the programme throughout the year of the study up until April 2013.

The expectation was to collect from a sample of 221. This assumption was calculated based on the retrospective routine data of ACES which had been collected annually, since the programme started in 2009. The entry study was projected to include a total of 23 new families starting the programme across all locations per month. It was estimated that 80% of participating families would complete a one-to-one questionnaire. Based on these assumptions, then after 12 months from the commencement of the study a total of (n=221) would have been recruited. However, a total of (n=194) of the entry questionnaires were in fact collected, an actual three quarters of the expected number. Even so, a 75% rate of return is considered high. From these, a total (n=13) of these questionnaires were filled out by siblings of obese children. This group were not overweight or obese children themselves. Thus, they had to be discounted from this study. Thus, only (n=181) of families who completed the entry questionnaire were included in the final analysis.

4.4.5.2 Data entry and coding

After collecting the questionnaire, each was assigned a unique identification code by coaches, using the child's initials and date of birth, which was stated on the top of the cover page of the questionnaire. This unique identifier was maintained consistently throughout the analysis. It was also used to identify the child's full name from the ACES main data base in order to complete any missing information, such as an address, demographic or anthropometric data. This was also important in order to be able to identify and follow-up with the child in the exit study.

For ease of analysis, variables were then collated by the entry questionnaire and subdivided into themes according to which were relevant to child characteristics, or parental characteristics. These outcomes were coded according either to the scoring system provided with each valid measurement such as the Child Feeding Score (CFQ), the Truby Body Image Test (CBIS), Child Difficulties Score (SDS), or to the ordinal sense of those answers provided by categorical data statements.

All data collected in the entry questionnaire was linked to other data sets provided in the family weekly attendance records. The latter was assigned a unique code identifier assigned by the first and surname of the mother and child respectively in order to link the data collected from the questionnaire with child attendance records. Further information is provided in the next section. The entry questionnaire (see Appendix 3) included the following sections as in Table 4-1:

Table 4-1: Entry Questionnaire sections

Section 1	Contained baseline demographic information (1:1 assessment data) e.g. child date of birth, gender, areas, venue name, postcode, initial contact number.
Section 2	Contained parental characteristics e.g. parental demographic factors. marital status, education level, income, accommodation type, car ownership; parental recognition and concern of child's weight status; parental feeding style (CFQ); family cohesion (Adaptability & Cohesion Scale).
Section 3	Contained child behavioural problems (SDQ).

The collected data were entered into SPSS version 0.18 for data analysis purposes, in order to determine which of these baseline characteristics were linked to child weight status and are predictive of lower attendance.

4.4.5.3 Family weekly attendance records

The child attendance record data was provided in separate data sheets by each location where the programme operated. Attendance sheets were normally collected by coaches in all venues and stored in the manager's office at each location. Entries were then recorded on separate excel spreadsheets. In order to merge these collected attendance records with other information collected by the researcher; a unique identifier code was assigned. This same unique identifier code allowed the researcher to match attendance records with the ACES main database in order to identify the child and mother's first and family names. These NHS database sourced names were then matched with those in the ACES attendance sheets.

4.4.5.4 Data anonymity and confidentiality

In order to uphold Data Protection Laws (1998), all data used a unique identifier code in order to maintain anonymity. No names were used or other identifying demographic details to maintain participant anonymity. This data was saved in a secure procedure see (section 3.4.3.4).

4.4.5.5 Missing and duplicate observation and data linkage

Missing data was primarily demographic, for instance: child date of birth, gender and SIMD (n=17). Additionally, there were a few questionnaires where complete sections had been left blank (n=6). In these instances, blank sections were sensitive in nature, such as the family cohesion and child difficulties sections. Using the identifier code on the questionnaire and the ACES database, this demographic data was gathered by the researcher (n=17). For the blank sections (n=6), the researcher contacted the ACES manager in the relevant areas to gather data from coaches' 1:1 appointment sheets, which had been stored locally. The coaches worked with 4 families to complete the questionnaire prior to the second visit. Another two families did not attend the second visit, and the researcher called them directly and completed data over the phone

Duplicate records were identified by cross-referencing postcodes (n=11) which may have resulted from collecting data from siblings who had previously been discarded as ineligible as they were not overweight or obese themselves.

4.5 Measurements

4.5.1 *Child Baseline Characteristics*

Child characteristics used in this study included child age, gender, socioeconomic status using (SIMD code) see (section 3.5.1.3) and anthropometrics.

4.5.2 *Child Anthropometric Measurements*

Overweightness and obesity were measured in terms of Body Mass Index (kg/m^2). Standard Deviation Scores (BMI-SDS) were described in the Routine Data Analysis chapter (see section 3.5.1.1). The child's weight and height were measured at the venue by trained coaches during the 1:1 assessment, before starting their 1st week session. BMI-SDS was calculated using the LMS software of the Child Growth Foundation (Pan & Cole., 2008).

4.5.3 *Attendance Records*

Weekly attendance record sheets were normally manually entered by coaches in each area and venue separately, and this data was then transferred and compiled onto Excel spreadsheets at the main administration office, whilst hard copy records were stored centrally. The researcher collected the electronic attendance spreadsheets for each designated area on a regular basis, when the programme was approaching its end (after the 12 week session). This was for the purpose of merging each attendance record with the child baseline entry information record.

4.6 Questionnaire Content

Based on the EST model (see Figure 1-1), the parent entry questionnaire was structured to focus on three main sections: child characteristics; parent characteristics; and family characteristics (see Appendix 3).

4.6.1 *Child Baseline Characteristics*

This section includes child socio-demographic data (see section 3.5.1.2 and 3.5.1.3), anthropometric data (see section 3.5.1.1) and child behavioural difficulties (SDQ).

4.6.1.1 The Strengths and Difficulties Questionnaire (SDQ)

The Strengths and Difficulties Questionnaire (SDQ) incorporated into this study is a standardised design questionnaire (Goodman, 1997) used to detect behavioural, emotional and relationship difficulties in children aged 4-16 years. The child Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) was used to identify negative and positive psychological factors; it was originally designed for the 3-16 year old range, and so that the informant-rated version could be implemented by the parent and teacher. It is based on the original valid and reliable Elander & Rutter (1967) questionnaire but has been updated to meet criteria from the International Classification of Diseases, tenth edition (World Health Organisation, 1994) in addition to the Diagnostic and Statistical Manual of mental disorders, fourth edition (American Psychiatric Association, 1994) to put greater emphasis on paediatric psychopathology (Goodman, 1994; 1997). It assesses the difficulties and the competencies of the psychosocial dimension (Carr, 2000, Rhee *et al.*, 2001). The higher the individual scores or the total score, the greater difficulty the child has on a psychological level. However, Goodman (1994) designed the additional pro-social scale for parents which indicate the level of positive -social traits a child demonstrates (Goodman, 1997). The lower this score, then the lower the child's ability to socialise with others effectively (Goodman, 1997). This free and accessible tool benefits from being positively-worded, brief and so is time-efficient (Goodman & Scot, 1999).

The questionnaire was based on 25 items: 10 strengths, 14 difficulties and one neutral item. The 25 items were divided into 5 scales of 5 items each: hyperactivity, emotional symptoms, conduct problems, peer problems and pro-social behaviour. Each SDQ item had three possible answers which were assigned a value 0, 1 or 2. The score for each scale was generated by adding up the scores on the 5 items within that scale, producing scale scores ranging from 0 to 10. A 'Total Deviance' score was derived from the sum of scores from each of the scales, except the Pro-social Behaviour scale, producing a total score from 0 to 40. The SDQ was used for children aged 4-12 years in the 2008 survey. The latter correlates highly with the Rutter questionnaire and the Child Behaviour Checklist, both of which are long established behavioural screening questionnaires for children that have

been proved valid and reliable in many contexts and correlate highly with one another. The SDQ is shorter than these screening instruments and is the first to include a scale focusing on positive behaviour: the Pro-social Behaviour Scale (Goodman, 1997).

This study utilised the parent SDQ only as this was a community-based intervention rather than school-based. In their review of the SDQ incorporating 48 studies, Stone *et al*. (2010) found that the 25-item SDQ demonstrated high psychometric characteristics despite its shortness. In terms of reliability, whilst they found greater internal consistency amongst teachers, it was still at a satisfactory level for parents (Stone *et al.,* 2010). The scale indicating greatest weakness in terms of capacity to discriminate and internal consistency was the parental pro-social scale.

The SDQ has been used in the UK in a range of studies that attest to its reliability and validity (Glazebrook *et al*., 2002; Goodman *et al*., 2004). For instance, it was used by Goodman *et al.,* (2004) in their UK population clinical study of 1,028 5-17 year olds in order to assess SDQ for improving and detecting community psychiatric disorders, and involved assessing both total and pro-social domains. The study found that screening with the SDQ (in this instance carer and teacher versions) could enhance the identification and treatment of emotional, focus and behavioural issues among looked-after children. Goodman (2000b) reports that the SDQ has high predictive validity of diagnosis in the clinical setting. Goodman also goes on to identify the predictive effectiveness of applying an algorithm to the SDQ scores in the community setting for screening for psychiatric condition purposes (Goodman *et al.,* 2000a).

In relation to validity, a systematic review found that the five-factor scale structure was affirmed by the majority of studies, with correlations with other indicators of child psychopathology high, and with strong evidence as to the effectiveness of the SDQ as a screening tool (Stone *et al.,* 2010). However, parental assessment of peer problems utilising the scale showed the greatest validity and reliability weakness (Stone *et al.,* 2010). Generally, reliability and validity were found to be weaker at the sub-scale rather than the total scale. Even so, overall the SDQ was found to be an effective, well-validated screening tool (Stone *et al.,* 2010).

4.6.2 *Parents Characteristics*

This section focuses on parental background, including the following:

4.6.2.1 Parental socio-economic status

The socioeconomic status of participant families was determined by using two types of variables. First, the standardised Scottish Index of Multiple Deprivations (SIMD) code (2009) was employed (see section 3.6.1.2). Second, the SES score was calculated using the sum of five questions describing parental socio-economic circumstances (see Table 4-2). Parents were asked to describe their socioeconomic circumstances using five nominal multiple-choice questions on: marital status; level of education of the child, Q21; level of education of the parents, Q 22; household income, Q 23; housing, Q 24; and care ownership, Q 25. The latter tool is used to augment SIMD. The SES score was developed using specific statements which can evaluate parental socio-economic status and which gave an indication that they were reflecting the same level of socio-economic status as described by SIM. Thus SIMD helped to validate the principle used to create the SES score.

4.6.2.2 Parents beliefs and expectations

Parental beliefs were examined in two researcher-developed questions based on the literature review which had indicated that parental beliefs and expectations of the necessity of attending a treatment programme may impact attendance or engagement (Zeller *et al.*, 2004; Braet *et al.*, 2010; De Niet, 2011). Despite searching, no suitable pre-existing validated tool that met the aims of the research could be identified. Thus this self-generated questionnaire was piloted, feedback obtained and the final version was developed. Question 4 investigated the importance to the family of making the decision to join the programme. This comprised of seven statements, answered on a 5-point Likert scale, from ‘very unimportant’ (1) to ‘very important’ (5). One exception was Question 5, which was related to parental expectations from attending the programme. Ten statements were considered, using a 5-point Likert scale: from ‘strongly disagree’ (1) to ‘strongly agree’ (5).

4.6.2.3 Parental recognition and concern about their child's weight

Parental recognition and concern about their child's current weight was measured through direct and indirect mechanisms based on findings in the literature indicating there may be variation in response (Jones *et al*., 2011). Parental recognition measurements included: first, directly asked (Question 6 & 7) parental opinion about their child's current weight. Second, a standardised body size images scale (CBIS). For question 6, answers were given through 5 ordinal responses: ('don't know' (0), 'very underweight' (1), 'underweight' (2), 'normal' (3), 'overweight' (4), 'very overweight' (5). Also, in Question 7, on the parent's opinion of their child's current weight and healthiness, answers were given on a 4-point scale: ('don't know' (0), 'no' (1), 'probably not' (3), 'probably' (4), 'yes' (5).

Visual scales (CBIS) were utilised in questions 12 and 13. This tool was developed by Truby & Paxton (2002) in order to evaluate parental perception of their child's current weight now and how they would like to see their child in the future based on visual scales, and had the advantage of being quick. It has been found to be a good measure of body dissatisfaction (Truby & Paxton, 2002).

These asked parents to identify their child's current weight from a selection of standardised body size images to determine levels of parental recognition of their child's weight status as well as to find out how satisfied parents were with their child's current weight. Parents were asked to nominate the body figure they most would like their child to look like. The Trudy Child Body Size Image scales for boys and girls are equivalent to BMIs on or around each of 7 conventional 1979 NCHS percentiles (3rd, 10th, 25th, 50th, 75th, 90th and 97th) (Hamill *et al*., 1979).

Parental concern is another aspect covered in this section. This focused on two questions which come from the CFQ questionnaire (see section 4.6.2.4): Questions 9 and 10. Parents were asked to select from a 4-point Likert scale, from 'unconcerned' (1) to 'very concerned' (4). Both of these were used to ask about the parental level of concern about their child's weight now (Question 9) and in the future (Question10) (see Appendix3).

4.6.2.4 Parental Feeding Style (CFQ)

The parental feeding style (CFQ) is a parental self-reporting tool which was devised to identify parental attitudes and behaviours towards their child's food intake. It also assesses parental concerns and attitudes regarding their child's weight status (Birch *et al*., 2001).

The CFQ was used in three varying samples in the same study in the literature: 1) 394 parents in the US focusing on growth nutrition and development in 5-10 year old girls, with parents averaging mid 30s 2) 148 parents in the US of 8-11 year old children (53:boys; 67: girls), with parents averaging early 40's 3) 126 parents in the US of 7-11 year old (63 boys; 63 girls), with parents averaging in their 30's (Birch *et al*., 2001). The perceived parental responsibility mean was 3.4 (±0.95); parent perceived child weight mean was 2.9 (±0.50); parent concern mean was 2.3 (±1.15); pressure to eat mean was 2.5 (±0.95); the food restriction mean was 4.0 (±0.78); and, food monitoring was 3.6 (±0.91).

This study utilised the standardised CFQ questionnaire in order to assess aspects of child-feeding perceptions, and their relationships to obesity levels among families that attended the treatment programme. This was in order to identify if parental feeding practices can affect family engagement through attendance with the treatment.

The child-feeding practice score developed by Birch *et al,* (2001) was designed for completion by parents of children aged 2 to 11 years. It uses a 31-item questionnaire involving 7 domains. These include: level of parental responsibility for feeding their child, concern about their child's weight, restriction on a child's food intake, parental pressure exerted to consume or not consume foods, and degree of monitoring of food intake. The range of responses for each question was on a 1-5 point Likert scale.

Several studies by Birch and fellow researchers have attested to the validity and reliability of the questionnaire for measuring several elements of parental feeding styles in early childhood (Birch & Fischer, 1998; 2000; Carper *et al*., 2000; Birch *et al*., 2001).

4.6.2.5 Family characteristic (Cohesion)

A standardised developed questionnaire (Adaptability and Cohesion Evaluation Scale) (Olson *et al*., 1983) was used to evaluate the effect of family function. The version of the questionnaire used comprised of 25 items, on a 3-point Likert scale: 'not true' (0), 'somewhat true' (1), 'certainly true' (2). The sum of the scores for the 25 statements gave a total score to measure the level of cohesion within the family; a lower score indicating lower cohesion, and a higher score showing greater family attachment.

4.7 Data Analysis Procedure

In order to address the aim and objectives of this chapter, the data analysis and results are presented in three main sections as follows:

4.7.1 *Section 1: Descriptive Analysis*

A descriptive analysis was done comprising of two main parts: a description of all baseline characteristics (Child, Parents and Family) and family attendance levels.

4.7.2 *Section 2: Comparative Descriptive Analysis*

A comparison of the above characteristics between non-completers (0-7 weeks attendance) and completers (≥ 8 weeks attendance).

4.7.3 *Data Regrouping*

In order to improve the power of the statistical analysis, some variables were re-categorised into fewer groupings due to small cell numbers (and sometimes, empty cells) when the variables were cross-tabulated e.g.; (child age, socioeconomic SIMD code and child BMI z score groups).These small cell numbers resulted to very small expected values. Chi-square tests can give inaccurate results when the expected numbers are small. To avoid this, the data was regrouped to reduce the number of empty cells or cells with small numbers. These re-categorisations were also conducted for all variables with scanty cell data and for the following variables.

Child anthropometric Z score of children's height, weight and BMI was calculated using the UK 1990 growth chart references BMI (Cole *et al*., 1998), BMI data was also explored using the BMI z score continuous (Figure 4-2). Due to the distribution of the mean and median of the BMI z score (refer to Figure 4-2) the data was re-categorised into two groups: (overweight & obese ≥2.00SD to 2.66SD) and (severely obese ≥ 2.67th).

A binary re-grouping of child age was developed, which explored the distribution of age as continuous (see Figure 4-1**).** This showed that the age of the children was normally distributed, and that both the mode and the median were equal to 10 years. Given that the age range of the children was between 5 and 15, and the fact that the data was normally distributed, instead of having three age groups as shown in Table 4-1, age data was re-

categorized into two groupings: first, between (5-10 yrs) named ‘the young age group’, and second, (11-15 yrs) referred to as ‘the old age group’ as shown in Table 4-2.

The socioeconomic status of participants’ children and their families using SIMD (2009) were re-categorised. The areas were ranked from 1 (most deprived) to 5 (least deprived) as shown in Table 4-1, however in this analysis Table 4-2 they were amalgamated from five to three categories of SIMD code to improve cell proportions of both the 'Most deprived', ‘middle’ and the ‘most affluent’ groups respectively. Hence, the ‘Most deprived’ & ‘Deprived’ were combined and designated as ‘deprived’. The ‘most affluent’ & ‘affluent’ were also merged into an ‘affluent’ grouping, as shown in Table 4-2.

The baseline socio-economic characteristics of the parents were described using other specific ally collected information. Studying these variables supported the findings of SIMD (2009) levels used to describe family level of socio-economic circumstances. A measure of the parent socioeconomic status (SES) was constructed by scoring their socioeconomic characteristics and summing the scores (see Figure 4-3) (see Table 4-5). The scores were developed by assigning scores to the responses to 5 questions used to measure parental socio-demographic characteristics. These included: marital status, level of education, income, accommodation and car ownership). The code number of (0 or 1) was assigned to nominal responses (No = 0 and Yes = 1) to these questions on marital status, income source, and car ownership, and to ordinal responses to level of education, and accommodation type was assigned scales between (0 and 3) where the lower scale represents a lower level of education or least accommodation type and a higher scale indicates higher education level and type of accommodation respectively. For instance, level of education has 3 levels scales as school age 16 = 0, school age 18 = 1 and higher education=3. For type of accommodation, social houses = 0, private rented = 1, house with mortgage=2, house without mortgage=3.

Parental beliefs were investigated the importance to the family of making the decision to join the programme. This comprised of seven statements, answered on the 5-point Likert scales used to obtain information on parent belief and expectations but condensed to three as Unimportant (= Very unimportant + Unimportant), Neutral, and Important (=Very unimportant + Unimportant**)** for parent’s belief and Disagee (= Strongly disagree + disagree), neutral and Agree (=Agree + Strogly agree), The sum of the scores mirrored the

SIMD categories of the parents (see Table 4-4). The distribution of scores was approximately normal with similar mean and median (3.8 and 4.0 respectively); the spread was relatively small as shown by the range (0 - 8) and standard deviation was 2.1 (see Figure 4-3).

In (Table 4-10), parental recognition and concern about their child's current weight was measured through Question 7 on the parent's opinion of their child's current weight and if it was healthy; answers were given on a 4-point scale: 'don't know' (0), 'no' (1), 'probably not' (3), 'probably' (4), and 'yes' (5). This evaluated parental perceptions of their child's current weight and how they would like to see their child in the future based on visual scales, and it had the advantage of being quick. This method has been found to be a good measure of body dissatisfaction (Truby & Paxton, 2002). As such, parents were asked to identify their child's current weight from a selection of standardised body size images to determine levels of parental recognition of their child's weight status as well as to find out how satisfied parents were with their child's current weight. Parents were asked to nominate the body figure they most would like their child to look like. Parents' level of accuracy was calculated by comparing three BMI categories (over, obese and severe) with parents' perceptions of their child's current weight categories (Normal weight, overweight and very overweight) by assigning 1, 2 and 3 respectively to both the actual BMI and parents' perception. The difference between actual BMI and the perception of parents gives a measure of accuracy which range from -1 to +1. Zero means that parents' perception match perfectly with actual BMI (accurate estimation), a score of -1 entails underestimation by the parents while a score of +1 means overestimation.

4.8 Results

Data collected on 181 children and their parents who participated in the entry study was analysed, and the following was found:

4.8.1 *Child Socio-demographic Characteristics*

Table 4-2 describes the baseline anthropometric, demographic and socioeconomic characteristics of children n= 181 who were seen during their initial evaluation visit. Of them, 100 (55%) were female and 81 (45%) were male. The mean age at baseline for both genders combined was (9.91±2.51) (see histogram 4-1). Almost half (n=81, 44.8%) of children were aged between 9 and 11 years old. More than half of the children were identified as having BMIs falling within the severely obese category (≥99.9th centile) (see histogram 4-2). Almost a third of children who attended the 1:1 interview were from the most deprived socio-economic status (n=71, 39.7%).

Table 4-2: Child demographic, socioeconomic, anthropometric baseline characteristics

Total number of participants	**N=181**
Age at baseline, mean ±SD, n=181	9.91±2.51
Height z score, mean ±SD, n-176	1.13±1.15
Weight z score, mean ±SD, n=175	2.82±0.90
BMI z score, mean ±SD, n=175	2.93 ± 0.76
Age at baseline, (categories), n (%)	
Age 5-8	52 (28.7)
Age 9-11	81 (44.8)
Age 12-15	48 (26.5)
Gender, n (%)	
Male	100 (55.2)
Female	81 (44.8)
BMI z score (categories), n (%)	
Overweight 91^{st} - 9^{8th}	14 (8.0)
Obese > 98^{th} - 99.6^{th}	57 (32.6)
Severely obese ≥ 99.6^{th}	104 (59.4)
Socio-economic (SIMD), n (%)	
1 Most Deprived	71 (39.7)
2 Deprived	26 (14.5)
3 Middle	21 (11.7)
4 Affluent	47 (26.3)
5 Most affluent	14 (7.8)

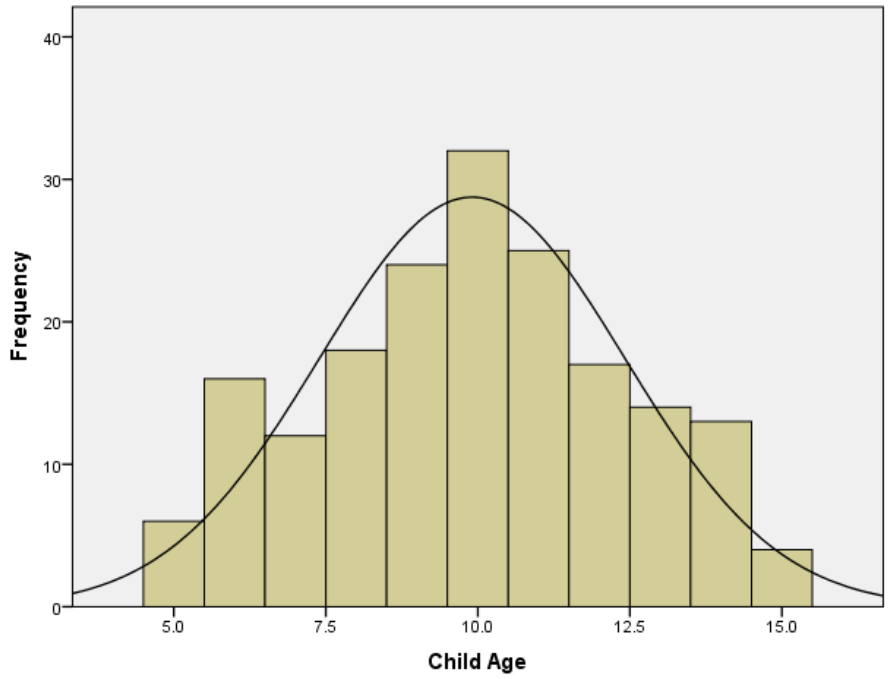


Figure 4-1: The distribution of child age at baseline

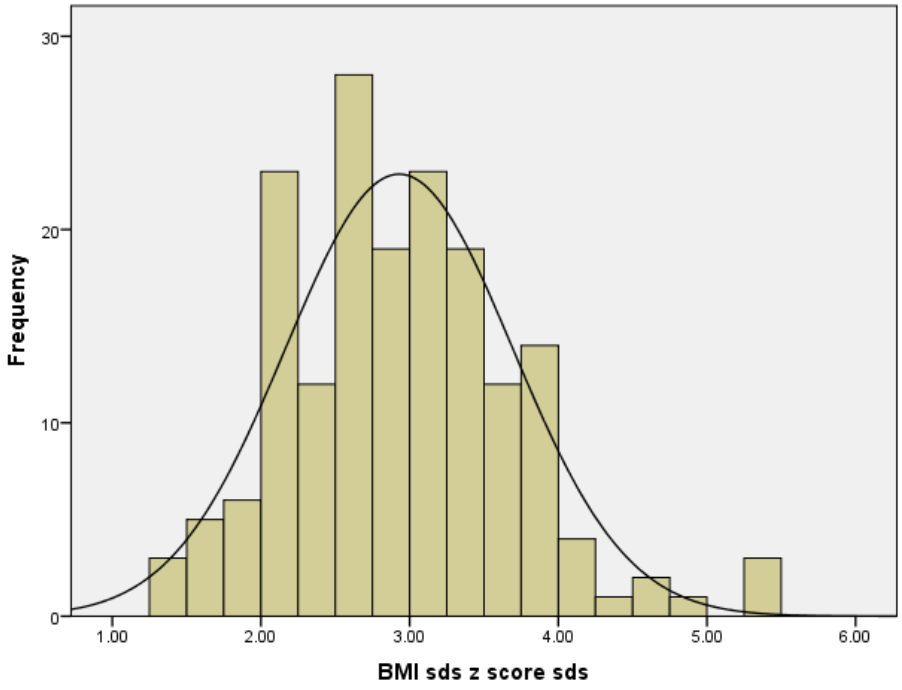


Figure 4-2: The distribution of child BMI sds at baseline

Table 4-3 shows, that there was little difference in z-score height and weight between boys and girls. Boys had similar height z-scores but they were much heavier than girls. This meant a significant difference in BMI z-score groups between the boys and girls as depicted by the independent t-test in (Table 4-3). However, the pattern of distribution across the BMI groupings was similar for girls and boys and showed no statistically significant difference using chi-square tests. The proportion of girls who were younger than boys was 62% (age 5-10 year-olds), and the distribution across age groupings indicated that there was a significant difference between girls and boys using chi-square. However, independent t-test indicated that no significant differences were found between age and gender.

Table 4-3: Descriptive comparison between child gender group at baseline

Characteristics	Baseline - 1st Assessment		P-value
	Female	Male	
Age continue, mean ±sd	9.59±2.33	10.21±2.72	0.078
Height z score, mean ±sd	1.09±1.01	1.19±1.21	0.622
Weight z score, mean ±sd	2.71±0.70	2.95±1.02	0.081
BMI z score, mean ±sd	2.82±0.62	3.07±0.83	0.033
Age (categories), n (%)			
Age 5-10, n=108	67 (62.0)	41 (38.0)	0.025
Age 11-15, n=73	33 (45.2)	40 (54.8)	
BMI z score (categories), n (%)			
Overweight/Obese 91st - **<**99.6th, n=71	42 (59.2)	29 (40.8)	0.487
Severely Obese ≥ 99.6th, n=104	56 (53.8)	48 (46.2)	
Socio-economic (SIMD), n (%)			
1 most deprived, n=71	34 (47.9)	37 (52.1)	
2 derived/Middle, n=47	23 (48.9)	24 (51.1)	0.055
3 affluent, n=61	41 (67.2)	20 (32.8)	

Table 4-4: Descriptive comparison between children BMI z score group at baseline

Characteristics	Baseline BMI Categories		P-value
	Overweight/Obese	**Severely Obese**	
	91st - <99.6 th	**≥ 99.6th**	
	N= 71	**N=104**	
Age (categories), n (%)			
Age 5-10, n=106	42(39.6)	64(60.4)	
Age 11-15, n=69	29(42.0)	40(58.0)	0.751
Socio-economic (SIMD), n (%)			
Most Deprived,n=67	18(26.9)	49(73.1)	
Deprived/Middle,n=46	25(54.3)	21(45.7)	0.008
Affluent,n=61	28(45.9)	33(54.1)	

The stratification of the BMI sds z-score grouping by age groups in Table 4-4 indicate that the highest proportion of children among the age groups fall within the severely obese group. Nevertheless, results of the Person chi square test (p-value=0.751) showed that no significant association was found between BMI z score groupings and age groups. Cross tabulating BMI z score with socioeconomic circumstances SIMD score categories shows that almost half of the severely obese group came from the most deprived areas. Results of the Pearson chi-square (p-value= 0.008) showed there is a significant association between BMI z score groups and SIMD.

Figure 4-3: The distribution of parental SES score

4.8.2 ***Parental Socio-economic Characteristics at Baseline***

Those with a lower score meant a lower SES, and those with a higher score indicated that families had a higher SES. Family SES scores have been calculated as per Section 4.4.6. The purpose of using this score was to validate the measurement of SES to assess wider individual soco-economic measures beyond the validated standardised SIMD measure (Scottish Index of Multiple Deprivations, 2009, see 3.6.1.2), which tends to be reliant on postcode. In this study, the SES score reflected the SIMD score (see table 4-5), attesting to the SES score validity. Additionally, this SES measure could accomodate for anamolous wealthier families living in less affluent areas. Thus, this SES measure provided accurate and more detailed measure of socio-economic status than utilising SIMD alone, and analysis demonstrated alignment of SES and SIMD measures.

Table 4-5 shows that of the n=170 supporters who accompanied the children to the 1:1 interview, almost half (49.4%) were single parents. More than half of the parents were educated up to age 16-18, with only about a quarter having a university degree. Most parents were wage or salary earners, with (48.3%) living in house and (73%) owning a car. Also, results in Table 4-5 were developed using the mean SES scores. ANOVAs and t-test were used to examine the differences between the SES mean scores of parental socio-economic characteristics & SIMD scores level. As expected ANOVA tests confirmed the

existence of significant differences between the mean score of the SES, level of education and type of accommodation and deprivation using SIMD code (p-value= ≤0.001). Parents with a lower level of education, who live in rented accommodation, and come from the most deprived SIMD had the lowest SES score. Similarly, parents who did not receive a salary and did not own a car had a lower SES mean score.

Table 4-5: Parental socio-economic characteristics at baseline using

Parental Characteristics	Total n (%)	*SES Score mean±sd	P-value
	170	3.76 ± 2.09	
Child responsibility,n=166			
Single parent	82 (49.4)	2.85±1.75	<0.001
Shared responsibility	84 (50.6)	4.96±1.77	
Education Level,n=167			
School age 16	86 (51.5)	2.91±1.77	
School age 18	39 (23.4)	3.87±1.82	<0.001
Degree	42 (25.1)	5.76±1.62	
WageorSalary income, n=177			
No	53 (29.9)	1.79±1.39	<0.001
Yes	124 (70.1)	4.62±1.75	
Accommodation child lives in, n=167			
Social housing	61 (34.7)	1.80±1.12	
Private rented house	30 (17)	2.80±1.39	<0.001
House mortgage/without	85(48.3)	5.52±1.15	
Owned car,n=178			
No	48 (27)	1.75±1.31	<0.001
Yes	130 (73)	4.53±1.78	
SIMD,n=179			
1 most deprived	71(39.7)	2.62±1.72	
2 derived/Middle	47 (26.3)	3.91±1.96	<0.001
3 affluent	61 (34.0)	4.98±1.89	

***SES cores derived as the sum of Parental Characteristics (Education level, Salary income, accommodation, owned car and SIM**

4.8.3 *Parental Beliefs and Expectations*

The majority (>94%) of the respondents reported that the assessment was their first visit and they had never used ACES before. It is evident that the vast majority of parents assigned high importance to join the programme (>50%) as only (7.1 %) of participants stated they did not. Their reasons for joining ACES are shown in Table 4-6.

Table 4-6: *Parental beliefs on factors related to joining ACES*

Agreement with suggested reasons for joining ACES	Importance level		
	N (%)		
	Unimportant	**Neither/not**	**Important**
Overall Importance total	10(7.1)	15(10.7)	115(82.2)
Childbenefits,n=140	10(7.5)	9(6.8)	114(85.7)
Child would enjoyit	9(6.4)	25(17.9)	106(75.7)
Child would improveweight	10(7.1)	19(13.6)	111(79.3)
Child would be educated	9(6.4)	18(12.9)	113(80.7)
Parents benefits,n=140	9(6.4)	12(8.6)	119(85.0)
would be educated,	10(7.1)	20(14.3)	110(78.6)
Would help to support child,	9(6.4)	15(10.7)	116(82.9)
Recommended by,n=140	10(7.1)	62(44.3)	68(48.6)
GP or School nurse	10(7.1)	59(42.2)	71(50.7)
Other friends /family	15(10.7)	97(69.3)	28(20.0)

(Regroping and categories): Unimportant (Very unimportant + Unimportant) / Important (Very important + important

In general, expectations were high among the families that joined ACES (see Table 4-7). The great majority perceived the programme as an opportunity to learn and improve their knowledge to establish healthy eating, and to improve the fitness and health of their children. Parents also expected that the programme would offer them an opportunity to become more physically active and get fitter. Hence the expectations of the participants hinged on the fact that the programme could provide a platform to learn new ways of improving family and child health through healthy eating and other physical activities.

Table 4-7: Parental expectations of ACES programme at baseline

Expectations of ACES	Expectation level		
	N (%)		
	Diasgee	Neither/not	Agree
Expectationtotal	13(9.3)	3(2.1)	124(88.6)
AS a child, n=140	12(8.6)	3(2.1)	125(89.3)
Childgettingfit	13(9.3)	2(1.4)	125(89.3)
Improve child health	13(9.3)	2(1.4)	125(89.3)
Improve child confidence	14(10.0)	14(10.0)	112(80.0)
Improve childandparent relations	11(6.9)	12(8.6)	117(83.6)
As a family, n=140	12(8.6)	3(2.1)	125(89.3)
Domorephysical activity	17(12.1)	9(6.4)	114(81.9)
Make betterfood choices	12(8.6)	7(5.0)	121(86.4)
Learnabout healthyeating	12(8.6)	4(2.9)	124(88.6)
Improve familyweight	11(7.9)	4(2.9)	125(89.3)
Improve familyhealth	12(8.6)	2(1.4)	126(90.0)

(Regroping and categories): Disagee (Strogly disagree + Disagree) / Agree (Agree + Strongly agree)

4.8.4 *Attendance*

The number of weeks attended by each family was used to identify the cut-off point criteria. The distribution of the total number of weeks attended by families was explored in two ways (see Table 4-8). The first assessment included all the participants while the second excluded families (n=18) who had 0 week attendance (those who dropped-out after their 1:1 assessment). The modal number of weeks attended is 8 weeks for both assessment groups. According to the total weekly attendance distribution shown in Table 4-5, the cut-off point criteria was decided based on the most frequent number of weeks attended by participants, which was the (8th week). Thus in this study, the cut-off point enabled the classification of the families either as “completers” (1) = had higher level of attendance 8 weeks or more; or “non-completers” = those who had a lower attendance level from 0-7 weeks. In this study all findings were compared between these two main groups.

Table 4-8: Frequency & percentage of total weekly attendance by ACES families

Total weeks	Families attendance with 0 weeks		Families attendance without 0 weeks	
	N	%	N	%
0 week	17	9.4	-	-
1 week	9	5	9	5.5
2 weeks	7	3.9	7	4.3
3 weeks	7	3.9	7	4.3
4 weeks	12	6.6	12	7.3
5 weeks	9	5	9	5.5
6 weeks	9	5	9	5.5
7 weeks	16	8.8	16	9.8
8 weeks	25	13.8	25	15.2
9 weeks	20	11	20	12.2
10 weeks	12	6.6	12	7.3
11 weeks	21	11.6	21	12.8
12 weeks	17	9.4	17	10.3
Mean	6.84	-	7.55	-
Median	8	-	8	-
Mode	8	-	8	-

4.8.5 *The Association between Child Baseline Characteristics and Attendance*

Table 4-9 shows a comparison between two groups of family (completer and non-completer) based on their level of attendance. In total, (86, 47.5%) of children attended (0-7 weeks) and more than half (95, 52.5%) attended (≥8 weeks).

Table 4-9: Descriptive comparison of child baseline characteristics between non-completer (0-7wks) and completer (≥8wks)

Characteristics	Median session attended	Attendance group		P-value
		Non-completer 0 -7 wks	Completer ≥8wks	
Total number, n= (%)	8	86(47.5)	95(52.5)	
Age continue, mean ±sd	-	10.03± 2.62	9.79± 2.41	0.513
Height z score, mean ±sd	-	1.17±1.07	1.09±1.21	0.661
Weight z score, mean ±sd	-	2.87±0.97	2.76±0.82	0.443
BMI z score, mean ±sd	-	2.92± 0.82	2.93±0.70	0.916
Gender, n= (%)				
Female, n=100	8	48 (48.0)	52 (52.0)	0.884
Male, n=81	8	38 (46.9)	43 (53.1)	
Age (categories), n (%)				
Age 5-10, **n=108**	8	49 (45.4)	59 (54.6)	0.482
Age 11-15, **n=73**	7	37 (50.7)	36 (49.3)	
BMI z score (categories), n (%)				
Overweight/Obese, **n=71**	4	37 (52.1)	34 (47.9)	0.305
Severely Obese, **n=104**	7	46 (44.2)	58 (55.8)	
Socio-economic (SIMD), n (%)				
Most deprived, **n=71**	7	36 (50.7)	35 (49.3)	
Deprived/Middle, **n=47**	9	22 (46.8)	25 (53.2)	0.650
Affluent, **n=61**	8	26 (42.6)	35 (57.4)	
SES score, mean±sd		3.40±2.11	4.15± 2.03	0.026

Non-completer children were slightly older than children who completed. However, the chi-square test of association between the two groups indicated no statistically significant differences between age and the number of weeks of attendance. There was no significant gender, BMI Z score, or SIMD code related difference respectively between the two attendance categories. Although, the SIMD code indicated no significant association between socioeconomic status and attendance, the SES score found that children with low attendance (0-7wks) had a lower SES mean score in comparison with high weekly attendance (≥8wks). The t-test indicated that there was a significant association between the SES score and number of weeks attended (p-value=0.026) (refer to Table 4-9).

4.8.6 *Parental Recognition and Concern about Child Weight*

Results in Table 4-10A show that only 26% of the parents thought that their child was "very overweight", although the majority (59%) of the children who joined the programme were severely obese (see Table 4-2).

Table 4-10A: Parental recognition and concern about current & future child weight & health

Parents rating of child weight	Total number	Child Actual BMI z score			P-value
		Overweight	Obese	Very obese	
Child current weight,	**N=181**	**N=14**	**N=57**	**N=104**	
Normal Weight	-	-	-	-	
Overweight	129(73.7)	14(100.0)	47(82.5)	68(65.4)	
Very Overweight	46(26.3)	-	10(17.5)	36(34.6)	0.004
Child Body image now,	**n=175**	**N=12**	**N=54**	**N=103**	
Image(D - E), 50th-75th	39(23.1)	7(58.3)	18(33.3)	14(13.6)	
Image(F),≤ 90th	35(20.7)	5(41.7)	17(31.5)	16(15.5)	
Image(G),≥97th	95(56.2)	-	19(35.2)	73(70.9)	≤0.001
Child Body image future,	**n=165**	**N=12**	**N=52**	**N=101**	
Image (A- B- C) (3rd-25th)	56(33.9)	6(50.0)	19(36.5)	31(30.7)	0.366
Image (D - E) (50th-75th)	109(66.1)	6(50.0)	33(63.5)	70(69.3)	
If child weight is healthy,	**n=175**	**N=14**	**N=57**	**N=104**	
Probably/Yes	20(11.4)	-	12(21.1)	8(7.7)	
Probably/No	55(31.4)	-	17(29.8)	38(36.5)	0.001
Don't know	100(57.2)	14(100.0)	28(49.1)	58(55.8)	
Parental estimation of child weight	**N=175**	**N=14**	**N=5**	**N=104**	
Accurate estimation	51(29.1)	9(64.3)	6(10.5)	36(34.6)	
Underestimation	124(70.9)	5(35.7)	51(89.5)	68(65.4)	≤0.001
Concern about child current weight,	**N=171**	**N=14**	**N=56**	**N=101**	
A little concerned	78(45.6)	14(100.0)	35(62.5)	29(28.7)	
Very concerned	93(54.4)	-	21(37.5)	72(71.3)	≤0.001
Concern about child weight in future,	**N=171**	**N=14**	**N=56**	**N=101**	
A little concerned	50(29.2)	5(35.7)	21(37.5)	24(23.8)	0.166
Very concerned	121(70.8)	9(64.3)	35(62.5)	77(76.2)	

The researcher related the child's actual BMI z-score to the parents' perceived child current weight. While the majority of the parents of overweight children correctly recognized that their child was overweight, parents of obese and the severely obese children tended to underestimate their child's actual weight (see Table 4-10A). Indeed, no association was found between parental estimation of their child's weight (accurate or under-estimated) and other baseline characteristics related to the child or the parents e.g. child gender, age group, (SIMD), parental socioeconomic SES score.

The parental recognition of their child's current weight was also studied using another tool; Child Body Image Size (CBIS) scales. In order to examine satisfaction with body size using the CBIS, the perceived–ideal discrepancy was examined by parents for girls and boys. Results in Table 4-10A indicate that 58% (female children) and 33% (male children) of parents currently labelled their overweight/obese child as normal in body image, respectively. This suggests either avoidance by parents or desensitisation. However, the greatest level of accuracy in weight recognition did occur with parents whose child was severely obese (71%).

Even so, a third (34%) of parents in total chose a preferred future body image for their child that was underweight (3rd-25th). This again suggested cognitive distortion by parents around what constitutes normal weight. It confirmed the earlier finding that parents may experience difficulty in recognising the reality with weight status, as well as perhaps reflecting a cultural bias towards being underweight. However, chi-square tests showed that there was no significant difference between the actual BMI-z score groups (p-value=0.366).

Further, it can be seen from Table 4-10A that more than a third of parents stated that their child's weight did not impact on their health, whilst over half admitted to being unsure if there was a relationship. This seems to support the idea that parents prioritised food and diet with weight management over exercise and lifestyle factors. As only 11.4% were ready to acknowledge that their child's health was unhealthy, this may have reflected an avoidance attitude towards parental responsibility.

While parents did overwhelmingly show some concern about their child's weight in the present and future, parents showed a greater degree of concern about their child's weight in the future (71%) rather than in the present (54%), suggesting a lack of urgency on the parent's part and as a consequence a strategy for the parent to delay making any behavioural change interventions in the present.

In addition, parental levels of concern about their child's current weight were higher among the severely obese child group compared with overweight and obese children (p-value= ≤0.001).

Table 4-10 B: Parental recognition of child actual weight using bmi sds and level of concern

Level of Concern	Parental recognition		
	Acurate N=50	Underestimate N=121	P- value
Concern Now, n(%)			
Little Concern	12 (15.4)	66 (84.6)	≤0.001
Very Concerned	38 (40.9)	55 (59.1)	
Concern Future, n(%)			
Little Concern	6 (12.0)	44(88.0)	0.001
Very Concerned	44 (36.4)	77 (63.6)	

Interestingly, Table 4-10B results showed that level of recognition affects level of concern. Those who had an accurate estimation were more concerned about their child's current weight and in the future (p-value≤0.001) than those who had underestimated their child's weight (p-value= 0.001). Additionally, even those parents who claimed they did not know if their child was overweight or very overweight expressed a high degree of concern (45%) about their child's weight now and in the future (64%), suggesting a degree of awareness of their child's weight status and so implying that their lack of recognition may be an avoidance strategy.

Despite these findings, Table 4-11 suggests that neither the child's current weight, their image perception by their parents or perceived child's health status explained attrition. Parental concerns about their child's current weight or future weight did not significantly differ between the completers and non-completers.

Although the parents of the completers were slightly less concerned about their child's weight compared to that of the non-completers, this did not reach statistical significance so there was no evidence to suggest that level of concern was associated with attrition.

Table 4-11: Descriptive comparison of parental recognition and concern

Parental Perception	Median session attended	Total number	Attendance groups		P-value
			Non-ompleter (0-7wks)	Completer (≥ 8wks)	
		N (%)	N (%)	N (%)	N (%)
Child current weight,		**N=181**	**N=86**	**N=95**	
Overweight	8	135(74.6)	65(75.6)	70(73.7)	0.770
Very Overweight	8	46(25.4)	21(24.4)	25(26.3)	
Body image,		**N=175**	**N=82**	**N=93**	
Image(D & E), 50th-75th	9	39(22.3)	15(18.3)	24(25.8)	0.400
Image(F),≤ 90th	8	40(22.8)	18(22.0)	22(23.7)	
Image(G),≥97th	7	96(54.9)	49(59.7)	47(50.5)	
Is child weight healthy?		**N=181**	**N=86**	**N=95**	
Probably/Yes	7	20(11.0)	12(13.9)	8(8.4)	0.481
Probably/No	8	56(31.0)	25(29.1)	31(32.6)	
Don't know	8	105(58.0)	49(57.0)	56(59.0)	
Concern about child current weight,		**N=177**	**N=84**	**N=93**	
A little concerned	8	80(45.2)	33(39.3)	47(50.5)	0.133
Very concerned	7	97(54.8)	51(60.7)	46(49.5)	
Concern about child weight in future,		**N=177**	**N=84**	**N=93**	
A little concerned	8	52(29.4)	22(26.2)	30(32.3)	0.376
Very concerned	8	125(70.6)	62(73.8)	63(67.7)	
Estimation of child weight		**N=175**	**N=83**	**N=92**	
Accurate estimation	8	51(29.1)	23(27.7)	28(30.4)	0.741
Underestimation	8	124(70.9)	60(72.3)	64(69.6)	

4.8.7 *Parental Feeding Style (CFQ), Child Behavioural Difficulties (SDQ) and Family Cohesion*

Table 4-12 illustrates the mean scores for each of the child feeding domains (CFQ), Child behavioural difficulties (SDQ) domains and family cohesion scores. The calculation of these scores for all children at baseline was described earlier in this chapter (see section 4.6.2).

Table 4-12: Descriptive comparison of (CFQ) score and (SDQ) score between

Parents rating	Total mean±sd	Child BMI z score group			Child age group		
		Overweight / Obese	Severe Obese	P-value	Young	Old	**P-Value
(CFQ) score							
Responsibility N=172	4.18±0.74	4.08±0.78	4.21±0.74	0.494	4.23±0.76	4.08±0.75	0.253
Concern N=171	4.44±0.71	4.37±0.72	4.46±0.73	0.576	4.32±0.81	4.59±0.52	*0.008
Restriction N=171	3.96±0.61	3.84±0.67	4.04±0.57	*0.027	3.92±0.63	4.04±0.59	0.382
Pressure N=171	2.26±0.86	2.29±0.84	2.30±0.92	0.968	2.36±0.85	2.18±0.91	0.204
Monitoring N=171	3.70±0.87	3.65±0.87	3.69±0.89	0.820	3.73±0.85	3.60±0.89	0.336
(SDQ) score							
Total score N=171	17.23±5.40	15.56±4.77	18.23±5.69	*0.005	16.19±4.86	18.61±5.87	*0.001
Pro-social N=171l	7.93±2.00	8.29±1.96	7.85±1.93	0.307	8.24±1.65	7.64±2.41	0.062
Hyperactivity N=171	4.75±1.77	4.42±1.53	4.96±1.89	0.182	4.80±1.69	4.58±1.89	0.629
Emotional N=171	3.80±2.79	3.19±2.50	4.28±3.03	*0.014	3.34±2.55	4.58±3.05	*0.003
Conduct Problem N=171	3.16±1.62	2.76±1.45	3.32±1.73	0.061	2.91±1.39	3.45±1.95	*0.022
Peer Problem N=1717	5.51±1.62	5.18±1.43	5.68±1.69	0.080	5.14±1.60	6.00±1.51	*0.000
Family Cohesion score	60.37±9.27	59.82±8.76	60.76±9.89	0.452	60.40±9.95	60.38±8.37	0.877

** Independent t-test / * Significant

Also, results in Table 4-12 found that the average of SDQ score was higher among severely obese children relative to overweight children across the five dimensions, except for the pro-social dimension. Comparison between the two groups indicated that there were statistically significant differences in their total and emotional dimensions' average scores with severely obese children being more likely to have significantly higher scores. Also, older children were more likely to have statistically significantly higher total, emotional, conduct problem and peer problem average scores (p-value < 0.01) compared with younger children.

Table 4-13: Descriptive comparison of (CFQ) score and (SDQ) score

Parents rating	*SIMD groups			p-value	**SES SCORE	
	Deprived	Middle	Affluent		R	p-value
(CFQ) score						
Responsibility N=176	4.20±0.81	4.37±0.47	4.04±0.73	0.184	- 0.147	0.051
Concern N=175	4.41±0.72	4.56±0.67	4.39±0.75	0.537	- 0.112	0.139
Restriction N=175	3.96±0.54	4.16±0.56	3.81±0.72	0.093	- 0. 136	0.072
Pressure N=176	2.24±0.86	2.30±0.72	2.33±0.92	0.166	- 0.020	0.788
Monitoring N=176	3.56±0.88	3.77±0.75	3.81±0.88	0.124	0.130	0.084
(SDQ) score						
Total score N=175	17.42±5.27	17.63±3.77	16.65±6.12	0.467	- 0.292	≤0.001
Pro-social N=175	7.64±2.14	8.74±1.73	8.32±1.78	0.003	0.242	0.001
Hyperactivity N=175	4.70±1.85	5.11±1.37	4.63±1.79	0.868	- 0.199	0.009
Emotional N=175	3.94±2.92	4.00±2.36	3.67±2.84	0.365	- 0.201	0.007
Conduct Problem N=175	3.17±1.61	2.84±1.64	3.09±1.68	0.902	- 0.166	0.028
Peer Problem	5.60±1.58	5.68±1.60	5.26±1.67	0.362	- 0.242	0.001
Family Cohesion score N=168	59.47±9.00	61.21±11.22	61.83±9.17	0.419	0.178	0.021

*Anova test using and **bivariate correlation

In addition, results on the five child feeding (CFQ) and psychosocial status (SDQ) domain scores in (Table 4-13) indicated that they do not depend on child socioeconomic class, using the SIMD code. However, SDQ scores showed that pro-social average scores differ significantly (p-value = 0.003) between the three SIMD groups with average scores higher in the middle and affluent class. Average scores did not differ across the other four remaining SDQ domains and SES classes. With regards family cohesion findings, the average score did not appear to be influenced by the child's BMI z score, age or SIMD (refer to Tables 4-12 & 4-13).

Table 4-14: Descriptive comparison of (CFQ), (SDQ) and Family cohesion scores between non-completer (0-7wks) and completer (≥8wks)

Parents Perceived	Total mean	Non-Completer	Completer	*P	Total weeks	
		mean±sd		value	R	**p-value
(CFQ) score						
Responsibility N=178	4.20±0.81	4.27±0.69	4.09±0.79	0.077	-0.102	0.174
Concern N=177	4.41±0.72	4.49±0.69	4.37±0.74	0.104	-0.173	0.021
Restriction N=177	3.96±0.54	3.99±0.62	3.95±0.62	0.696	-0.011	0.885
Pressure N=178	2.24±0.86	2.32±0.94	2.26±0.82	0.751	-0.046	0.534
Monitoring N=178	3.56±0.88	3.67±0.93	3.69±0.83	0.998	0.100	0.186
(SDQ) score						
Total score N=177	17.42±5.27	17.92±5.55	16.51±5.22	*0.029	-0.204	0.006
Pro-social N=177	7.64±2.14	8.11±2.14	7.91±1.88	0.958	0.003	0.968
Hyperactivity N=177	4.70±1.85	4.71±1.87	4.71±1.71	0.680	-0.014	0.856
Emotional N=177	3.94±2.92	4.27±2.85	3.47±2.76	*0.042	-0.208	0.006
Conduct Problem N=177	3.17±1.61	3.27±1.76	3.01±1.54	0.122	-0.150	0.047
Peer Problem N=177	5.60±1.58	5.68±1.52	5.32±1.69	0.081	-0.158	0.036
Cohesion score N=170	59.47±9.00	60.56±8.86	60.25±9.74	0.829	-.052	0.498

* using Independent t-test ** using Bivariate correlation

Table 4-14 suggests that child feeding styles CFQ scores did not differ between the programme completers and non-completers. However, SDQ scores indicated that average total and emotional scores were statistically significantly lower (p-value < 0.05) among the completers compared to non-completers. This current study did not include a control group. However, this has been addressed by comparing findings in this study with norms established in previous studies.

Norms of the UK population have been established based on a UK-wide study of over 10,438 young people aged between 5-15 years on child and adolescent mental health undertaken by the Office for National Statistics and funded by the UK Department of Health (see Table 4.15). The informant-rated parental norms were based on SDQ completed data of 10,298 parents (99% of sample). Norms were also established for teacher responses (79% of sample) and for the self-rated version for 11-15 year olds (93% of this age band) (Meltzer *et al.,* 2000). It is clear that the obese children undertaking ACES had greater psychosocial issues compared to the general UK population, and had lower socialising skills (pro-social score) than the general population.

Table 4-15: Comparison of ACES sample against the national average: SDQ mean scores

Parent SDQ score	Mean score (SD)	
	ACES	National average
Total score,N=177	17.2 (5.2)	8.4 (5.8)
Emotional Symptoms, N=177	3.6 (2.8)	1.9 (2.0)
Conduct Problems, N=177	3.2 (1.5)	1.6 (1.7)
Hyperactivity, N=177	4.8 (1.8)	3.5 (2.6)
Peer problems, N=177	5.6 (1.6)	1.5 (1.7)
Pro-social scale, N=177	7.3 (2.2)	8.4 (5.8)

Notes: National norms are drawn from interviews with the parents of a nationally representative sample of 10,298 pupils aged 5-15 (see Meltzer *et al.,* 2000)

Hence, analysis in this study suggested that non-completers were more likely to have psychological and emotional challenges in comparison with children who completed the programme. Lastly, family cohesion did not seem to be related to attrition.

4.9 Discussion

4.9.1 *Introduction*

This summary discussion places the entry study's key findings on baseline gathered data within the context of the recommended conceptual model, EST (Skelton, *et al.*, 2011). It also frames these key findings against the backdrop of the literature review on factors related to child weigh status and family engagement with the treatment. A more holistic discussion of key findings that encompasses those of all three phases of this study occurs later in Chapter 6. Factors seldom explored in the literature and not examined in this study include child motivation and child recognition. The former was examined in the Routine Data Analysis chapter (see Chapter 3). Child recognition still requires further research. Three factors which have been identified in the literature as being associated with attrition are not considered here but are in Chapter 5: coaches' attitudes and skills; programme logistics; and ethnicity of participants.

4.9.2 *Entry Study Key Findings*

From the literature review, the following child-related factors have been consistently associated with attrition: child psychosocial status. This study found a similar negative association between total score SDQ with attrition (18.2±5.45 non-completer; 16.2± 5.24 completer, p-value=0.029); also a negative association with the emotional domain of SDQ and attrition (4.2±2.75 non-completer; 3.4±2.77 completer, p-value=0.042). However, age was not found to be associated with attrition in this study. The distribution of participant age was skewed to the younger age group (< 11years, mean 9.91 years ±9.1).

Less consistently found in the review were associations between attrition and child BMI. This study did not find such an association. Other factors rarely examined in the literature regarding the child include gender, which was found not to be associated with attrition in this study. The following parent and family-related factors were also found in the review to be consistently associated with attrition: parental BMI, parental psychosocial status and family dynamic. Parental BMI and parental psychosocial status were not assessed in this research. It was considered that such an approach would be more suitable in a clinical-setting due to the sensitivity of data. Lastly, no association was found between family cohesion and attrition.

Other factors considered in this study, which were also identified in the review as having limited previous research, found no association. These factors included: child gender, parental recognition, and concern. The latter was associated with child BMI z score. It should be noted that in this study, SES (by SIMD) was found to have no association with attrition. Also, the baseline characteristics of obese children found in this study should be taken into consideration.

4.9.2.1 Child Characteristics

The association with both the total SDQ score and attrition and again with the emotional domain score suggested that these emotionally challenged individuals are less likely to complete the programme. It should be noted that in all four domains of the SDQ and in the total score, the sample was substantially above the UK norms; whilst for the pro-social skills results indicated participants were below the UK norm (see 4-15). These findings agree with those of several other UK-based studies which also utilised the SDQ to assess obese/treatment child psychosocial status (Griffiths *et al.,* 2011; Croker *et al.,* 2012).

For instance, Glazebrook *et al*. (2002) undertook a UK population community versus clinical study of 10,745 5-15 year olds that was based on the SDQ. This prevalence study aimed at determining whether children attending general paediatric out-patient clinics for chronic conditions are at heightened risk of experiencing emotional and behavioural issues that were currently being untreated. From the out-patient clinical setting of a UK hospital, 307 children ranging from 5–15 years-old were assessed for potential child behavioural issue. This representative sample from the clinical setting was then compared against a UK-wide community sample of 10, 438 children ranging from 5–15 years. The SDQ was utilised to obtain parental-reported child SDQ scores. Using the UK Norms (Meltzer *et al.,* 2000), this study found that there was an elevated occurrence of emotional 2.5 (Cl =1.8-3.3) and behavioural disturbance 1.6 (Cl=1.2-3.8) in children attending paediatric out-patient clinics, and went on the recommend that the SDQ be incorporated into routine child assessments in order to improve referrals to the appropriate child mental health services. These children did not necessarily have obesity issues but obese children attending community-setting weight management programmes may be similar to those attending paediatric out-patient clinics in that they have higher than normal emotional and behavioural issues in comparison to those non-attending a treatment programme. This

being the case programme designers would need to anticipate these issues in the design and staffing of the programme.

Nevertheless, it is worthwhile examining specifically how these obese children within the treatment programme compared in SDQ with other obese children to identify if their difficulties reflect the wider pattern. For instance one UK study found that obesity is associated with emotional and behavioural problems from a very young age. Differences were indicated by age 5 (Griffiths *et al.,* 2011). These researchers used the SDQ in their Millennium Cohort prospective study of 11,202 UK-resident children from throughout the nation from September 2000 until January 2002 to determine if there was a link between child obesity and emotional and behavioural issues. Height and weight measurements were taken at ages 3 and 5 respectively and obesity identified by using IOTF cut offs for Body Mass Index. Griffiths *et al.* (2011) found an association between SDQ and age. On the other hand, only a weak relationship between overweight /obesity and psychosocial problems was found with a Netherlands-based study (Drukker *et al.,* 2009), though this may reflect the differing populations and subsequent variation in child characteristics. This research investigated the relationship between child weight and psychosocial difficulties at two age groups (5-6 n=797 and 13-14 years n=614 respectively) using SDQ. This Dutch-based study found that overweight adolescents using the self-reporting SDQ displayed greater peer issues and lower pro-social behaviour than teenagers of a normal weight but that this was not associated and for younger children whose parents completed the SDQ no association was found between hyperactivity, emotional and conduct problem.

The current study did find differences in SDQ by age (p-value=0.001) (see Table 4-12), with the older the child the greater the psychological difficulty across most domains (total score emotion p-value= 0.001; conduct p-value=0.022 peer problems <0.001). However, unlike the Dutch-based study in the current study the parental informant-based version was used rather than the self-reporting version of SDQ due to the wider age range of participants. Indeed, the wide age range of the current study, 5-15 years, may partly have accounted for the widespread dysfunction in all domains of the SDQ (see Table 4-12) as Griffith *et al.* (2005) in their UK-based study suggest that SDQ scores may deteriorate with age. This also requires further research. Such differences between these obese children in a treatment programme by age have design implications for the programme.

Another UK randomised control study of 72 obese children (Croker *et al.,* 2012) examined the effectiveness of family-based behavioural treatment of child obesity within the National Health Service implemented total score SDQ as one measure of psychosocial issues. The assessment was at baseline, and after 6 months of the treatment programme. Initial SDQ total mean score of 13.2 (sd. 6.7) at the baseline was above the UK norm of 8.4 (sd. 5.8) (Meltzer *et al.,* 2000) (see Table 4-15), and also indicated that obese children do have psychosocial problems. This current research actually found that the emotional score was 3.6 (sd.2.8) which was almost double the norm, 1.9 (2.0); while the conduct score was also double 3.2 (sd.1.5) compared to the norm 1.6 (1.7) (Meltzer *et al*., 2000) (see Table 4-15). This suggests that the ACES participants had greater levels of psycho-social difficulties than in the study by Crocker *et al.* (2012). Indeed, the SDQ scores in all domains in this study were substantially outside the UK norms (see Table 4-15). As per the findings by Croker *et al.* (2012) it is not surprising as all the ACES participants were overweight/obese, and 59.4% of participants were severely obese. Thus, such an obese sample is expected to be above the norms. The extent that participants were above the norms in their emotional, behavioural and total scores may have been related to the severity of obesity of the ACES sample (Croker *et al.,* 2005), though this may require further research.

Although it is to be acknowledged that there are some dissenting voices, such as Lamertz *et al.* (2002) in a community survey in Munich, Germany exploring obesity and risk of mental health issues of (n=321) 14-24 year old youth using the Symptom Checklist 90 Revised instead of the SDQ. However, not only was a different tool used to measure psychosocial status, and the age range of participants spilled into young adult, but also this was a different population. Each country has its own child characteristics. Thus more value must be assigned to the UK-based studies which examine UK child characteristics.

Correlations in this study (see Table 4-14) also found a negative association with conduct and peer problems, respectively, and attrition. For instance, those who dropped out of the programme had higher scores in the following emotional states: worrying; feeling depressed; fearful, insecure, nervous and clingy; and insecure and unconfident. These findings reinforced those of other researchers who have stressed the importance of establishing and building self-esteem, self-belief, social support from peers, peer acceptance in the success of the intervention (Zeller *et al*., 2004; Murtagh *et al.*, 2006;

Zeller *et al.,* 2008). In keeping with these other studies (Zeller *et al.,* 2004; Murtagh *et al*., 2006; Zeller *et al*., 2008), these current findings may also have reinforced the need to address the group culture within the programme, so that participants feel safe and secure and free from bullying and teasing, and in so doing enhanced programme engagement and retention. As part of this, sensitivity is required to constructing activities and groups that are attentive to differing age concerns as a mechanism to minimising conduct or peer issues. In order to accomplish the latter, it appears there is a need to incorporate psychological education and interventions into the treatment programme not only for their efficacy but to improve engagement and retention, and that coaches suitably qualified in this area need to be recruited or trained.

This study found there is a significant association between BMI z score groups, SIMD, and SDQ scores respectively. With the latter, a significant relationship occured with BMI z scores and both the total and emotion scores of the SDQ. The three SDQ domains (emotional, conduct problems and peer problems) were in turn associated with age; with the older the child; the greater the psychosocial difficulties (refer Table4-12). In terms of parental feeding styles, there was a positive association between children by BMI z scores and those parents who put their children on a restrictive diet. Parental recognition was associated with BMI z scores for those who are obese and severely obese whilst those overweight tended to be recognised correctly by parents. Parental concern was also associated with both BMI and age respectively; with the heavier or older the child, the greater the concern expressed (Table 4-12)

Child behavioural difficulty pro-social scores (SDQ) showed an association with a child's SES, using SIMD code, with average scores higher in the ‘middle’ and ‘affluent’ class (4-13). No association, however, existed between parental estimation of their child’s weight (accurate or under-estimated) and other baseline characteristics associated with either the child or the parents, including: gender, age, SIMD, or parental SES. Additionally, no association occured between parental concern and other variables, such as SES, SIMD or gender.

4.9.2.2 Parental Characteristics

The home environment has an impact on the child (Scaglioni *et al.*, 2008). In this study, the parental SES score correlated with the child SIMD code (see Table 4-4), indicating that those parents from the lowest socio-economic background had the lowest educational level, were not employed on a regular salaried basis and were unlikely to own a car. The implication is that parents of children with the most disadvantaged backgrounds were themselves disadvantaged. As the Scottish Government (2012) has reported low parental education levels, particularly that of the mother, can also affect their knowledge of healthy eating and exercise habits. This suggests that parents may benefit from support in order to access and attend the programme, promote healthy food, health and fitness education and have ready access to fitness facilities. This is particularly important as parents who have an understanding and appreciation of the problem of obesity as well as eating and physical activity habits that can maintain child health and well-being are more likely to encourage healthy eating environments and healthy behaviours (Birch & Fisher, 2000; Hughes *et al.*, 2008). The need to ensure adequate parental knowledge, understanding and relevant skills was supported by the study finding that SES was linked to programme attendance i.e. 'non-completers' had lower SES scores compared to 'completers' (p-value=0.026) (refer to Table 4-9). So, addressing these logistical and socio-economic circumstances would aid family attendance levels and engagement.

In this study parental BMI was assessed in the self-reporting questionnaire, Q. 16 (see Appendix 3), and no association was found. However, this may have been subject to under-reporting (Carnell *et al.*, 2005; Marloes *et al*., 2013) due to the sensitivity of the data (Jones *et al*., 2011). More accurate measures would have been obtained from anthropometric measurement (Carnell *et al.*, 2005; Marloes *et al*., 2013). This may account for the inconsistency of results found compared to those reported in the review.

Actual recognition was not associated with attrition in this study. However, it did find unreliability of parental self-reporting as being associated which concurs with findings in several systematic reviews (Parry *et al*., 2008; Doolen *et al*., 2009; Towns & D'Auria, 2009; Marloes *et al.*, 2013). Indeed, several findings in this study suggested parental cognitive distortion, conflict and desensitisation to their child's weight which may have impacted on programme engagement through attendance, and this is consistent with other studies (Carnell *et al*., 2013). For instance, as Table 4-10 reports, only 26% of the parents

thought that their child was "very overweight", although the majority (59%) of the children who joined the programme were severely obese (see Table 4-2). This shows that parents of obese and severely obese children were likely to underestimate their child's actual status (refer to Table 4-10). This level of under-reporting is commensurate with that reported in other research of between 25%-66% (Doolen *et al.,* 2009; Manios *et al.,* 2009).

The verbalised estimation of child weight was less accurate than the image scales (see Table 4-10), especially for parental identification of severely obese children. This concurs with findings by Jones *et al*. (2011) who recommended the image scales over verbalised responses as parents seem to find stating aloud the accurate weight status of their child more challenging than indicating this on a picture.

Even so, a third (34%) of parents in total chose a preferred future body image for their child that is underweight (3rd-25th), again suggesting a level of denial and a focus on body image rather than health or fitness. This may also have accounted for 58% of parents with severely obese children still answering that they did not know if their child's weight status adversely affected their health status, and only 11.4% being ready to acknowledge that their child's health is unhealthy (Murtagh *et al.,* 2006). It also may have accounted for the inconsistency of those parents who claimed they did not know if their child was overweight or very overweight expressing elevated concern (45%) about their child's weight now and in the future (64%). Such a finding also echoed that of Jones *et al.* (2011) who recommended dealing with this parental fear of their child becoming overweight/obese rather than focusing on the actual current weight status of the child. Jones *et al.* (2011) argue that such an approach allows for circumnavigation of parental resistance and denial, and allows for a more productive-relationship between the parents with the programme as it evades issues related to parental personal responsibility, blame, guilt or disapproval (Jackson *et al.,* 2007; Bolling *et al.,* 2009; Booth *et al.,* 2009) or fear of stigmatising the child by labelling him/her obese (Zeller *et al*., 2004; Carnell *et al.*, 2005; Marloes *et al*., 2013).

As parents can influence the extent to which children participate in organised or non-organised physical or sedentary activities by providing support and serving as role-models for greater activity (Smith *et al*., 2010), as well as influencing child learning about food and feeding habits (Ventura & Birch, 2008; Huley *et al*., 2011), such denial of the issue

implies that home support may also be lacking. This parental avoidance strategy may impact on programme engagement as not only does it suggest resistance to recognising that a problem exists (Jones *et al.,* 2011; Marloes *et al*., 2013) and prioritising the necessary changes in behaviour, as Rhee *et al*. (2005) previously reported; but it also suggests that such ambivalence may communicate to the child and equally impact on child motivation and commitment levels (*Zeller et al*., 2010; Murtagn *et al.,* 2006).

Another interesting finding was that parents demonstrated more concern about their child's weight in the future (71%) rather than in the immediacy of the present (54%). This follows on from Jones *et al.'s* (2011) similar finding in The Gateshead Millennium Study. This may also indicate less parental motivation and ambivalence to change in the present as found by Rhee *et al*. (2005), and so adversely impact subsequently on programme engagement (Jackson *et al*., 2007; Bolling *et al.,* 2009; Booth *et al.,* 2009).

In contrast, parents who realistically estimated their child's weight status were more concerned about their child's weight both in the present and in the future than those who underestimated their child's weight (p-value≤0.001) and (p-value= 0.001), respectively, suggested more acceptance of reality, and more likelihood to sustain programme engagement. This would support Carnell *et al*.'s (2005) contention that a parent's recognition of the fact that their child is overweight or obese means that such parents are more likely to provide such children with sustained, positive support for weight loss efforts than those who do not accurately recognise their child's weight status.

In view of the fact that outside of school, children spend a lot of time in their homes, it is important that parents have a clear idea of their child's health and well-being. This suggests the need for the treatment programme to tackle potential parental avoidance, and resolve internal conflicts within parents which may result in ambivalence. It maybe that further research is required to identify if indeed parents who themselves have weight issues are more sensitive to this issue than parents of normal weight.

Parents serve as role models demonstrating a suitable feeding style (Smith *et al.,* 2010). They determine the nature of a family's eating environment since they control the foods; timing and sizes of the portions provided during the family meals (Birch *et al.,* 2001), factors that often determine the child's food preferences and practices in adulthood (Wills

et al., 2004). In the current study parental concern was associated with child obesity, with the higher the child's weight the greater the parental concern. This finding concurs with that of UK-based Cecil *et al.* (2005) which was a cohort study of 74 healthy primary-school children aged 6-9 years in Scotland. The younger age group was 6-7.8 years (n=45), including 3 obese, 8 overweight while the older children were 8-9.8 years (n=29), including3 obese, 8 overweight children. The child weight status was significantly correlated (r=0.34, p-value< 0.01) with the mother's weight (BMI, using UK 1999 growth charts) (Cole *et al.,* 1998). Similarly the child's weight status was also correlated with the level of maternal concern (r=0.36, p-value< 0.01).These results demonstrated an internal subscale consistency of CFQ of 0.86, which is similar to Birch *et al.*'s (2001) findings of 0.75. In this current research agreed with Cecil and colleagues (2005) that maternal concern was higher among currently very obese children (p-value≤ 0.001) (see Table 4-10), and was higher for the future also. Additionally, as this research explored a wider age range than other studies identified that mothers also showed more concern for older children than younger children (p-value= 0.008), (refer to Table 4-12). These findings contrast with that of, Montgomery *et al.* (2006) in their Scottish-based study. Their research was conducted on pre-school activity, lifestyle, and the energeticness (SPARKLE) of 117 Scottish children (53: boys; 64: girls) aged between 3-5 years between 1999-2001, which included completion of the CFQ. In this study, 114 were completed by mothers. Their findings suggested that there is a possible pattern of obese parents passing on their own feeding patterns to their child, and thus supported a parental intervention as well as a child intervention in order to stop intergeneration and family systemic unhealthy feeding-related behavioural patterns. The results suggest the need to individualise the programme to meet the needs of parents as this pattern does not seem to apply to mothers of normal/lean weight.

Another study explored the relationship between parental control and child feeding. This UK longitudinal population study involved 10,000 pairs of twins born in England using their own questionnaire based on review (Johnson & Birch, 1994; Koeppen *et al*., 2001) with 214 families of same sex twins, 100 of which had overweight /obese parents and 114 with normal/lean weight parents (Warld *et al.,* 2002). These families were selected from the Twins Early Development Study (TEDS) which is deemed representative of UK families with young children (Dale *et al*., 1998). Warld *et al* (2002) found obese mothers had less control over their child's intake compared to normal-weight mothers. This finding

contrasts with that of Montgomery *et al.* (2006) in their Scottish-based study which showed no relationship between normal weight children and their parents' weight status. The current study also shows no such relationship in the parental responsibility and control domain (refer to Table 4-10). However, this finding may differ from Warld *et al*. (2002) because of differences in the feeding measurement used in each study. Equally, it may also be due to the difference in processing data as in this study no analysis of parental weight status occurred in relation to control of child feeding.

Whepper *et al.* (2010) utilised the CFQ in their longitudinal study of 531 families with children aged 7-9 years in a London school (PEACHES). Those overweight/obese in this study were 16% less than in the population as a whole. Food restriction seemed to occur as a consequence of parental fear of their child becoming overweight/obese in the future rather than because their child had gained weight. In this study severely obese parents had higher restriction scores in the present than other parents (p-value=0.027); concern was high in the future also, especially for severely obese parents but it was not statistically significant. This finding may reflect similar fears by parents for their child in the present.

Although in this study there were no significant findings between family cohesion to weight status or attrition respectively, other studies have identified a huge role in the development and management of obesity in children (McQuaid *et al.,* 2003; Carnell *et al.,* 2005; Fies & Everhart, 2006; Lindsay *et al.,* 2006). Families that work together; eat meals together and make decisions about healthy foods and healthy levels of exercise (Lindsay *et al*., 2006) are more likely to develop and maintain healthy eating and lifestyle habits (Carnell *et al.,* 2005). A greater level of family cohesion is, therefore, related to better eating habits and ultimately health and well-being. An extract of the FACES questionnaire (Olsen, 1986) was used in this study which focused on family cohesion, and the way the family worked together. Other domains of the questionnaire were not utilised in this study, and this may have impacted on the reliability and validity of the results.

4.9.2.3 Programme Characteristics

Programme characteristics are further investigated in the coming chapter.

4.10 Conclusion

The impact of socio-economic status using SES score and child weight status is reinforced here, and that as weight issues are more prevalent amongst young age participants that this needs to include parents. Factors related to parental characteristics were found to be linked to the child's weight status severity. However, these factors were not linked to programme attrition, although in some other studies a relationship was identified. The exception is in the case of parental reporting of child psychosocial problems, as indicated in the total and emotional domain scores of the SDQ. This was especially the case for older children who seem to have greater emotional issues compared to the younger age group. These findings highlight that addressing child psychosocial issues as well as parental recognition and acceptance might help programme retention. Further, such an understanding of these issues may support better programme engagement, and may even play a role in prevention. This clearly has implications for programme design and coach recruitment. These findings also supported the notion of establishing a deeper and wider understanding of the family dynamics which can be related to a child's weight status to aid in delivering weight management programmes, with an emphasis on communication strategies within the family. Overall, the study emphasises the need to differentiate participants in terms of age and gender, as well as being more attentive to their individual psycho-social profile, and addressing parental behaviours relating to communication, diet, physical activity, and feeding style. This suggests the need to individuate the treatment plan rather than design a one-plan fits all approach. Other factors linked to programmatic characteristics and programme attrition will be examined further in the exit study of this research (see Chapter 5). This next study explored parental satisfaction with the ACES treatment programme and the perceived barriers to programme completion.

Chapter 5. Study Three: The Exit Survey

5.1 Introduction

As was discussed in the literature review chapter (see Chapter 1), there is a lack of evidence in the literature that informs criteria for improving treatment approaches, although a few studies have identified factors that can affect attendance by children and families. These studies suggest that both internal factors (related to the individual/family) and external factors (related to the treatment programme) can influence low engagement with programmes that seek to address childhood obesity in communities. Data also shows that levels of satisfaction with the programme (structure and content), expectations from the treatment and perceived barriers can influence participation and level of engagement with children and families, as well as logistical factors, such as scheduling, timetable and distance.

5.2 Purpose of this Chapter

Community obesity treatment programmes involve a significant expenditure of resources and effort, and there is, therefore, a need to make the best possible use of this investment. The interface between the programme and the families for which it is designed must be analysed to identify the reasons that some families successfully participate, while others leave a programme after some of the sessions. A focus on factors contributing to better sustained family involvement in treatment programmes can help to minimise problems of attrition, examining the internal (individual/family) and external (programme-related) factors together in order to evaluate the impact of these on engagement with behaviour and lifestyle changes.

5.3 Aims and Objectives

To analyse family satisfaction with the treatment programme and perceived barriers to retention in order to investigate the interaction between the family and programmes characteristics which influence attendance patterns (attrition). The following questions, therefore, must be addressed:

1. To what extent do families find the programme helpful?
2. How much are families satisfied with the programme, including 1st contact, coaches, structure and the content?
3. How did satisfaction with the programme vary between different baseline characteristics (variable sub-groups)?
4. What are the perceived barriers associated with drop-out?
5. What are the family characteristics associated with these identified barriers?
6. How can the interaction between families and programme characteristics predict attrition?

5.4 Methodology

5.4.1 *Ethical Approval*

In October 2011 ethical approval, with substantial amendment, was obtained from the NHS Ethics Committee to interview a number of families who had previously attended ACES, for the purpose of developing an exit questionnaire. The final exit questionnaire draft was then requested by the Ethics Committee for final approval. In June 2012, final approval for the exit questionnaire and the study commencement was received from the NHS Committee (see Appendix 1). The exit study was conducted between September 2012 and June 2013.

5.4.2 *Location*

The exit study was carried out in the same locations as the entry study. This involved locations across Greater Glasgow and Clyde, East Renfrewshire, West Renfrewshire, East Dunbartonshire, West Dunbartonshire and Inverclyde in Scotland.

5.4.3 *Participants*

In this survey, data collection started when the questionnaire was given to families participating in the ACES programme in two varying time periods. Firstly, there was retrospective data collection from those families who participated in ACES over the previous 2 years, from the time when the second study of this research (the entry prospective survey) began. This allowed for a relatively large sample in the current study, and so for more feedback of family experience of the programme. Secondly, the prospective exit questionnaire data collection included families currently participating in the programme. These are the same families who participated in the entry questionnaire and were followed up by the researcher in order to link exit data to entry data.

5.4.4 *Exit Study Survey*

The questionnaire was developed in order to objectively evaluate family satisfaction with the treatment programme, collect information on family experience with the programme, and to investigate reasons contributing to families either not returning after their first assessment or discontinuing treatment.

5.4.4.1 Questionnaire development

In this survey, an observational quantitative structured questionnaire was used. It was designed in a format to obtain information from two categories of families: those who did not complete (see Appendix 4), and those who did (see Appendix 4). Information was obtained on the respondent's experience of the treatment programme conducted. Family baseline data considered originated from those families who participated in the routine data analyses study (see chapter 3) for the period 2010-2012 and those who participated in the entry study (see chapter 4) for the period between 2012 and 2013.

The first-draft of the exit questionnaire was developed after conducting a small number of informal semi-structured interviews (see attached interview schedule in Appendix 3), with ACES families who were already in the programme attending ACES sessions (between Nov-Dec 2012). Families were chosen based on the selection criteria in the study protocol**.** The interviews lasted from 30-35 minutes and covered reasons for change, why families took the action to enroll, barriers that may have inhibited them coming into the programme, and what other reasons were motivated to continue the programme. The exit questionnaire was then developed by drawing from themes arising out of the informal

interviews also from other comprehensive evidence based. Moreover, results of the initial quantitative and qualitative descriptive analysis of ACES routine, of the family accessibility and opinion questionnaires, helped to finalize the exit draft questionnaire, which was piloted in March-April 2012. Given the outcomes from the pilot and the initial data analysis report of the retrospective routine data it was sensible to design two exit questionnaires: one for early drop-outs and one for late drop-outs and completers.

Thus, two versions of the questionnaire were developed: a short questionnaire consisting of 13 questions (see Appendix 4), and a long questionnaire consisting of 19 questions. Two versions of the questionnaire were designed as the short one contained the main core questions and obtained information from respondents across families who attended ACES for very few weeks 2 weeks or less meant those who dropped out. The long questionnaire contained these same core questions, along with further questions specifically to obtain more in-depth information from those with longer exposure to the programme (3-12 wks).

The short questionnaire was developed after informally piloting it between March-April 2012 with a selection of families who were part of the ACES programme but whose attendace was fluctuating: families who typically attended for two weeks, before being absent for a number of sessions, and then returning. The specific criteria involved selecting the different types of family: those who attended a 1:1 meeting, missed the first week, and then returned in subsequent sessions; those who missed the first session but then returned; and, those who missed sessions throughout the programme and whose attendance fluctuated across the twelve weeks. Alongside completers, who answered the longer questionnaire, it was important to gather the views of these families who were not perfect attenders as this ensured that a range of perspectives were gathered. The number of families used in the pilot was 6 families and they were from East Glasgow, West Glasgow and East Renfrewshire. The families gave very constructive feedback and they generally wanted the first version of the questionnaire to pose more questions that were relevant to their experiences in the programme. They expressed a desire to have more say regarding ACES' quality of service and its programme delivery. Another area that they wished to give comments on was how they judged the professional qualities of the ACES coaches. Furthermore, those who were piloted asked for open-ended questions to be added that encouraged them to comment on the ways in which the programme helped them and how it could be improved for each family's needs. Finally, they also wanted their views to be

heard on how the programme could be better structured to help parents address their children's obesity. All of these comments were addressed in the final 7-page version of the questionnaire.

The 13 core questions contained in the short version of the questionnaire (version 1) (see Appendix 4) corresponded to questions 1-8, 11-13 and 16-17 on the longer version of the questionnaire. Question 19, which was open-ended, was also common to both versions of the exit questionnaire, and asked for general suggestions for improvement of the programme. Both versions of the questionnaire were designed in a format to obtain four main principles relating to reasons behind non-completion of the programme – these were the core questions. These sought to identify the role and predominance of child, family and programmatic factors in family drop-out/attendance: family satisfaction with the programme; family expectations and the extent to which these were met; barriers and difficulties faced; other issues with programme adherence, like family confidence with the knowledge, skills and behavioural change they had learned.

The longer questionnaire was developed after informally piloting it between March-April 2012 with a selection of families who had completed the ACES programme. Six families were piloted and the selection criteria was based upon their patterns of attendance. The feedback was focused on the ways in which the questionnaire could be made more concise and participants suggested that certain questions' options were repetitive and could be removed. Based on the feedback from the piloting, the questionnaire was edited to form a more concise final version: the draft version was cut down significantly to 3 pages for the final edit.

The longer questionnaire (version) (see Appendix 4) also contained additional questions about family satisfaction and preference for components of each session of the ACES programme; family confidence about applying lessons learnt to their everyday life; and reasons/factors that motivated them to continue with their attendance. Further information about specific question content is described in (refer to section 5.5). Both versions of the questionnaire were structured in Likert-type scales, giving options on scales from not satisfied to very satisfied; not confident to very confident; not at all to always; and strongly disagree to strongly agree. The findings will be discussed in this chapter's Results section.

A space for additional comments was included on the questionnaire alongside each of the Likert-scale questions.

5.4.4.2 Questionnaire Implementation

A total of 486 questionnaires were distributed to the respondents across the retrospective (57.6%) and prospective (42.4%) studies. Table 5.1A shows that, of the 486 questionnaires, 275 were completed, giving an overall response rate of 56.6%. The response rate for the longer version (66.9%) was lower than that of the shorter version (33.1%). Almost the same responds came from (52.4%) of the retrospective and (47.6%) of the prospective study questionnaire of the completed questionnaire. The majority (63%) of the questionnaires were completed by telephone interview by the researcher, with 29% completed at the programme venues by coaches, and ony 8% by post by the researcher. Table 5.1B indicates that there were differences in the response rate between completer and non-completer depending on the data collection method. The non-completers' response rates were higher than that of the completers in postal and telephone methods. While the majority of the completers responded more at the venue.

Table 5-1a: Number and percentage of distributed questionnaires and responses by study type

Questionnaire data collection Characteristics	Total number	Retrospective (2010 - 2011)		Prospective (2012 - 2013)	
		N	*%*	***N***	***%***
			all sent		All sent
Sent Exit Questionnaire	486	280	57.6	206	42.4
Short (0-2wks)	170 (34.9)	111	39.6	59	28.6
Long (3-12wks)	316 (65.1)	169	60.4	147	71.4
			Returned		Returned
Completed Returned Exit Qu'aire	275 (56.6)	144	52.4	131	47.6
Short (0-2wks)	91 (33.1)	65	45.1	26	19.8
Long (3-12wks)	184 (66.9)	79	54.9	105	80.2
			Method		Method
Method of Completed Exit					
Post	28 (10.2)	16	11.1	12	9.1
Phone calls	172 (62.5)	128	88.9	44	33.6
At venue	75 (27.3)	-	-	75	57.3

Table (5-1b) Returned questionnaire according to attendance and the study time period

Level of attendance	Filling out questionnaire method												P-value Exact
	Non Completer (0-7wks)						Completed (≥8weks)						
Filling Qu'ers method	*Post*		*Phone call*		*Venue*		*Post*		*Phone call*		*Venue*		
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	
Total	19	68.0	123	72	12	16.5	9	32.0	49	28.0	63	83.5	
Retrospective	12	63.2	94	76.4	0	0	4	44.4	34	69.4	0	0	*0.004*
Prospective	7	36.8	29	23.6	12	100	5	55.6	15	30.6	63	100	*<0.001*

5.4.5 *Data Management*

This section describes the data collection, entering and coding system, as well as the checking (missing & duplication) and analysis procedures undertaken in this study.

5.4.5.1 Data collection

Exit questionnaires were posted by the researcher to families that had participated in the programme. Families who failed to complete the programme at any stage were contacted, as were those that completed but did not have the opportunity to fill in the exit questionnaire at the venue. An attempt was then made to contact families by telephone if these were not returned within 2-3 weeks.

Attempts were made to contact each family by phone on at least three occasions, varying the day and time of day, in order to obtain the maximum possible number of responses. On some occasions, up to 8 attempts were made to contact families in order to maximise survey completion. Some days and times (e.g. weekends, evenings) were found to be more productive for these calls. However, some families were unavailable for contact, due to contact details being absent or incorrect, or a lack of response to telephone calls despite persistent attempts.

The principal difficulty with this aspect of the study was the low response rate by participants despite the repeated and rigorous attempts to contact individuals described above. Other difficulties faced by the researcher in this part of the study include: some telephone call respondents were less supportive and forthcoming with information than others; language issues, with a respondent's inability or discomfort conducting a telephone

interview in English; the time and effort spent on repeated contact attempts, which affected the average number of questionnaires completed per day; and difficulty in maintaining motivation in the face of persistent lack of response.

One advantage of this method of data collection is that families were sometimes better able to express their feelings about health-care services in this way. This was due to having more confidence in responding to questions and giving feedback than they would in a 1:1 face-to-face interview, especially if their feedback was sensitive or negative.

5.4.5.2 Data entry and coding

System codes were provided to identify families that participated in the exit study, in order to link their exit data with their baseline demographic data. In the case of the retrospective study, codes were used to link individuals with their existing unique NHS ID code, provided by their routine data records from their participation in the programme.

In the case of the prospective study of families that participated in the entry survey, each collected questionnaire was also coded. The same code was used as in baseline information collected. Exit data in both cases was coded by the researcher to identify the exit data collection method used (by post, telephone, and at the venue).

5.4.5.3 Family weekly attendance records

For the prospective study, child attendance record data was provided separately by the ACES main administration office. All venues stored their attendance hard copies in their local offices. Weekly attendance record sheets were normally collected by coaches for each area and venue separately, and stored on two different formats: electronic (Excel spreadsheet) and hard copy. The author collected the electronic spreadsheets of the recorded attendance from each area separately on a regular basis when the programme was approaching its end (the 12 week session). This was for the purpose of merging each attendance record with the child's baseline information record. The NHS unique identifier was used on participant questionnaires and matched with weekly attendance records.

For the retrospective study, information on weekly attendance was available on the NHS Metaframe ACES database. This had been entered by ACES coaches directly onto the electronic database. After tracking a child's attendance level, the researcher prepared

envelopes, each containing information, a consent sheet and the correct version of the Exit questionnaire, and sent them to families. This was followed up with a phone call in the case of those which were not returned.

5.4.5.4 Data anonymity and confidentiality

In order to identify the attendance level of each child, the child's first name, surname, and mother's name were used. This data was then used to match with venue attendance-sheet names in order to identify the child's unique NHS identifier code. The latter was sourced from either the NHS routine data, for those that participated in the exit retrospectively; or, the new code allocated in the entry questionnaire for those children participating in the prospective study. This unique identifier was used to ensure participant anonymity. Data was saved securely to maintain confidentiality see section (3.4.3.4 and 4.4.5.4).

5.4.5.5 Missing and duplicated observation and data linkage

Data was checked by the researcher for accuracy and to identify possible missing or duplicated records. This was to enhance the reliability and power of the data analysis and findings. Caldicott guardian status had been obtained before commencement of the entry study, which allowed the researcher access to hard copy NHS records in order to update any variables missing in the NHS Meta-Frame ACES database. Attendance records had already been collected at the baseline and entry studies, so no missing or duplicate data occurred. Missing data from questionnaires was resolved by the researcher calling families, as described in section5.4.5.1.

5.5 Measurements

5.5.1 *Baseline Characteristics*

The baseline characteristics of ACES families in this exit study had been previously provided by families that participated in the first (retrospective) routine data analysis study (see Chapter 3), and were also provided by families participating in the second (prospective) entry study (refer to Chapter 4). Child characteristics to be used in this study include child date of birth (age), gender, socioeconomic status (SIMD) and anthropometrics. Also, child referral sources, areas and location where the sessions took place will be considered as baseline data on programme characteristics. Finally, some parental baseline characteristics, such as educational level, recognition of child weight and

level of concern, will be linked with baseline characteristics available in the cases of families (n=131) that completed both the exit study and participated in the entry study.

5.5.2 *Social Economic Status (SIMD) code*

The socioeconomic status of participating families was determined by using the Scottish Index of Multiple Deprivations (SIMD) code (2009), ranked from 1 (most deprived) to 5 (least deprived), as described in the routine data analysis (see chapter 3).

5.5.3 *Anthropometric Measurements*

Overweight and obesity were measured in terms of those Body Mass Index (kg/m^2) Standard Deviation Scores (BMI-SDS) described in the Routine Data Analysis chapter. The child's weight and height were measured by trained coaches at the venue during the 1:1 assessment. This occurred before starting their first weekly session. BMI-SDS was calculated using the LMS software of the Child Growth Foundation.

5.6 Questionnaire Content

The questionnaire consisted of seven sections. Each section was developed in order to address three goals (see Appendix 4). First, the need to understand family satisfaction with the programme. Second, it also sought to identify family reasons contributing to drop-out. Third, it sought to capture ideas from participants on how the service could be improved in the future. Questions were presented using a Likert-type scale, and results were coded for analysis as described below.

5.6.1 *Family Satisfaction*

This section consisted of several questions relating to satisfaction with the treatment offered in the programme. Four main groups of questions were included, as described below.

Question 5 asked parents and children how helpful they consider the programme to be in general. Answers were given on a 3-point Likert scale: (not helpful=1), (helpful =2), (very helpful =3).

Question 6 investigated how satisfied families were with various aspects of their first contact with the administration: the appointment itself; the location; the time; the

environment; the information and handout given. A four point Likert scale was used for these questions: (poor =1); (fair =2); (good =3) and (excellent =4).

Question 7 asked families about their satisfaction with coaches' knowledge, attitude and skills: including the support/encouragement given; friendliness; ability to discuss the child's weight issue; the opportunity to ask questions; answers given to parents' questions; and, the coaches' knowledge and explanation of materials. The same 4-point Likert scale was used as in Question 6.

Question 8 was only included in the longer questionnaire, data collection was related to satisfaction with the programme structure, and was measured on a 5-point Likert scale: (not at all useful=1); (not useful=2); (slightly useful=3); (useful=4); and (very useful=5). There were a total of six statements, asking for opinions on the content of individual sessions; information and handouts given; scheduled time of sessions; duration of sessions; venue; and, total number of sessions.

Finally, Question 9 was only included in the longer questionnaire, and asked for information on the usefulness of each programme session. These sessions were divided into three categories: practical, physical activity and behavioural change targeted sessions. A 5-point Likert scale was used in Question 9, similar to Question 8: (not at all useful=1); (not useful=2); (somewhat useful =3); (useful=4); (very useful=5). The individual programme components rated in this question were the talking session (e.g. goal-setting, food labelling, hidden fat and sugar, and the traffic light system for food); physical activity; parent and child nutritional and behavioural sessions; child-only nutritional and behavioural sessions; cooking practice sessions; and, the lifestyle diary.

5.6.2 *Family Session Preference*

In Question 10, the author aimed to determine which of the sessions provided were perceived as being preferred to others, and asked whether each component should be given more time, less time, the same amount of time or removed altogether. Answers were given on a 4-point Likert scale: (remove this session=1); (less time =2); (same time=3); (more time=4). The sessions contained in the question were as in Question 9 and divided into the same categories: practical/physical activity or talking/nutritional information. There was one additional statement; this related to the swimming activity session, which was only available in Renfrewshire.

5.6.3 *Family Lifestyle and Behavioural Changes*

Family expectations of the programme were investigated in two ways. First, families had been previously asked about their expectations at baseline. Second, Question 11 of the exit questionnaire then asked whether families had made any changes since starting the programme. Families were asked to give information about what they felt they had learned from the programme in terms of changes to eating behaviours and physical activity. Parents were asked to complete this question according to their child's and their own opinion respectively. With regard to child-related changes, four statements were given, relating to the child's fitness, self-esteem, health, and relationship with parents.

With regard to family-related changes, seven statements were investigated. These related to more physical activity; more healthy food; checking labels and better choices; restricting snacks; less high-sugar/fatty foods; more family involvement in grocery shopping; and, more family involvement in food preparation. Answers were given on a 4-point Likert scale: (no change=1); (little change=2); (medium change=3); (large change=4).

5.6.4 *Barriers*

Question 12 asked families whether they had missed any sessions of the programme. If so, they were asked to complete the following section (Question 13). Question 13 asked for feedback on barriers contributing to families missing sessions or not returning to the programme. These were categorised into two types of barriers: child-related barriers relating to the child's feelings, and parent-related barriers relating to parents' views. Answers were given on a 5-point Likert scale: (not at all =1); (slightly=2); (somewhat=3); (quite=4); (always =5).

Child-related barriers were investigated through statements relating to psychological factors affecting the child: self-esteem/confidence, the child's attitude to treatment and child's issues with programmatic factors. Statements about child-related self-esteem/confidence related to: embarrassment; worry at meeting new people; unhappiness at being labelled as overweight; discomfort in a mixed age group setting. Also, children's attitude relating to attrition was examined, including: lack of motivation; lack of readiness-to-change; doubts about the usefulness of the programme; and doubts about weight improvement. The child-related programmatic factors investigated were lack of interest in

sessions; sessions not meeting expectations; missing school work; and finding the programme unhelpful.

Parent-related barriers were investigated through statements relating to both parental attitude/beliefs regarding the programme and parental programmatic (e.g. practical, logistic) factors. Statements about parental attitudes examined in the questionnaire related to lack of readiness-to-make changes and doubts about the usefulness of the programme. The parental practical issues which impacted attrition examined in the questionnaire related to poor information given; inconvenient times for sessions; problems with session scheduling; transportation issues; unsuitability of the venue; excessive session duration; schedule not meeting expectations; and parents missing work.

5.6.5 *Programme Adherence*

In Question 14, the question asked families to judge how difficult they found it to apply lessons from the programme to their daily family life. The aspects of the programme to which this question referred related to lifestyle, eating and physical activity behaviours. Several statements were given, asking about whether it was difficult to keep eating healthily; maintain higher levels of physical activity; keep setting goals; make and adhere to plans; receive family support on advised changes; keep the child motivated; keep parents themselves motivated; and, adhere to the ACES eating, PA & behavioural change diary. Answers were given on this 5-point Likert scale, gauging the perceived level of difficulty in adhering to lessons from the programme: (strongly agree=1); (agree=2); (unsure=3); (disagree =4); (strongly disagree=5).

5.6.6 *Family Confidence in Awareness, Skills and Behaviours*

Question 15 was related to family perceptions of the extent to which the programme helped to increase their confidence to make lifestyle changes. This was divided into three main themes: (1) awareness; (2) knowledge and skills, so that families can make behavioural changes and eat more healthily; and, (3) doing more physical activity. Each of these themes, respectively, included the following:

1. Family confidence in awareness of their child's weight status; the causes of unhealthy weight; the effects of unhealthy weight; the risks of excessive TV/passive viewing time; the importance of being active; the importance of healthy

food; guiding/regulating the child's eating; the importance of family support to make changes.

2. Knowledge/skills, so that families can establish realistic goal-setting; problem-solving; healthy choices/eating; appropriate portion sizes; an understanding of food labelling; support of their child with weight management; control of the food environment; and, responsibility-sharing within the family.
3. Confidence to make changes included: eating more healthy food; maintaining healthy eating; becoming more active; and, continuing to be more active.

Each statement on these themes were given on a 5-point Likert scale: (not at all confident =1); (slightly confident=2); (somewhat confident=3); (quite confident=4); (highly=5).

5.6.7 *Suggestions for Improvement*

Question 18 contained general structured statements, and was targeted at completer families that had missed programme sessions. These statements referred to factors that may have contributed to increasing motivation to continue attending. Families were asked to what extent they agreed with these statements as suggestions for improvement. These suggestions included: making the session more fun (i.e. more activity); more materials (detail/information sheets); more support/encouragement from coaches; text reminders; better times or venues; more sessions but shorter duration; less sessions but longer duration. Answers were given on a 5-point Likert scale: (strongly agree =1); (agree=2); (unsure=3); (disagree =4); (strongly disagree =5).

Question 19 was open-ended giving families the opportunity to make general suggestions or comments about ways in which the child weight management programme could have better family engagement. Quoted paragraphs were obtained from families' answers that gave valuable qualitative information reflecting their thoughts about the programme, such as their feelings of satisfaction with the service and how it can be improved. Families' feedback was used to identify broad themes and concepts. For example, parents wrote about their feelings and their child's feelings toward the programme and its services, as well as the difficulties and barriers for them and their child to engaging with the sessions. The parents also provided thoughts on how the programme could be more engaging.

5.7 Study Analysis Plan

In order to address the aim and objectives of this chapter, the following shows the study analysis plan for this chapter's data analysis and the results are then interpreted. The data analysis and results section will be presented in three main sections.

5.7.1 *Descriptive Analysis*

A descriptive analysis is given, comprising three main parts: a description of participant baseline characteristics, programme characteristics, and family attendance levels. With regard to participant baseline characteristics, all families who were delivered the exit questionnaire were included, whether or not they responded to the distributed questionnaire, and taking into consideration the time periods that this family baseline data was collected, retrospectively (2010-2012) or prospectively (2012-2013). Mean and standard deviation (mean ± sd.) were considered in order to describe the continuous data included (child age, height, weight, BMI z-score, total weeks of attendance). Categorical data was described using frequency and percentages. The categorical variables considered in this study were gender; socio-economic status (SIMD); and, programme characteristics, e.g. referral source, area & location, chronological factors, and year/season of beginning the programme.

Additionally, some testing was performed to investigate differences and variation between participant baseline characteristics, using a Chi-square test for categorical data and t-tests for any continuous scales. Also, the mean and sd scores of the three programme satisfaction statements were used to identify if there were any differences between participants according to the study type, attendance level and child socio-demographic factors groups (see Table 5-8).

5.7.2 *Comparative Descriptive Analysis*

A comparative descriptive analysis was conducted, firstly between non-completers (0-7 weeks) and completers (≥ 8 weeks). The two group categories were developed from the frequency total weekly attendance of families. The comparative descriptive analysis in this section considers the three core concepts covered in the questionnaire and reported by parents (i.e. satisfaction, expectation and barriers). Most of these concept statements, as described in the questionnaire content section above, were categorical (Likert scale);

therefore a Chi-square for categorical data is applied to find if there any differences between the two attendance groups according to all other variables. An independent t-test for continuous data was also analysed. The mean and the standard deviation (sd.) for all "scores" were developed from the adding up of question statements (based on Likert-scale ratings). There were several instances when in presenting the data response categories were combined.

Firstly, this combination occurred to improve the power of the cross-tabulation analysis due to limited responses in some categories. For instance, three groupings in Q.7 have been developed from the four-point Likert scales (Poor, Fair, Good and Excellent). Thus, family responses were re-categorized into three main groups (Poor & Fair = dissatisfied), (Good=satisfied), (Excellent=very satisfied) and will be considered during this study analysis. Also, weighted scores were obtained from this categorical data and a mean score was calculated for each satisfaction theme (see Table 5-7). This also occurred with Q. 8 (see Table 5-8).

5.7.3 *Logistic Regression*

Finally, a binary logistic regression analysis was performed in order to develop two logistic models. The first of these was a model comparing the non-completer=0 and the completer groups=1, in order to identify factors relating to attrition. The second model sought to identify factors that would help to improve this multi-approach weight management programme, between families with low and high attendance. In both models, a univariate analysis was carried out using a number of baseline characteristics and other predictors. Subsequently, a multivariate logistic regression analysis was conducted to identify which of these factors can be predictors of attrition.

5.7.4 *Data regrouping*

In order to improve the power of the statistical analysis, some variables were re-categorised into fewer groupings due to small cell numbers (and sometimes, empty cells) when the variables were cross-tabulated, and some scores were developed using the categories means

Family responses were re-categorized into three main groups (Poor & Fair = dissatisfied), (Good=satisfied), (Excellent=very satisfied). These three groups were used in this analysis

and were coded as 1= dissatisfied, 2= satisfied and 3= very satisfied. We obtained the mean of the responses to each of the comments under each satisfaction theme. The total scores and their standard deviations were then obtained by averaging the means of all comments under each theme and calculating the standard deviation (see Table 5-7). The same approach was also used for Q. 8 (see Table 5-8).

Families' feedback on their expectation of lifestyle changes is provided in (Table 5-2). Q. 11 regarded lifestyle behavioural change in relation to the child and the family (see Table-5-9). The 4-Likert scale statements were re-grouped into (No change + little change=1) and (medium change + large change=2). Also, a mean developed score was computed using perceived child behavioural statements, which were then used to report the mean lifestyle changes score. The range of this score was range=2.75 between (1.25-4). The same approach was adopted for family lifestyle changes, which included seven Likert scale statements used in the questionnaire (see Appendix 4). The range of this score was range=3 between (1 - 4). The higher the score, the more this indicated considerable change.

With regards Q. 13 on parental reporting of child perceived barriers (see Table 5-10 & 5-11), also the 5-Likert scale statements were re-grouped into three main categories: (Not at all + slightly=1) (somewhat=2) (quite often + always=3) used in the exit questionnaire (see Appendix 4). Also, a mean score was computed using parental-reported perceived barrier statements for both child and parents, using a number of different statements provided in the questionnaire (see Appendix 4). The computed mean scores had a (range=2) and their interval was between (1-3). Child psychosocial factoring as a barrier was calculated using the statements (A, B, C, D). This same process was applied to identify the mean of child attitude as a barrier, using statements: (E, F, L). The mean of child beliefs as a barrier used statements (G, H, I, J, K). Parent reports on their own barriers utilised the same approach to regrouping. Parent beliefs as a barrier was computed using statements (B, D, E, F, H). Also, parental perceptions on programmatic barriers were calculated using statements: (G, I, J, K, L, M). Finally, some re-categorisation and combining of results was done to demonstrate more clearly a categorical 5-Likert scale of agreement in Q 14 regarding adherence to behavioural change. The 5-Likert scale was regrouped into 3 categories (strongly agree + agree=1), (unsure=2), (strongly disaagree + disagree=3) (see Table 5-14).

5.8 Results

5.8.1 *Baseline Charateristics*

Table 5-2 indicates that there were no significant associations by baseline characteristics between responders and non-responders respectively for either the retrospective or prospective study, with one exception. Total weeks attended mean score for the prospective versus retrospective study did indicate differing responses. Attendacnce was found to be higher in the prospective than retrospective population.

Table 5-2: Baseline characteristics of all families who responded and did not respond

Baseline Characteristics	Families who delivered the Exit questionnaire(2010-2013) N=486					
	Retrospective N=280		*P-value*	*Prospective N=206*		*P-value*
	Responder N=144	N-responder N=136		Responder N=131	N-responder N=75	
Total weeks,n	N=144	N=136		N=131	N=75	
mean±sd	3.72±3.42	5.83±3.71	≥0.001	7.28±4.06	6.14±3.24	0.033
Gender, n	**N= 144**	**N= 136**		**N=129**	**N= 75**	
Boys	62(43.1)	63(46.3)	0.582	39(33.6)	35(0.0)	0.365
Girls	82(56.9)	73(53.7)		77(66.4)	53(0.0)	
Age, n	**N=142**	**N=136**		**N=130**	**N=75**	
mean ± SD	11.49±2.62	11.35±2.49	0.632	10.18±2.63	9.82±2.41	0.336
Height (sds),n	**N=133**	**N=136**		**N=106**	**N=75**	
mean ± SD	146.14±14.7	146.95±13.7	0.911	144.65±14.16	143.63±12.69	0.623
Weight(sds), n	**N=133**	**N=136**		**N=106**	**N=75**	
mean ± SD	62.96±20.59	62.36±20.74	0.811	59.13±20.29	60±23.23	0.777
BMI (sds),	**N=133**	**N=136**		**N=106**	**N=75**	
mean ± SD	28.23±5.11	28.13±5.38	0.878	27.53±5.37	28.29±7.34	
Socioeconomic (SIMD),n	**N=141**	**N=136**		**N=131**	**N= 72**	
Most deprived	57 (40.4)	60 (44.1)		51 (38.9)	32 (44.5)	
2	29 (20.6)	33 (24.3)		21 (16.0)	6 (8.3)	
3	15 (10.6)	20 (14.7)	0.190	15 (11.5)	8 (11.1)	0.615
4	18 (12.8)	8 (5.9)		34 (26.0)	19 (26.4)	
Most affluent	22 (15.6)	15 (11.0)		10 (7.6)	7 (9.7)	

5.8.2 *Attendance level and its association with beseline characteristics*

As shown in (Table 5-3), whilst the median overall attendance score was 8 weeks across all participants, when examined further, this represented only 1 week for retrospective participants but 8 weeks for prospective participants.

Table 5-3: Attendance for the cohort study period (Baseline data collection)

Total weeks		All families 2010-2013		Retrospective 2010-2012		Prospective 2012-2013		P-Value
		N	%	N	%	N	%	
Total number of weeks	0 week	34	12.4	22	15.3	12	9.2	
	1 week	28	10.2	22	15.3	6	4.6	
	2 weeks	25	10.5	21	14.6	4	6.1	
	3weeks	19	5.8	14	9.7	5	1.5	
	4weeks	13	4.4	10	6.9	3	1.5	
	5weeks	10	3.6	9	6.2	1	0.8	
	6weeks	9	3.3	3	2.1	6	4.6	
	7weeks	16	5.8	5	3.5	11	8.4	
	8weeks	46	16.7	15	10.4	31	23.7	
	9weeks	22	8.0	9	6.2	13	9.9	
	10weeks	16	5.8	6	4.2	10	7.6	
	11 weeks	22	8.0	8	5.6	14	10.7	
	12 weeks	15	5.5	0	0.0	15	11.4	
	Total	275	100.0	144	100.0	131	100.0	
	Mean	6.41		4.86		8.01		<0.001
	Median	8.00		1		8.00		<0.001
	Mode	8		-		8		
Percentile	25	2.00		1.00		6.00		
	50	6.00		3.00		8.00		
	75	9.00		8.00		10.00		

(Table 5-4a) reinforces that retrospective study participants were tended to non-completion of the programme (p-value=<0.001) whilst prospective study participants were most likely to complete (p-value=<0.001).Age was also shown to be significantly associated with non-completion (p-value=<0.009), with the mean age of non-completers 11.2 years ±2.81. In addition, attendance was improved over time among both younger and older children see (table 5-4b)

Table 5-4a: Comparative descriptive of child baseline characteristics between (0-7wks) and (≥8wks)

Characteristics	Total	Attendance		P-value
		Non-completer 0 -7 wks	Completer ≥8 wks	
Study Period (Cohort)	275	154 (66.0)	121 (44.0)	
2010	59	47 (30.5)	12 (9.9)	
2011	83	55 (35.8)	28 (23.1)	<0.001
2012	100	43 (27.9)	57 (47.1)	
2013	33	9 (5.8)	24 (19.9)	
Age continue, mean ±sd	272	11.32±2.81	10.09±2.45	0.009
Height z score, mean ±sd	239	0.30±1.31	0.87±1.35	0.010
Weight z score, mean ±sd	239	2.49±0.88	2.62±0.87	0.309
BMI z score, mean ±sd	239	2.87±0.66	2.89±0.63	0.669
Gender, n (%)	273	152 (55.7)	121 (44.3)	
Female	158	86 (56.6)	72 (59.5)	0.627
Male	115	66 (43.4)	49 (40.5)	
Age (categories), n (%)				
Age 5-10	121	55(36.2)	66 (55.0)	0.002
Age 11-15	151	97 (63.8)	54(45.0	
BMI z score (categories), n (%)				
Overweight/Obese 91st- <99.6th	95	58 (40.0)	37 (39.4)	0.888
Severely Obese ≥ 99.6th	144	86 (60.0)	57 (60.6)	
Socio-economic (SIMD), n (%)				
1 most deprived	107	64 (42.1)	43 (35.8)	
2 derived/Middle	80	43 (28.3)	37 (30.8)	0.572
3 affluent	85	45 (29.6)	40 (33.3)	

Table 5-4b: Comparative descriptive of the completion rate (attended 8 or more session) over time, by child age group at baseline

Characteristics	Routine Study (2010 - 2013)			
	2010	2011	2012	2013
Young age				
Non-Completer	9 (69.2)	23 (63.9)	20 (38.5)	3 (15.0)
Completer	4 (30.8)	13 (36.1)	32 (61.5)	17 (85.0)
Total	13 (100)	36 (100)	52 (100)	20 (100)
Old age				
Non-Completer	38 (82.6)	30 (68.2)	23 (47.9)	6 (46.2)
Completer	8 (17.4)	14 (31.8)	25 (52.1)	7 (53.8)
Total	46 (100)	44 (100)	48 (100)	13 (100)

5.8.3 *Family satisfaction and perception of the programme*

Table 5-5a illustrates the responses to the overall helpfulness of the programme as perceived by the parents and their children according to the two study periods and the method of family's feedback. In the Retrospective study, both parent and child level of satisfaction among the non completer and completer groups was not affected by the way the questionnaire was delivered and no significant differences were found in their overall satisfaction level. In the Prospective study period, There was no

association between the method of questionnaire delivery and the level of satisfaction for parents in the non-completer's group. However, the level of satisfaction was significantly ($p < 0.0001$) associated with questionnaire type for parents in the completer group. For the children, questionnaire type was significantly associated with level of satisfaction both for the non-completer and completer groups (p-values = 0.004 and < 0.001 respectively). Within the prospective completer group, the majority completed the questionnaire in the venue not by telephone or post.

Table 5-5a: Parent & Child feedback on the Helpfulness of ACES according to Attendance, Filling the questionnaire methods & Study Period

Level of attendance	Parental feedback						Child feedback					
	Non-completer (0-7wks)			Completer (≥8weks)			Non-completer (0-7wks)			Completer (≥8weks)		
	Not helpful	***Helpful***	***Very helpful***	***Not helpful***	***Helpful***	***Very helpful***	***Not helpful***	***Helpful***	***Very helpful***	***Not helpful***	***Helpful***	***Very helpful***
Retrospective study, n(%)												
Post	2(16.7)	5(41.7)	5(41.7)	0(0)	3(75)	1(25)	4(33.3)	4(33.3)	4(33.3)	0(0)	3(75)	1(25)
Phone call	25(26.6)	50(53.2)	19(20.2)	1(2.9)	11(42.2)	22(64.7)	50(53.2)	27(28.7)	17(18.1)	2(5.9)	10(29.4)	22(64.7)
Venue	-	-	-	-	-	-	-	-	-	-	-	-
P- value		0.241			0.245			0.341			0.188	
Prospective study, n(%)												
Post	2(28.6)	3(42.9)	2(28.6)	-	4(80)	1(20)	3(42.9)	2(28.6)	2(28.6)	-	3(60)	2(40)
Phone call	5(17.2)	16(52.2)	8(27.6)	-	3(20)	12(80)	17(58.6)	7(24.1)	5(17.2)	-	2(13.3)	13(86.7)
Venue	-	10(83.3)	2(16.7)	-	57(90.5)	6(9.5)	0(0)	10(38.3)	2(16.7)	1(1.6)	56(88.9)	6(9.5)
P - value		0.307			0.000			0.004			0.000	

Parental and child perceptions of programme helpfulness indicated that the majority of both did find it helpful (see Table 5-5b). Those parents who found it most unhelpful tended to be those who attended least. Also, this finding was significantly associated with the study source of baseline data collection and level of attendance. Those who participated in prospective years (2012-2013) of the study found it more helpful than the retrospective (2010-2011) years. Similarly, those who stayed longer in the programme found it more helpful than those who attended for seven weeks or less. In all, children found the programme less helpful than their parents.

Table 5-5b: Family perception of the helpfulness of the ACES programme by study type and level of attendance

Level of attendance	Parental feedback			*P value*	Parent repprt of child feedback			*P value*
	Not helpful	***Helpful***	***Very helpful***		***Not helpful***	***Helpful***	***Very helpful***	
All family, n=275	38 (13.8)	161 (58.5)	76 (27.6)		84 (30.5)	119 (43.3)	72 (26.2)	
Study Period , n (%)								
Year 2010, n=59	14 (23.7)	30 (50.8)	15 (25.4)		29 (49.2)	16 (27.1)	14 (23.7)	
Year 2011, n=83	16 (19.3)	39 (47.0)	28 (33.7)	0.003	30 (36.2)	26 (31.3)	27 (32.5)	<0.001
Year 2012, n=100	6 (6.0)	72 (72.0)	22 (22.0)		21 (21.0)	58 (58.0)	21 (21.0)	
Year 2013, n=33	2 (6.1)	20 (60.6)	11 (33.3)		4 (12.1)	19 (57.6)	10 (30.3)	
Attendance ,n (%)								
Attended < 8wks, n=154	38 (24.7)	87 (56.5)	29 (18.8)	<0.001	84 (54.5)	47 (30.5)	23 (15.0)	<0.001
Attended ≥ 8wks, n=121	-	74 (61.2)	47 (38.8)		-	72 (59.5)	49 (40.5)	

In examining the key characteristics between those children who found the programme helpful and those who did not, age seems significant. Table 5-6 below identifies that there was a difference in the mean age between children who found the treatment helpful and those who did not, with older children showing the greatest dissent (p-value=0.001).

Table 5-6: Descriptive comparison of child feedback on the helpfulness of the treatment programme by study period, attendance & child baseline characteristics

Characteristics	Child overall satisfaction			P-value
	Not Helpful	Helpful	Very helpful	
Total number, n (%)	84 (30.5)	119 (43.3)	72 (26.2)	
Total week attendance, median	1	8	8	
Attendance level,n=275				
Dropped (0-7wks),n=154	84 (54.5)	47 (30.5)	23(14.9)	
Completed (≥ 8wks),n=121	-	72(59.5)	49(40.5)	
Age continue, mean ±sd	11.87±2.74	10.35±2.38	10.49±2.84	<0.001
BMI z score, mean ±sd	2.87±0.61	2.79±0.68	2.95±0.69	0.313
Gender, n (%) N=273				
Female,n=158	42(26.6)	78(49.4)	38(24.1)	0.068
Male,n=115	42(36.5)	41(35.7)	32(27.8)	
Age (categories), n (%) N=239				
Age 5-10, n=100	22(18.2)	61(50.4)	38(31.4)	<0.001
Age 11-15, n=81	62(41.1)	57(37.7)	32(21.2)	
BMI z score (categories), n (%) N=239				
Overweight/Obese 91-98th	30(31.6)	43(45.3)	22(23.2)	0.484
Severely Obese ≥ 99.6th	53(22.2)	54(37.5)	37(25.7)	
Socio-economic (SIMD), n (%) N=272				
1 most deprived.n=107	35(32.7)	46(43.0)	26(24.3)	
2 derived/Middle,n=80	21(26.3)	36(46.0)	23(28.8)	0.852
3 affluent,n=85	28(32.9)	37(43.8)	20(23.5)	

The various components of the ACES programme were appraised by the respondents and their responses are shown in (Table 5-7). Results indicated overall that the programme made a good impression on most participants. Indeed, family satisfaction rates with coach support and encouragement, their friendliness and approachability were high, whilst least satisfaction related to discussing their child's weight issue and perceived coach willingness to answer questions. Equally, family feedback on programme structure, especially the programme content, information and handouts was high.

Table 5-7: Family satisfaction with 1st contact, Coaches KAS, Programme structure

Family satisfaction with ACES	Family satisfaction n (%)		
	Unsatisfied	Satisfied	Very satisfied
First, N=268			
Contact with administration	30(11.2)	121(45.1)	117(43.7)
1st appointment reminder	23 (8.6)	109(40.8)	135(50.6)
1 st appointment venue	37(13.8)	119(44.4)	112(41.8)
1 st appointment time	34(12.7)	124(46.3)	110(41)
1 st appointment environment	37(13.8)	116(43.3)	115(42.9)
1 st appointment info & handout	25(9.3)	122(45.5)	121(45.1)
1st contact total score, mean±sd		2.32±0.59	
Coaches KAS, N=264			
Support and encouragement	24(9.1)	75(28.4)	165(62.4)
Friendliness and approachability	23(8.7)	80(29.1)	161(61)
Ability to discuss child's weight issue	41(15.5)	82(31.1)	141(53.4)
Giving an opportunity to ask questions	37(14)	80(30.3)	146(55.7)
Answering questions	31(11.7)	91(34.5)	142(53.8)
Knowledge & material explanation	27(10.2)	89(33.7)	142(53.8)
KAS total score, mean±sd		2.45±0.64	
Programme structure, N=269			
Content of sessions	11(4.1)	29(10.8)	229(85.1)
Information and handout	15(5.6)	31(11.5)	223(82.9)
Session scheduled times	25(9.3)	41(15.2)	203(75)
Duration of sessions	19(7.1)	40(14.9)	210(78.1)
Venue of sessions	25(9.3)	30(11.2)	214(79.6)
Total number of sessions	14(5.2)	44(16.4)	211(78.4)
Structure total score, mean±sd		2.73±0.45	

Table 5-8: Descriptive comparison of family satisfaction with treatment (1st Contact, Coaches KAS and programme structure) by study type, attendance & child baseline characteristics

Characteristics	1st contact	Coaches KAS	Treatment structure
	mean±sd		
Time period, n	**N=268**	**N=264**	**N=269**
2010,n=59	2.05 ± 0.57	2.14 ± 0.55	2.59 ± 0.55
2011,n=82	2.24 ± 0.59	2.34 ± 0.73	2.69 ± 0.49
2012,n=94	2.42 ± 0.59	2.62 ± 0.57	2.79 ± 0.36
2013,n=33	2.74 ± 0.39	2.82 ± 0.45	2.84 ± 0.34
P-value	<0.001	<0.001	0.023
Attendance, n	**N=268**	**N=264**	**N=269**
Dropped	2.11 ± 0.59	2.16 ± 0.65	2.59 ± 0.45
Completer	2.61 ± 0.47	2.86 ± 0.35	2.91 ± 0.20
P-value	<0.001	<0.001	<0.001
Gender, n			
Girls	2.32 ± 0.58	2.50 ± 0.62	2.74 ± 0.44
Boys	2.32 ± 0.62	2.39 ± 0.68	2.72 ± 0.46
P-value	0.996	0.208	0.657
Age category, n	**N=265**	**N=261**	**N=266**
Young	2.45 ± 057	2.63 ± 0.56	2.93 ± 0.34
Old	2.22 ± 0.59	2.32 ± 0.67	2.67 ± 0.51
P-value	0.002	<0.001	0.003
BMI categories, n	N=234	N=231	N=233
Overweight/Obese 91st- <99.6th	2.31 ± 0.61	2.35 ± 0.72	2.73 ± 0.47
Severely Obese ≥ 99.6th	2.29 ± 0.61	2.45 ± 0.62	2.71 ± 0.47
P-value	0.750	0.258	0.758
SIMD, n	**N=265**	**N=261**	**N=266**
Most deprived	2.34 ± 0.61	2.45 ± 0.63	2.76 ± 0.47
Deprived/Middle	2.33 ± 0.57	2.54 ± 0.65	2.69 ± 0.48
Most affluent/affluent	2.32 ± 0.61	2.8 ± 0.66	2.73 ± 0.42
P-value	0.974	0.329	0.650

On average, the mean and sd satisfaction scores (i.e. of 1st contact, coaches KAS and programme structure) showed that there were differences between the two groups by study type of baseline data collection, level of attendance and child age but not with BMI level or deprivation. The mean score of each of the three satisfaction statements was lower among those who attended the programme earlier, those who dropped out, and children from the older age group, respectively. This suggests that family programme satisfaction was impacted upon by these characteristics (see Table 5-8).

Table 5-9: Families' feedback on if their expectation on lifestyle changes

Parental reported about changes on their child after the programme	Parental report on changes	
	No/Little	***Medium/Large***
n=263		
Child became fitter	62 (23.6)	201 (76.4)
Child self-esteem improved	195 (74.1)	68 (25.9)
Child health improved	197 (74.9)	66 (25.1)
Child & parents spending more time together	193 (73.4)	70 (26.6)
Child expectation score, mean±sd		
Family doing more physically activity	183 (69.3)	81 (30.7)
Family eating more healthy food	160 (60.6)	104 (39.4)
Doing health food choice & checking labels	168 (63.6)	96 (36.4)
Restricting unhealthysnacks	163 (61.7)	101 (38.3)
Less fat and sugary foodat home	165 (62.5)	99 (37.5)
Family member involved in planning meal	191 (72.3)	73 (27.7)
Family member involved in food preparation	185 (70.1)	79 (29.9)

Table 5.9 gives a summary of the expected lifestyle and behavioural changes reported by parents as a result of attending the weight management programme. Although the response rate was low in the medium/large change category compared with the little change category, most responses stated that the child became fitter (76%). Families reported that they did better in healthy eating, making better food choices and restricting unhealthy snacks rather than having any improvement with child self-esteem, overall health, families doing activities together or improved relationship with their parents. However, the

programme seems to have been fairly successful at sensitizing families to the need to eat more healthy food, eat less fat and sugar and involve every family member in food preparation. About a third of families were in agreement that the programme had succeeded in this food sensitization.

5.8.4 *Barriers*

Table 5-10: Families' perceived barriers related to the child

Barriers	Familyperceptions N(%)		
	Always	***Somewhat***	***Not at all***
Child Self Efficacy			
Does not like to be in a group with children of different ages	36 (14.3)	25 (10)	190 (75.7)
Worries about meeting new people	36 (14.3)	29 (11.5)	187 (74.2)
Does not like to be labelled as overweight	34(13.6)	29 (11.6)	187 (74.8)
Embarrassment	32 (12.7)	26 (10.4)	193 (76.9)
Total score, mean ± sd	1.34±0.66		
Child Attitudes			
Did not want to go to the session	26 (10.4)	20 (8)	204 (81.6)
Not motivated to start new activity	10 (4)	20 (8)	220 (88)
Not ready to make change	9 (3.6)	14 (5.6)	225 (90.7)
Total score, mean ± sd	1.19±0.45		
Child Beliefs			
Not sure if attending would be helpful	-	47(18.8)	203 (81.2)
His/her weight not getting better	8 (3.3)	34 (13.9)	203 (82.9)
Session schedule not as expected	25 (10)	34 (13.7)	190 (76.3)
Sessions not interesting	22 (8.9)	35 (14.1)	191 (77)
Missed lots of school work	-	12 (4.9)	235 (95.1)
Total score, mean ± sd	1.23±0.41		

Table 5-11: Families' perceived barriers related to parents & programme non-completion

Barriers	Family perceptions N (%)		
	Always	***Somewhat***	***Not at all***
Parents beliefs			
Not ready to make change	-	30 (12.0)	221 (88.0)
Sessions not interesting	18 (7.1)	21 (8.3)	214 (84.6)
Not sure attending ACES would help	7 (2.8)	25 (10.0)	217 (87.2)
Session schedule not as was expected	11 (4.3)	23 (9.1)	219 (86.6)
Parents were missing lots of work	15 (6.0)	17 (6.8)	217 (87.2)
Total score, mean ± sd		1.18±0.35	
Programme barriers			
Information & explanation not enough	-	19 (7.6)	232 (92.4)
Difficult to get there (Transportation)	17 (6.8)	22 (8.8)	212 (84.4)
Session not at suitable venue	18 (7.2)	18 (7.2)	215 (85.6)
Sessions not at a convenient time	23 (9.1)	24 (9.6)	205 (81.3)
Session duration is too long	-	10 (4.0)	240 (96.0)
Programme goes on for too many weeks	-	10 (4.0)	241 (96.0)
Total score, mean ± sd		1.17±0.35	

(Table 5-10) and (Table 5-11) highlight which barriers parents rated as impacting upon attendance to the programme for both the child and parents. These primarily related to the child and how s/he feels. It included how they felt being around other people (particularly the social anxiety of being labelled overweight compared to their counterparts in the completers group). Self-efficacy mean±sd score was a higher barrier in comparison to others related to child attitude & beliefs, parent and programme related factors. At least a third of them believed that attending the programme might not help and others felt the programme did not meet their expectations. Similarly 10% of parents felt that their expectations were not met and so concluded the programme would not help. However, most parental barriers were programmatic practical barriers, like session time, venue and transportation difficulty (refer to Table 5-11).

Table 5-12: Descriptive comparison of families' perceived barriers scores related to the child, parent & programme between non-completers & completers. BY study type, attendance level & child baseline characteristics

Characteristics	Perceived barriers scores				
	Child			Parents	Programme
	Psychosocial	Attitude	Beliefs		
		mean±sd		mean±sd	
Study Type, n	**N=253**	**N=252**	**N=252**	**N=255**	**N=252**
Year 2010	1.67±0.79	1.28±0.58	1.41±0.49	1.54±0.49	1.28±0.46
Year 2011	1.49±0.77	1.27±0.55	1.29±0.49	1.51±0.81	1.23±0.41
Year 2012	1.22±0.45	1.13±0.31	1.14±0.29	1.17±0.35	1.09±0.23
Year 2013	1.11±0.28	1.08±0.22	1.08±0.19	1.13±0.22	1.10±0.18
P-value	<0.001	0.053	<0.001	<0.001	0.003
Attendance, n	**N=253**	**N=252**	**N=252**	**N=255**	**N=252**
Dropped	1.61±0.76	1.31±0.54	1.37±0.48	1.26±0.41	1.24±0.42
Completer	1.07±0.25	1.03±0.21	1.04±0.17	1.08±0.20	1.07±0.20
P-value	<0.001	<0.001	<0.001	<0.001	<0.001
Gender, n	**N=251**	**N=251**	**N=251**	**N=253**	**N=250**
Girls	1.41±0.67	1.18±0.44	1.21±0.39	1.15±0.29	1.15±0.32
Boys	1.36±0.64	1.21±046	1.27±0.44	1.22±0.42	1.20±0.38
P-value	0.652	0.679	0.219	0.107	0.307
Age category, n	**N=250**	**N=249**	**N=249**	**N=252**	**N=249**
Young	1.22±0.50	1.14±0.38	1.12±0.26	1.16±0.32	1.14±0.29
Old	1.49±0.72	1.23±0.48	1.30±0.47	1.19±0.36	1.19±0.39
P-value	0.001	0.114	<0.001	0.448	0.214
BMI categories, n					
Overweight/Obese 91st- <99.6th	1.42±0.67	1.24±0.49	1.24±0.43	1.22±0.37	1.16±0.35
Severely Obese ≥ 99.6th	1.41±0.68	1.19±0.44	1.26±0.42	1.18±0.35	1.18±0.36
P-value	0.985	0.424	0.699	0.345	0.693
SIMD, n					
Most deprived	1.39±0.68	1.20±0.46	1.25±0.43	1.14±0.27	1.16±0.33
Deprived/Middle	1.37±0.68	1.16±0.41	1.21±0.42	1.20±0.39	1.18±0.40
Most affluent/affluent	1.37±0.61	1.22±0.48	1.23±0.38	1.22±0.40	1.15±0.31
P-value	0.058	0.744	0.783	0.258	0.846

From (Table 5-12) it is clear that the overwhelming majority of participants who perceived barriers were from the retrospective study. This applied to child, family and also to those perceived programme barriers with (p-value=<0.001). As was seen in (Table 5-2), the key variable between those participating in the retrospective and those participating in the prospective study is child age, with the former being predominantly from the older age group Thus, perceived barriers to programme attendance were higher among the retrospective relative to the prospective group for both the children and parents (p-value < 0.001).

(Table 5-12) indicates that the older age group of the retrospective study were highly impacted by psychosocial, attitudinal and belief factors. Also, perceived barriers scores were significantly higher for the drop-outs compared to the completers. Age was positively associated with increased perceived barriers. The older children had higher mean scores across the three factors relative to younger children, with significantly higher mean score for psychosocial and belief factors. There is no strong reason to believe that perceived barriers were associated with child BMI categories and social class SIMD.

Table 5-13: The association between child perceived barriers and child age and attendance level of those who reported (Always / Somewhat)

Barriers	Perceived child barriers perceive reported by combined Always/ Somewhatresponses									
	Age				*P. value*	*Attendance*				*P. value*
Child Barriers	Total	mean±sd	Young	Old		Total	mean±sd	≤7wks	≤8wks	
Child Self-efficacy, n (%)										
Does not like be in a group of different ages	55	11.9±2.68	16(29.1)	39(70.9)	0.004	61	2.5±2.88	56 (91.8)	5 (8.2)	<0.001
Worries about meeting new people	61	11.7±2.74	20(32.8)	41(67.2)	0.020	65	2.5±2.90	59 (90.8)	6 (9.2)	<0.001
Does not like to be labelled	57	11.9±2.65	16 (28.1)	41(71)	0.003	63	2.6±3.09	56 (88.9)	7 (11.1)	<0.001
Embarrassment	54	12.5±2.59	14(25.9)	40(74.1)	0.001	58	2.6±3.06	52 (89.7)	6 (10.3)	<0.001
Child Attitudes, n (%)										
Child did not want to go to the session	44	11.3±2.66	16 (36.4)	28 (63.8)	0.163	46	2.5±2.50	43 (93.5)	3 (6.5)	<0.001
Not motivated to start a new activity	28	11.2±3.04	11 (39.3)	17 (60.7)	0.547	30	2.7±3.04	27 (90)	3 (10)	<0.001
Not ready to make change	21	11.7±3.03	6 (28.6)	15(71.4)	0.097	23	2.4±2.95	21 (91.3)	21.3 (8.7)	0.001
Child Beliefs, n (%)										
Child not sure attending would be helpful	42	11.6±2.94	11 (26.2)	31 (73.8)	0.005	47	2.9±3.50	40 (85.1)	7 (14.9)	<0.001
His/her weight not getting better	37	12.3±2.74	8 (21.6)	29 (78.4)	0.001	42	1.5±1.92	41 (97.6)	1 (2.4)	<0.001
Session schedule not as child expected	54	11.7±2.7	16 (29.6)	38 (70.4)	0.005	59	2.2±2.39	56 (94.9)	3 (5.1)	<0.001
Sessions not interesting	52	11.7±2.77	16 (30.8)	36 (69.2)	0.014	57	2.4±2.84	52 (91.2)	5 (8.8)	<0.001
Child missed lots of school work	11	12.5±2.3	2 (18.2)	9 (81.8)	0.058	12	1.2±1.60	12 (100)	-	0.002

The results shown in (Table 5-13) explore the perceived barriers linked to both age and attendance in more detail. This table also shows that low self-efficacy and limiting beliefs had the greatest impact on attendance; and concurs with the findings of (Table 5-12) that these factors were also found most commonly amongst the older age group. Notably, though, the mean age ranged between 11-12 years for those rating highly for low self-efficacy indicates that the perception of barriers was skewed towards the older aged participants. Whilst the attendance ranged from 0-12 weeks for these participants, median attendance was for only 1 week. However, attendance was also strongly associated with attitude whilst age was not.

All components of self-efficacy were significantly associated by age and attendance, for instance: does not like to be in a group of different ages; worries about meeting new people; does not like to be labelled; and, embarrassment. The most prevalent across both age groups was the worrying about meeting new people (social anxiety); while, teenagers most feared being labelled (71%) and disliked being in mixed age groups (70.9%). Embarrassment had the lowest combined response of 54% of those indicating it as a contributor to low self-efficacy; the vast majority of these were from the older age group (74.1%). Age was also associated strongly with limiting beliefs.

Indeed, the (Table 5-14) results concur with the findings that Self-esteem, Attitude & Beliefs can affect the families' engagement with the treatment and their adherence to it. Of the parents who expressed difficulty in putting into daily practice behavioural change, such as healthy eating, physical activity and doing activities with families, the majority had children with high psychosocial, attitudinal and self-belief barriers.

Table 5-14: Families report on the difficulties to adhere to behavioural lifestyle change

Behavioural change	Total N (%)	Perceived barriers scores			
		Child mean±sd			Parents mean±sd
		Psychosocial	Attitude	Believe	Belies
Difficult to keep eating healthily	N=160				
Agree	65 (40.6)	1.33±0.64	1.29±0.61	1.21±0.41	1.18±0.35
Disagree	95 (59.4)	1.07±0.21	1.02±0.13	1.06±0.21	1.05±0.16
P-value		0.001	<0.001	0.005	0.004
Difficult to keep doing physical activity	N=161				
Agree	68 (42.2)	1.32±0.62	1.29±0.61	1.21±0.41	1.17±0.37
Disagree	93 (57.8)	1.06±0.22	1.01±0.08	1.05±0.20	1.05±0.15
P-value		0.001	<0.001	0.003	0.007
Difficulty in setting goals, planning	N=156				
Agree	73 (46.8)	1.32±0.61	1.28±0.58	1.20±0.43	1.17±0.34
Disagree	83 (53.2)	1.06±0.26	1.01±0.07	1.05±0.21	1.06±0.16
P-value		0.001	<0.001	0.004	0.130
Difficult to keep my child motivated	N=166				
Agree	82 (49.4)	1.26±0.56	1.23±0.56	1.17±0.38	1.14±0.31
Disagree	84 (50.6)	1.10±0.30	1.03±0.14	1.06±0.21	1.07±0.19
P-value		0.027	0.003	0.032	0.095
Difficult to keep myself motivated	N=160				
Agree	55 (34.4)	1.18±0.44	1.13±0.37	1.12±0.28	1.12±0.23
Disagree	105 (65.6)	1.16±0.42	1.10±0.36	1.09±0.24	1.07±0.18
P-value		0.810	0.565	0.568	0.140
Difficult to keep the diary	N=156				
Agree	90 (57.7)	1.25±0.51	1.16±0.45	1.14±0.34	1.14±0.3
Disagree	66 (42.3)	1.06±0.28	1.03±0.14	1.05±0.21	1.05±0.15
P-value		0.120	0.040	0.065	0.037

5.8.5 *Factors predicting family drop-out*

Table 5-15: Child baseline characteristics and parent perceptions of programme determinants of dropping out

Baseline characteristics		Predictors of attrition at week 12			
		Unadjusted odds ratios *(95% CI)*	p-value for trend	Adjusted odds ratios *(95% CI)*	p-value for trend
	Categories, n (%)				
Year	2010,n=59	1		1	
	2011,n=83	1.99 (0.91 - 4.35)	0.008	0.51 (0.12 - 2.15)	0.364
	2012,n=100	5.19 (2.45 - 10.96)	0.001	1.34 (0.34 - 5.26)	0.666
	2013,n=33	10.44 (3.86 - 28.23)	0.001	2.73 (0.58 - 14.42)	0.236
	Categories				
Age	Young 5-10,n=158	1		**1**	0.120
	Old 11-15,n=115	0.46 (0.28 - 0.76)	0.003	0.50(0.20-1.19)	
	Categories,				
BMI z score	Overweigh/Obese,n=121	1		1	0.231
	Sever obese,n=151	1.03 (0.61 - 1.76)	0.888	1.76 (0.69 - 4.47)	
	Categories				
Gender	Female,n=158	1	0.627	1	0.837
	Male,n=115	0.88 (0.54 - 1.43)		1.10 (0.44 - 2.75)	
	Socioeconomic,				
SIMD	Most deprived,n=107	1		1	
	Deprived/Middle,n=80	1.28 (0.71 - 2.29)	0.407	1.25 (0.44 - 3.54)	0.673
	Most affluent/affluent,n=85	1.32 (0.74 - 2.35)	0.300	2.78 (0.89 - 8.65)	0.076
Satisfaction with	**Programme 1st contact**				
	Total score,n=268	5.23 (3.14 - 8.71)	<0.001	2.28 (0.93 - 5.57)	0.069
	Programme Coaches KAS				
	Total score,n=264	13.57 (6.87 - 26.80)	<0.001	1.91 (0.62 - 5.81)	0.253
	Programme structure				
	Total score,n=269	9.84 (4.00 - 24.19)	<0.001	10.70 (1.61 - 70.97)	0.014
Lifestyle change	**Child**				
	Total score,n=263	1.91 (1.34 - 2.73)	<0.001	1.87 (0.77- 4.54)	0.164
	Family				
	Total score,n=26	1.19 (0.88 - 1.62)	<0.001	0.46 (0.20 - 1.07)	0.073
Perceived barriers	**Child Self-efficacy**				
	Total score,n=253	0.09 (0.03 - 0.23)	<0.001	0.15 (0.18 - 1.37)	0.094
	Child Attitude				
	Total score,n=252	0.05 (0.00 - 0.15)	<0.001	0.24 (0.00 - 8.10)	0.432
	Child belief				
	Total score,n=252	0.03 (0.01 - 0.23)	<0.001	0.14 (0.00 - 2.72)	0.196
	Parents' belief				
	Total score,n=255	0.11 (0.03 - 0.33)	<0.001	1.73 (0.14 - 21.24)	0.665
	Programmatic barriers				
	Total scoren=252	0.15 (0.05 - 0.42)	<0.001	0.15 (0.01 - 1.67)	0.125

Table 5-16: Regression model on factors determinants of drop-out

Baseline characteristics	Predictors of attrition			
	Unadjusted odds ratios *(95% Confidence interval)*	**p-value for trend**	**Adjusted odds ratios** *(95% Confidence interval)*	**p-value for trend**
Study year				
Year 2010,n=59	1		1	
Year 2011,n=83	1.99 (0.91 - 4.35)	0.083	1.853(0.72 - 4.76)	0.201
Year 2012,n=100	5.19 (2.45 - 10.96)	0.001	3.58 (1.48 - 8.67)	0.005
Year 2013,n=33	10.44 (3.86 - 28.23)	0.001	6.64 (2.16 - 20.37)	0.001
Self efficacy,n=253	0.09 (0.03 - 0.23)	<0.001	0.08 (0.03 - 0.26)	0.001
Programmatic,n=252	0.15 (0.05 - 0.42)	<0.001	0.21 (0.06 - 0.66)	0.008

Adjusted for Study year, Age, Programme 1st contact, Programme coaches, Programme structure, Child, Family, Child self-efficacy, Child Attitude, child believes, Parents' believes and programmatic barriers)

When considered independently, programme year, age, programme satisfaction, lifestyle change and perceived barriers were statistically significant predictors of drop-out (see Table 5-15). The number of weeks were participants attended the programme for increases with the increasing year-on-year maturity of the programme. Older children have less odds of staying long into the programme compared to younger children. However, when all these variables were adjusted for simultaneously in a multiple logistic regression model, only the programme structure came out as a statistically significant predictor of drop-out. (Table 5-16) gives the final selection of the best subset predictors of attrition. The determination of the variables included in the model was based on the selection of all variables whose p-value is 0.3 or less. The table indicates that retention increased as the programme matured in time, after adjusting for the effects of child self-efficacy and programme barriers. Also, after adjusting for the effects of the programme period and perceived programme barriers, the odds of perceived child efficacy barriers occurring were 11.24 times higher among the non-completers relative to completers. Perception of programmatic barriers was also significantly higher amongst non-completers compared to completers. The odds were about 4.76 times higher for non-completers after adjusting for the effects of the programme period and perceived child efficacy barrier.

5.9 Discussion

This discussion focuses on the key findings of the exit study within the context of the conceptual model EST (Skelton*et al.* 2011). It also examines these findings within the context of the literature review on attrition. A more holistic discussion of all the major findings across the three stages of the research occurs in chapter 6. In this study attrition was defined as those families who attended ≤ 7 weeks (non-completer) and those who attended ≥ 8weeks (completer) out of the 12 week programme. These categories were derived according to the total weeks attended distribution data (mean, median and mode) (refer to Table 5-3).

5.9.1 *Exit Study Key Findings*

In this study satisfaction levels increased and attrition increased over time but decreased with increasing age. While a majority of participants found the programme helpful, more of those who found the programme unhelpful were in the older age range. They were also least likely to be satisfied with the programme and most likely to be non-completers and older youths were least satisfied, especially with 1st contact, coaches' KAS and the programme structure.. . Given that there was a decrease in the number of older children entering the programme as younger children were targeted to join the programme after the year 2011, there was the possibility that the overall increase insatisfaction and retention over time was confounded by decreasing age of participants. However, the adjusted logistic model found that variables predicting attrition were the year of the programme, child self-efficacy and programmatic logistic factors, with age not independently predictive. That is, age did not confound the observed relationship between year of programme and attrition. Otherwise satisfaction levels were high among both parents and children, although the latter were significantly less satisfied overall than parents. The trend for satisfaction levels for each aspect measured was upward over time for both parent and child.

Perceived barriers were significantly higher for the non-completers compared to the completers, with age being positively associated with increased perceived barriers. The greatest barriers to be significantly negatively associated with completion were found to be child psychosocial status and limiting beliefs, respectively, particularly low child self-efficacy. Parental barriers which were linked to attrition were associated with negative

beliefs about the programme logistical factors i.e.: materials; venue; schedule, session duration; and, location. These parental barriers relating to perceptions of programmatic logistical factors reduced over time year on year. Additionally, both parents and child also indicated significant association between unmet expectations and continued attendance. However, the longer the programme ran, the fewer barriers reported by both parent and child, and the higher the levels of satisfaction with both parent and child.

Child baseline characteristics showed significant difference between younger and older children in terms of both psychosocial and belief barriers but not attitudes. Child age was not found to be linked to parental beliefs about perceived programme barriers. Although parental beliefs were associated with attrition, the pattern of parental beliefs by mean score year by year was decreasing.

In this study no differences were found between those who responded to the questionnaires and those who did not in terms of their baseline characteristics. Nevertheless, due to the homogenising of the data in each cohort by programme year, results showed that retrospectively those families that participated in the programme perceived more barriers resulting in drop-out than those families who participated in the programme prospectively.

The family baseline characteristics among the two above across time highlighted that there was a significant difference between the total study population in terms of child age and total weeks attended, respectively. Children were older in earlier years of the programme and attendance mean was lower in the earlier years of the study. Recruitment strategies over time changed such that the children recruited became younger. Therefore, age was a confounding factor in the analyses of data in this study.

It must be acknowledged that respondents to the exit study might not be representative of all those who took part in ACES (selection bias) and that, separately, answers from respondents may not be valid (information bias). With respect to selection biases, responders and non-responders were compared in Table 5-2. There were no significant differences in the proportions of males and females, age, height, weight, or socio-economic circumstances in those who did and did not respond to either the retrospective or prospective arms of the exit questionnaire. Other, unmeasured, selection biases might exist, however. Thus, in this exit follow up study, one of the steps taken to minimise selection

bias was that all families who joined ACES from 2010 up to 2013 were sought; the questionnaire was posted to all families who joined ACES in that period. Thus, efforts were made to obtain responses from the entire population no targeting or selection was made. The consideration for obtaining responses from the whole population was to minimise the possibility of selection bias. In the meantime, in order to collect the most possible number of questionnaires in this study section 5.4.5.1 was describing the efforts were made to get as many families feedback to reply as possible.

Generally, in this kind of study the possibility of differences in the characteristics of those who responded and those who did not may increase even when sampled from the entire study population. This leads to what been described as response bias (Young et al.,2006; Haring et al.,2009). Thus, there may be differences in the responses by families that dropped out and the families that remained active in the programme. However, in this study Table 5-2 indicates that there were no significant associations in baseline characteristics between responders and non-responders respectively for either the retrospective or prospective study population

The exit questionnaire used three methods of data collection: post, phone call and at venues. After questionnaires were sent by post non responding participants were chased-up by phone calls to ask if they wanted to send back the questionnaire by post or complete it by phone. Table (5-1A & 5-1b) have shown that the non-completers' response rates were higher than that of the completers in postal and telephone methods. While the majority of the completers responded more at the venue.

The other bias that might affect the validity of the results of the exit questionnaire was information, or measurement, bias. McCambridge, Witton and Elbourne (2014) have emphasised the biased reporting bias effect, which suggests that the responses by participants may be biased due to their perception of being observed during the study, a form of responder bias. Podsakoff, MacKenzie, and Podsakoff (2012) have highlighted the presence of bias in social research, which gives rise to the possibility that the reporting provided by the participants may not be accurate, and they may have provided those reports recklessly due to certain factors such as their biasedness towards the programme, their responsiveness to the method of how data was collected, and their knowledge base.

These different data collection methods introduce the possibility of differential information bias in the way individuals respond. The responses of dropped families may be either relatively more accurate, since the were not interviewed as part of an ACES session , or less accurate, due to the reason they left. On the other hand, the responses of families that remained in the programme may be biased due to their perception of being observed. However, steps were taken to minimise responder bias; in the venues, coaches asked families who had not done so to fill out the questionnaire in a private room after the twelfth (and final) session. On the phone, the researcher emphasised that she was independent of ACES and was trying to understand why families dropped-out; she also made clear to all participants the confidential nature of the questionnaire and that the coaches delivering the programme would not receive any details. Furthermore, in structuring the exit questionnaire there were both closed questions (using a Likert scale) and one open-ended question that asked families why they left and how ACES could be improved. The open question allowed respondents to respond as fully as possible.

In this study, there was no association between the method of questionnaire delivery and the parental reports on the level of satisfaction with the programme in the non-completer's group, but there was among the completer group see (Table 5-5a). However parental reports about their child perceived satisfaction, questionnaire methods were significantly associated with level of satisfaction for both the non-completer and completer groups (Table 5-5a).

5.9.2 *Contextualising Key Findings according to the EST Theory*

Throughout the study EST (Birch & Davidson, 2001) has been used to contextualise findings (Skelton *et al.*, 2011). The literature review identified factors which impact on attrition rates of treatment programmes. The findings for the exit study explore statistically how varying factors have affected both attendance and attrition. These factors within the EST model are as follows.

5.9.2.1 The self: child characteristics

This study focused on the following factors related to attrition: child age and child psychosocial status, specifically self-efficacy.

The results indicated that there were no significant differences between the baseline characteristics of respondents and non-respondents for the total sample, irrespective of study type. In total the mean age of children who participated in this study is 10.85±2.70, BMI z score mean 2.86±0.663 and the mean of total weeks attended is 5.62±3.95. However, children recruited to the programme year on year became younger.

The exit study did not concur with the findings of the routine data analysis and that of other researchers that age was significantly related to drop-out (Zeller *et al*., 2004; Van den Akker *et al.*, 2007, Pott *et al*., 2009;Braet *et al.*, 2010; de Niet *et al*., 2011; Walker *et al*., 2011). This was most likely a consequence of the homogenises of the data representative in each cohort by programme year, as with time the recruitment of older children declined in preference to younger children. However, the study did find that child age was associated with programme barriers leading to attrition. Indeed, in the exit study age was found to significantly affect other factors, such as child psychosocial disposition and beliefs. This study found that the most critical age for drop-out was the transitionary period into adolescence of 11-12 years (see Table 5-4).

Although six other studies did not find age to be associated, the issue that makes comparison of results challenging is that all used differing age ranges. Barlow & Ohlemeyer (2006) ranged from 1-16 years; Jelalian *et al*. (2008) and (Vignolo *et al*. (2008) ranged from 6-12 years, and Savoye *et al.* (2011) ranged from 8-16 years. However, there were other differences in addition to age range that complicate matters further. For example, studies by Cote *et al*. (2004) and de Niet *et al*. (2011) had significant differences in structure to the ACES programme. For instance, Cote *et al.* (2004) was an individual US-based study of only 120 5-17 year olds as opposed to this multi-disciplinary study with a wider population sample of 257; whilst the de Niet *et al.* (2011) study, although a group setting, was of 1 year duration (n=248). In the latter case, study duration may have influenced results. Indeed, the findings in each cohort by programme year showed that comparison could not occur due to differing age ranges being applied. This argument can be applied to these studies as each utilised a different age range.

Overall, children found the ACES sessions helpful. However, older children in the exit study were more likely to believe that attending sessions would be unhelpful. This same older age group indicated that they did not believe the programme would help them to lose

weight, get healthier or get fitter (see Table 5-13). This relates to low self-efficacy (see Table 5-13) and includes the ability to sustain effort in the face of failure (Bandura, 1991; 1994). This low self-efficacy, combined with limiting beliefs, impacts on motivation (Bandura, 1997). As Rhee *et al*. (2005) reported, low motivation indicates poor readiness-to-make-change, resulting in higher attrition. The teenagers here may have already identified with failure prior to commencement, and subsequently have low motivation to change, and so subsequently drop-out (Davison *et al.*, 2008; Libbey *et al*., 2008). This means that motivational talks during the programme, whilst of benefit to all, may be particularly essential to older children.

Further, older children tended to report that their expectations and interest were not engaged, which can also indicate lack of intrinsic motivation (Bandura, 1994; Zimmerman, 2000). As parent (P.84) indicated:

> He was not very comfortable, bored all the time in the sessions. I would recommend same age small groups and fun activities

Successful engagement is more likely if the child themselves perceives an instrumental benefit rather than if recruitment is imposed by parents or other external forces (Zimmermann, 2000). Their responses regarding individual sessions reported that talking sessions were most unhelpful; unfortunately the first contact session for the programme was designed primarily as a talking session. This may be a consideration influencing the high drop-out after the first session, reported in the routine data analysis study (see Chapter 3), which saw a peak in programme attrition. It may also be linked to the Bandura curve on self-efficacy which denotes the crucial early dip point in the learning curve when an individual realises they have much to learn/change or when confronted with early failure, and when they must make a critical decision whether to continue or give up the pursuit (Bandura 1997).

In fact there was some indication that programme design needs to consider and differentiate by age. For instance, the cognitive-behavioural sessions most liked by teenagers, were the least liked by the younger group. For instance parent (P. 75) reports:

> Information given in the sessions was not suitable for his age as he was the youngest in his group. He was too young to understand the issues and answer questions. Talking session too long

The younger children preferred the activity sessions the most. For instance parent (P. 103) of a younger child requested "More physical exercise"; while parent (P. 45) of a younger child complained:

> They were talking most of the times and it was really boring for the child, he was expecting some fun and activities

This dislike of PA with age mirrors findings by Antshell & Anderson, (1998), and this is compounded by older children being found to have a more sedentary lifestyle (Gordon-Larsen & McMurray, 2000).

Further, in their review Gesell *et al*. (2008) highlight the role of peer pressure and peer response, especially to PA activities. There is a need to avoid embarrassment, teasing and bullying in groups. This is supported by other studies by Zeller *et al*. (2004), Murtagh *et al.* (2006), and Zeller *et al.* (2008). Frequently in this study comments related to this embarrassment were linked to being in a mixed-age group. In this study, a fifth of the total sample reported that being in a mixed-age group was a perceived programme barrier, with four-fifths of these being older participants. For instance, parent (P. 94) reported:

> He was not feeling comfortable in the sessions, he did not like his group mates, they were all quite younger than him and he did not find anything interesting in the program.

Also, parent (P. 25) noted:

> She was the oldest in her group and most of the other kids were younger in her group so felt embarrassed. It would be great to arrange groups for same age.

This conforms with findings from Chapter 4 that older age obese children had lower socialising skills, and subsequently possible higher social anxiety than younger obese children., and that obese UK children have lower socialising skills (Croker *et al.*, 2005; Griffiths *et al.,* 2005;) than UK norms (Meltzer, 2000). Thus, it may be even more problematic to begin with group sessions if older children are recruited, and indeed may require scaffolding development of such skills within the programme to avoid attrition. Clearly, paying attention to the child's desire for age-appropriate grouping would aid in reducing barriers.

Additionally, the fact that psychosocial dysfunction and limiting beliefs were significantly associated with older children and barriers leading to drop-out, suggests the need for greater psychological intervention delivered by skilled professionals in order to minimise non-completion, especially if older children are recruited. It should be noted that as the programme progressed it became more and more successful in reaching its target population. This meant that each cohort got younger. As the child got younger, the trend improved upwards for perceptions of programme helpfulness and satisfaction levels, whilst the trend for perceived barriers decreased. However, this has implications for older children in that it may be a new programme needs to be set up to target their specific needs, wants, expectations and that addresses their distinct psychosocial profile.

The exit study, however, did not agree with the routine data analysis in terms of finding that socioeconomic status (by SIMD) also was associated with drop-out. This was because the majority of the samples in the routine data analysis study were from the most deprived areas whereas in the current study, as in the entry study. Also, in the exit study the distribution by SIMD showed that there were no differences (see Table 5-3).

However, as is evident in Table 5-1 the exit study findings may have been influenced by family response rates which skewed results, so that the results were not representative of the overall total sample that was used in the routine data analysis study. In particular, the retrospective study, which had originally included a sample biased towards those from the most deprived areas, showed a high response rate from the more affluent participants and lower response rates from most deprived participants. The prospective sample used in the entry study was almost equally distributed between SIMD categories.

This study concurs with earlier findings from the routine data analysis study and that of other researchers (Tereshakovec & Kuppler, 2003; Cote *et al*, 2004; Zeller *et al*, 2004; Barlow and Ohlemeyer, 2006; Jelalian *et al* , 2008; Braet *et al*, 2010; Williams *et al*, 2010; de Niet *et al*, 2011) that SES is not related to programme non-completion. However, it must also be remembered that in the literature review findings with SES were also problematic due to varying definitions (see Table 1-2) with only ethnicity being consistently reported, and the latter was not relevant in the current study due to the sample characteristics.

This study concurred with routine data analysis findings and that of other researchers that child BMI was not a significant predictor of attrition (Tereshakovec & Kuppler, 2003; Cote *et al*, 2004; Zeller *et al*, 2004; Jelalian *et al* , 2008; Braet *et al*, 2010; Williams *et al*, 2010; Walker *et al*, 2011). The finding in this study may have also been influenced by the fact that all participants in this exit study are overweight/obese/severely obese.

5.9.2.2 Parent characteristics

From the literature review, previous studies focused on parental characteristics based on anthropometric data, demographics and psychological factors, such as parental motivation. However, in this exit study other factors were considered, including programme satisfaction and perceived barriers according to parental beliefs.

Reasons for drop-out in the routine data analysis stemmed from unmet parental expectations which impacted negatively on motivation (see section 3.7.4.3). Indeed the latter also was echoed in the findings of two other studies (Barlow & Ohlemeyer, 2006; Kitsch *et al*., 2009), and in the findings of the current exit study. Parental feedback on barriers impacting attrition focused primarily on logistical external factors such as venue, transportation, scheduling and did not report on intrinsic motivational or psychosocial factors. Parent (P. 24) indicated some of the common complaints:

> The timing of the sessions was the main issue that put us off from attending more sessions. Sessions were starting at 5 and it was hard to take her there straight after work, especially as the venue was far from home and traffic at that time was always awful

These logistical factors were reported in other studies also as barriers (Cote *et al.*, 2004; Barlow & Ohelmeyer, 2006; Kitscha *et al*., 2009; Hampl *et al.*, 2011). Parent satisfaction levels increased with time as the programme adapted to better meet their needs and as recruitment criteria became more focused.

5.9.2.3 The community: programme characteristics

Although satisfaction with the programme overall was high (of those who reported it as helpful), children were more likely to report it as unhelpful. Several factors were identified previously in the routine data analysis study programmatic reasons as impacting programme drop-out. These included stage of drop out; age; the programme structure, and particularly intensity and duration of session visits; recruitment area and season; and, venue. In this study, the key factors were found to be satisfaction with 1st contact with

programme, coaches' KAS, the programme structure, the level of confidence in KAS learning, and programme logistical factors.

Overall parents were satisfied with 1st contact, coaches' KAS, and programme structure. However, 57.2% of the total samples were non-completers. Of these 14.8% stated they were unhappy with coaches' ability to discuss weight issues. Another common perception, 13.3% were dissatisfied with the coaches' provision of opportunity to ask questions; 19.2% also reported negatively on coaches effectively answering their questions. Among those factors related to the programme structure, the greatest dissatisfaction was regarding the scheduled timings and venues. These findings awere supported by identified perceived parental barriers (See Table 5-11).

5.10 Conclusion

In this study, the impact of age was critical to child perceived psychosocial profile and beliefs seemed to impact negatively both on motivation and perceived barriers, which ultimately impacted on drop-out. In this study, like in the routine data analysis study, there was found also to be a strong association with perceived psychosocial difficulties. For both child and parents, programme expectations need to be addressed so that participants have a realistic perspective and can understand the significance of realistic goal-setting. Clearly these are sensitive topics for coaches to address as many participants also indicated that they dislike being labelled fat, and possibly disliked being confronted with unpleasant realities. Such an environment shows the level of diplomacy and skill required from a coach. These psychosocial factors will also logically have behavioural consequences and impact on group dynamics, programme engagement as well as ultimately attrition. Moreover the needs of this older age group are not necessarily the same as for the younger group where perhaps preventative strategies on emotional well-being may be more appropriate. Although younger children most wanted practical and physical activities, both age groups disliked the 'talking' sessions the most. The suggestion is that CBT sessions when they do occur need to be professional therapy or group therapy sessions rather than information-based lectures. It may also be appropriate to establish a separate programme to cater specifically to the needs, wants and expectations of older children with age appropriate materials and groupings. Programmatic factors related primarily to venue and scheduling issues, which are costly and personnel intensive, prohibit an individualized approach being taken. However, carrying-out a needs analysis of participants before finalizing the programme structure and schedule may support improved attendance.

Chapter 6. Discussion

6.1 Introduction

In this chapter, the key findings of this research are compared to those in the current literature in the field. The strengths and weakness of the current study are then discussed. Finally, the implications of these findings for clinical practice and future research are discussed with a series of recommendations provided.

6.2 Key Findings

In general, ACES family attendance continued to fall in subsequent sessions, with major drop-out rates in the first two sessions, The number of families dropping out declined year on year. The following have been found in this study to be linked to attrition in the child: higher age (Chapter 3); worse psychosocial status as measured by SDQ (Chapter 4); and, child self-efficacy as a perceived barrier (Chapter 5). In terms of the parent, no measured factor in this research has been associated with attrition. Finally, with the programme, attrition significantly reduced over time (Chapters 3, 4 and 5) and varied by location, being lowest in Renfrewshire & Dunbartonshire (Chapter 3). Logistical factors such as timing, duration and transportation, if seen as barriers, were also associated with attrition (Chapter 5).

Several novel findings were identified from each study. For example, from the routine data analysis study (Chapter 3), the longer the programme ran, the more retention improved. It is clear that the continuation of the programme allowed for improvement in attrition due to the responsiveness to feedback from parents and children that stemmed from the informal feedback gathered by coaches. Examples of changes that were made were the cutting of programme from 24 weeks to 12 weeks duration and the development of an introductory DVD. Equally, based on parental feedback and treatment success, recruitment criteria adapted with time to ensure that participants were recruited at a younger age. Indeed, with time, as the programme improved based on evaluation, parental satisfaction rose, and retention rose.

Another new finding is the importance of child psychosocial factors in terms both of behaviour linked to attrition (Chapter 4) and as a barrier to programme completion

(Chapter 5). Children in this study scored below UK norms for socialising skills, and above UK norms for emotional and psychological difficulties (Meltzer *et al.,* (2002). For the obese child population in the UK only a few studies have examined this relationship. For instance, The Millennium Study found an association between psychosocial status and obesity in the UK (Griffeths *et al.,* 2011), but no SDQ scores were provided. However, Crocker *et al.* (2012) also found that the initial SDQ score of the 72 obese children in their UK study was above the UK norms: SDQ total mean score was 13.2 sd 6.7 at baseline. This study had a participant average of SDQ total mean score of 17.2 sd 5.4. This may reflect the fact that more children in this sample were in the severely obese group rather than overweight or obese. No other UK-based study into child weight treatment has utilised the SDQ for child psychosocial status in terms of attrition. However, it must be remembered that each population has its own unique characteristics, since studies by Drukker *et al.*(2009) and de Niet *et al*. (2011) used the SDQ to measure obese children in the Netherlands, and found only a weak association between weight status and psychosocial status. Ultimately, the findings in this study still do not allow for a definitive outcome regarding factors impacting on programme attrition.

Even so, these findings can draw attention to what baseline characteristics of obese children and their parents can be. This may help in developing better prevention and intervention programmes that more effectively address participant needs.

6.3 How Key Findings Compare to Current Literature

Child age has also been found to be linked to attrition in a small majority of studies (Zeller *et al.*, 2004; Van den Akker, 2007; Pott *et al.,* 2009; Braet *et al.,* 2010; de Niet *et al.*, 2011; Walker *et al*., 2011). In keeping with all of these studies, this research also found that adolescents were most at risk of dropping-out in the first study evaluation the ' Routine Study'. Older children in this study cited more barriers to attendance than younger children. These barriers predominantly revolved around limiting beliefs about programme helpfulness; and programme relevance to outcome success; their own low self-efficacy which in turn was linked to low effort and resultant low child motivation (Bandura, 1994; 1997). This low expectation of success and poor self-efficacy were also found to be barriers in three other studies (Zeller *et al.,* 2004; Braet *et al.,* 2010; de Niet *et al.,* 2011). In all cases the low expectation of programme success was not perceived to be connected to the child's beliefs, attitudes or behaviours but was attributed instead by participants to a

mismatch between programme design and participant expectations. It should be noted, that this study along with Braet *et al. (*2010) and de Niet *et al.* (2011) only received parental feedback, so it is unclear exactly whose expectations have most been missed - the parents, the child or both.

Socio-economic status was not found in this study to be associated with attrition. Other studies have consistently found SES to predict attrition (Tershakovec & Kuppler, 2003; Zeller *et al*., 2004; Jelalian *et al.*, 2008; Heinberg *et al.*, 2009; Williams *et al.,* 2010). This may reflect the great effort by the programme to recruit and locate programme in the most deprived areas, but also each of these studies used different measurements for socio-economic status, thus making comparisons difficult and definitive outcomes unclear.

Child psychosocial status was consistently predicted with attrition in other studies by Zeller *et al*. (2004); Gray *et al.* (2008); Braet *et al.* (2010) and de Niet *et al.* (2011). However, these findings are inconclusive as differing measurements were used in each study.

Other studies have found that short intensive programmes have lowest attrition (Van den Akker, 2007; Jelalian *et al*., 2008) so the reduction in length from a 24-week to 12-week programme, may have contributed to the improved retention.

6.4 Strengths & Limitations

This research has several strengths and limitations. One of its strengths is that this research is the first in the UK to explore attrition in a large community-based treatment child obesity programme provided by NHS services targeted primarily at severely obese children.

The study thus had the privileged opportunity to examine a large sample in a real world programme that was currently running. All participants had the chance to participate, with broad ranging selection criteria.

The use of multiple instruments in this study allowed it to explore a wide range of variables based on standardized validated tools used in the current literature, some of them

used for the first time in an attrition study, though well established in child weight issue studies.

The evaluation approach taken in this research allowed the researcher to explore treatment process variables that impacted attrition through the time that the programme was active; also, high response rates occurred from families from both the entry the exit study.

The routine study chapter used retrospective data which can be a valuable tool in evaluating efficacy and successful outcomes (Padkin *et al*., 2001). Moreover, in this study data was collected from children as well as parents; this allowed both perspectives to be examined in exploring factors that predict attrition. Another limitation was that some of the tools used in the routinely data were internally developed within the ACES programme and had not been tested for reliability or validity e.g. readiness-to-change questionnaire; family eating, PA & sedentary behavioural questionnaire.

In the Entry study one of its main strengths was that it was a prospective study; the majority of those families who joined the programme during this study were followed up and the researcher managed to obtain a full attendance records for all children. Moreover, these families were able to participate in the exit study, even if they dropped-out or completed the treatment programme. In general, one of the strenght of prospective studies is that they are less prone to error due to confounding and bias compared to retrospective studies, however, this study had no normal control group to compare and contrast findings.

Strength of the Entry study was that a number of validated instruments for measuring risk factors for obesity in published child weight status studies were used. These have not been used in attrition studies before. According to the literature, these validated instruments measure appropriately the factors that they were created to gauge. This study found it hard to conclude if they actually predict attrition rates, or even give a valid score for attrition predictor factors. As some of these instruments have not been used in attrition studies until now, further research may need to be done into their validity. One advantage was that combining more than one standard instrument with a short bespoke questionnaire saved time as developing and validating a long list of new items was not necessary. Although a significant number of families gave their consent to participate in the Entry study, there are still some limitations that should be acknowledged given the nature of the study and its participants. The sample used in this study consisted of those families who had joined and met the pre-existing programme criteria. The characteristics of the children and their

parents in this study may be attributed to the specific characteristics of the ACES participants only during the time of this research (Shadish, 1995). Data was collected from more than 70% of the target population and covering a large age range and SES with different characteristics which is representative of the population of interest, making selection bias less likely. The Exit study had it own strengths and limitations too. The outcome included wide-ranging opinions of those who dropped out of the programme during different stages. Moreover, the Exit evaluation study collected parental perceived barriers where parents reported their opinion and their views and their children's opinions were obtained, too. Sampling a relatively large population with a variation of age group, in such as type of attrition study, gives more power.

The prospective group was much more likely to fill in the Exit questionnaire themselves as the number completed was more than those who dropped out and family's attendance was followed by the researcher. In contrast, the retrospective group covered more of those who dropped out and they filled-in the questionnaire by phone or post.

The data collected within the Entry and Exit studies were all based on self-reporting, which is open to people-pleasing behaviour and self-censorship, resulting in distorted under or exaggerated reporting and bias (Donaldson, 2002). The self-reporting was only focused on parents, and did not extend to wider family members such as siblings, grandparents, aunts and uncles as the EST model implies; nor did it include feedback from the wider community starting with programme coaches, and other relevant professionals (Birch & Davidson, 2001). Finally, this study did not obtain input from the child him/herself (Williams et al., 2010). Whilst parental perspectives are key, given variations in both development and age, it must be acknowledged that what parents consider as important may not be echoed in their children, and vice versa. The decision-making process is influenced by both parent and child, with the child becoming more dominant with age (Cote et al., 2004).

The decision to obtain feedback from the parent alone was to avoid the accompanying methodological issue of self-reporting from those under 12 years of age, as the latter is the stage of cognitive development that should allow meaningful and reliable feedback from questionnaires and surveys (Shaw et al., 2011). Although Shaw et al. (2008) argue that this can be considered in children over eight years of age. It must be remembered that this study was based on parental perceptions and reporting of child thoughts, feelings and

behaviours related to attrition. Triangulation of results between child, parent and community may provide stronger, more reliable and valid data in future services evaluation research (Denzin, 1989; Stake, 1995; Patton, 2002).

6.5 Implication of the Findings

The significance of age highlights the necessity of designing programmes that cater to the differing interests of varying age groups, and which also separates these groups by age. For instance, younger children in this study reported a preference for more practical and physical activity sessions than behavioural or educational sessions compared to adolescents. This concurs with the findings of the European perspective review by Flodmark *et al.* (2004). Parent (P. 20) alluded to this:

> Groups according to age please. Sessions with more physical activity for youngsters would be great.

Some parental feedback from (P.11) regarding the reason for her older children's reluctance to participate in physical activity sessions supported the findings of Antshel & Anderson (1998), and the finding in the Entry study that older children (aged 13-18 years) were most likely to be inactive (see Table 3.9):

> He did not like doing physical activities and exercises. These activities were hard for him and he was not motivated to go back to these sessions.

Again when considered along with the psychosocial issues, such lack of age differentiation can serve to heighten embarrassment, anxiety and shame in older children, and so result in lack of engagement, and ultimately attrition (Lissau 1994; Flodmark & Lissau 2002). Also as Forhan & Salas, (2013) identified and is reflected in (P. 12)'s comment, older youths tend to be more sensitive to being labelled, and this can promote an emotional response leading to attrition. As parent (P.12) acknowledged:

> A child does not want to get labelled as overweight. She was put in a group with other young children that is why she did not feel comfortable; it is highly recommend to put the same age kids in the same group.

This was echoed again by (P. 88):

> My child felt other kids were too young in his group. My child did not feel comfortable with them and recommended the same age group.

And again by (P.11):

> My child was feeling embarrassed as he was the oldest in the group and other kids were younger so he did not want to go back, it would be great if ACES can start sessions for older teens only.

As found in Chapter 5 of this thesis, acknowledging the impact of age will aid targeting participant motivation; and in so doing reduce barriers and aid attrition (Barlow & Ohlemeyer, 2006; Kitsch *et al*., 2009).

The relationship between age and mismatch in expectations suggests that parent and child needs and feedback must be taken into consideration in the planning and designing of the programme in order to minimise attrition (Barlow & Ohemeyer, 2006). However, this was not only age related. For instance, parent (P.8) addressed the special requirements of her child that were not addressed and resulted in attrition:

> …a child requires special needs and he could not mix with other older children, the first one hour was only talking and it was too long for him and same for the parents of younger kids

Moreover, Germann *et al*. (2006) found in their study that an orientation session would help clarify roles and responsibilities for all participating parties. This study agrees with (Barlow & Ohlemeyer, 2006) that such clarity leads to more realistic overall programme goals and expectations. Indeed, mutually agreed goals between parent-child and programme have also been found to be effective (Barlow, 2007) in helping to align these goals and expectations as well as sustaining motivation. This might help to avoid such feedback as P. resulting in attrition:

> I am very disappointed in the programme, not what I thought it would be. Feel I have a lot of knowledge but needed help with how to get my son to try, needed new ideas of what to do next when he tastes the food but doesn't like them, very generic sessions.

Specifically, orientation sessions may also help to address the steep attrition rates in the first two programme sessions reported in this study and similarly by Tershokovec & Kuppler (2003), and Barlow & Ohlemeyer (2006). Such aligned realistic expectations would then support both programme engagement and retention (Skelton & Beech, 2011). Indeed, this is a programme design aspiration which many other researchers have also commended (Cote *et al*., 2004; Barlow & Ohlemeyer, 2006; Kitscha *et al*., 2009; Skelton & Beech, 2011). Such an approach may also help to identify those who have low motivation and self-efficacy before programme commencement. The latter may either be omitted from the programme in preference of those who are ready-to-change (Rhee *et al.*, 2005) or alternatively be channelled into a pre-programme CBT module designed to boost motivation and self-efficacy.

As most of the families who recruited in this study were from the most deprived areas and most likely to be overweight. However no association was found with drop-out. It is important that the programme recruits successfully from the target population, as in this study, and those resources are not distributed to those areas or projects where the parents are most outspoken or most educated (Wells *et al.*, 2005; NHS National Services, 2007). These trends towards overweight/obesity in deprived areas may in part be due to wider socio-cultural factors reflective of Birch & Davidson's (2001) community in the EST model, such as a lack of local amenities and availability of affordable fresh produce (Dunton *et al.*, 2009), absentee parents and the consequence of self-catering latchkey children (Hawkins *et al*,. 2009a). However, it may also be supported by learned behaviour with children imitating the parental feeding model (Wills *et al*., 2004; Smith *et al*., 2010), and a more sedentary lifestyle (Gordon-Larsen & McMurray, 2000). Again with the EST model in mind, it is also likely that parents are affected by the same environmental factors impacting their children which also impact their dietary choices, levels of physical activity and sedentary lifestyle (Birch & Davidson, 2001).

Other studies have found that venue can impact on treatment programmes with a preference for a community setting (Cote *et al.*, 2004). Venue plays a part in this study as use of gyms provided alternative activities for parents whilst waiting for their child; provides encouragement for the child to participate in other physical activity; and facilitates shared family bonding (see Chapter 3). As parent (P. 138) commented, "the sports centre was brilliant. Enjoyed and benefitted a lot as a family…. "

This study found that severely obese disadvantaged children had the lowest social skills, as well as the greatest conduct issues. These behavioural issues with obese children have also been found in two other studies by Vila *et al.* (2004) with regards teenagers and Datar & Sturm (2006). These skill deficits may have implications for programme design to meet this target population's needs for effective communication and socialising skills, and in the establishing and maintaining of clear boundaries to address conduct issues. For instance, the lack of socialising skills may mean that group activities are particularly challenging for participants especially at the commencement of the programme. As parent (P.36) indicated when giving a reason for their programme attrition:

> My child was feeling embarrassed with other kids in groups. Now I'm taking him to a kids gym and he is doing more physical activities; the child has lost 3 stones recently.

Whilst, this finding may apply more so to mixed age groups, it still applies even as, over time, the programme increasingly recruited younger aged children. So until the programme can directly address these fears and support the development of child socialising skills in the programme materials and activities, it may be that programmes need to be designed in phases, starting with individual activities and moving onto group activities only when the child feels secure and confident enough to handle group interactions.

Identifying the key role of psychosocial status in the child in terms of attrition and weight status has ramifications for both programme design and for the coaches who are the face of that programme. The consequences of such child psychosocial skills deficits are that the programme personnel must have strong interpersonal skills. They need to be able to handle one-on-one communication, including demonstrating rapport-building skills (Leach, 2005; Farnesi *et al*., 2012), active listening skills (MacDonald, 2003) and being supportive (Hall *et al.,* 2009; Farnesi *et al*., 2012). At the same time, coaches need to apply effective group management skills to handle potentially challenging behaviour from these participants, who have poor socialising skills and conduct issues (Resnicow *et al*., 2006; Barlow *et al.*, 2007). Parent (P. 43) provided an insight into the issues:

> The programme itself was great but I would say it was badly managed, my child was in a group with a lot younger kids and they were not taking these sessions seriously, my child was 14 while all the other kids were less than 10 and they were laughing all the time at my daughter and fighting with each other so she could not manage to continue so she was nervous and embarrassed all the time.

Additionally, the further attrition-associated psychosocial issues identified in the Exit study (see Chapter 5) related to child limiting beliefs and low self-efficacy was found in other studies (Griffiths, 2006; *et al.,* 2009). This further reinforces the necessity for the coach to be able to motivate the child and help change beliefs (Cote *et al*., 2004; Barlow & Ohlemeyer, 2006; Kitscha *et al.,* 2009). Parent (P. 158) actually requested programme support to build child self-esteem:

> I would like to see parent/child session on eating disorders and bullying, and how kids feel about how people treat them because of their weight.

Thus, effective communication within the coach-child relationship is key, and this notion echoes that of Brown *et al.* (2001). The latter study and another by Barlow *et al*. (2007) report the need for effective, supportive coach-child communication that must be confidential and non-judgemental in nature. This is also reinforced by studies by Hall *et al*. (2009) and Farnesi *et al.* (2012). Staffing and time allocated must allow for such one-on-

one discussion, in private, and with regular feedback that allows for participant disclosure of possible drop-out, and allows for any intervention that may redress the child or parental perceived barrier (Brown *et al.*, 2001; Barlow *et al.*, 2007). Parent (P. 8) commented on this need for confidentiality and privacy:

> …all meetings were collective group meetings and we could not ask one to one questions and even child did not feel comfortable with the presence of some other annoying participants so that's why we did not find it useful

These considerations support the findings of two other studies by Resnicow *et al*. (2006) and Cox *et al.* (2011), which also emphasise that not only open and supportive communication skills are necessitated but also motivational interviewing (MI) skills are required of personnel. They argue that MI skills not only maintain motivational levels and sustain programme retention; but also support the change process itself. The importance of maintaining child motivation in obesity treatment programmes is not to be underestimated as it has been found to be associated with attrition in studies by Cote *et al*. (2004), Barlow & Ohlemeyer (2006) and Kitsch *et al.* (2009). As also been previously discussed low motivation in this study was evidenced in the low self-efficacy demonstrated, especially in the older child (see Chapter 5).

This has implications for the appropriate multi-disciplinarian skill set of coaches, as well as the necessity of adequate training (Resnicow *et al*., 2006; Cox *et al.*, 2011). From a practical perspective, the need for tracking and boosting motivation, has implications for programme design and management in that staff must be expected to make regular follow-up calls post-session (Jelalian *et al*., 2008). This is to ensure not only compliance but also to encourage programme retention, and also return of those who missed a session (Cote *et al.*, 2004). This factor becomes more critical the older the child.

In terms of programme design, this cycle of child negative thinking implies a requirement for cognitive behavioural therapy (CBT) techniques which target such distorted thinking, and appropriate accompanying materials/activities, which support such psychological interventions. This finding on the benefits of CBT concurs with the 'Ten Year Follow-Up of Behavioural Family-Based Treatment of Obese Children' report by Epstein *et al.*(1994) who established the dominant role in programme outcome success for CBT. This was reinforced by an Israeli randomised prospective study by Nemet (2005), and by another major US report by Barlow *et al*. (2007) on 'The Prevention, Assessment and Treatment of Children and Adolescent Overweight and Obesity'. This in turn has implications for

programme personnel recruitment and training. For instance, in a qualitative sampling interviewing study of parental perceptions of child obesity treatment efficacy, they also recommended behavioural change skills for dieticians (Stewart *et al.,* 2008). It may be consideration is required of such skills when recruiting coaches to at least ensure they have some knowledge and understanding of sports psychology to deal with the range of motivational and sensitive psychosocial issues that may occur from cohort to cohort. Other studies have already identified that staff may feel insecure about developing effective skills to handle psychosocial skills (Story *et al*, 2002; Perrin *et al*., 2005; Forman-Hoffman *et al.*, 2006; Hammed *et al*., 2010) as well as anthropometric measurements (Whitaker *et al*., 2004; Hearn *et al.,* 2007; Dettori *et al.,* 2009). Alternatively, the programme could recruit counselling CBT qualified coaches, who have an understanding of sport; or possibly explore hiring a CBT therapist and trainers to work alongside coaches, and provide ongoing training and support. The need for such interventions also seems to increase with age.

Further, the association between attrition and child psychosocial status suggest the need to identify, monitor and assess individual child psychosocial profiles at the start of the programme, and to cater programmes to meet these varying needs. This may manifest in the participant cohort in differing ways, for instance, parent (P. 18) who dropped-out suggested:

> The only reason we left this programme was that my child had Down's syndrome and it was very hard for the child to understand the information and answer questions about the awareness, I would suggest making different sessions for the kids with special needs.

While parent P. reported:

> My daughter only took part in the open day. There were plenty of activities but not enough staff to supervise the situation. She became over stimulated and anxious and would not take part; this was her first and last involvement with ACES

Such a differentiated approach implies the need for quite high skill levels of staff, and identifies the possible need of a mechanism for referral for professional counselling services for those who need professional support. It should be remembered that this could cover a wide range of issues with differing severity such as physical or sexual abuse in childhood, which has also been found to be linked to obesity and long-term health implications (Felitti, 1998).

As the EST model suggests, the child does not exist in isolation (Birch & Davidson, 2001). S/he is impacted by the family and wider community. So, it may be that family-based programmes may also benefit from assessing, profiling and addressing, if required, parental psychosocial status. This is especially the case if the parents themselves are overweight or obese, as this may be symptomatic of wider psychological issues, such as depression as other studies have found (Herva *et al.,* 2006; Anderson *et al*., 2007); and difficulties in particular with the mother's psychopathology (Roth *et al*., 2008) which in turn has been found to be associated with the quality of life of overweight adolescents (Janicke *et al.,* 2007). Parental psychopathological issues along with intergenerational learned behaviours may impact parental motivation for the programme, and consequently their role in changing family behaviours which may impact on their child's programme attrition (Cote *et al.,* 2004; Murtagh *et al.,* 2006; Braet *et al., 2011;* Gunnarsdottir *et al.,* 2011). P.215, for example, highlighted how parental beliefs can result in conflict over programme goals and required changes:

> ...I just felt that the child was being labelled overweight but parents feel it runs in the family, so the daughter shouldn't be too obsessed with the issue.

Again the message is that high levels of skills are required for such a complex and sensitive process interacting with parents who themselves may lack motivation and belief (Rhee *et al.,* 2005; Gunnarsdottir *et al.,* 2011), and this may have implications for staff recruitment and training. It may also support the wider family therapy intervention which allows for all family members to seek support as it recognises the inter-relation of attitudes and behaviours within the family system (Wilson, 1994), and can therefore boost child motivation (Borra *et al*., 2003).

In terms of those factors which add to the profiling of child and parental characteristics identified in this study, it is clear that parents of obese and severely obese children are in denial of the issue of their child's weight status. This research also agreed with the finding in several systematic reviews that parental recognition of child weight status is weak (Parry *et al*., 2008; Doolen *et al*., 2009; Towns & D'Auria, 2009; Marloes *et al*., 2013). For instance, recognition was compared against actual BMI, with only 29% of parents accurately matching child weight status with BMI; and 70% of parents underestimating their child's status. Additionally, this study mirrors the review finding by Marloes *et al*. (2013) that the more overweight/obese the child, the less accurate was parental recognition

(p= 0.004); with only 26 parents of 59 actual severely obese children being correctly identified as severely obese, with the majority mothers.

This study also supports the recommendation by Jones *et al*. (2011) and the review by Marloes *et al.* (2013) to use such scales over verbalisation. Against actual BMI measures, the Truby Body Image Scale (Truby & Paxton, 2002) was also found in this study to be a more reliable tool for parental recognition across different child BMI groupings ($p \leq 0.001$) than the verbalised responses from the CFQ (Birch *et al*., 2001) (p= 0.004).

This parental denial has been attributed to several reasons: possible stigmatisation of the child (Neumark-Sztainer *et al*., 2008); or, the change in societal norms as to what is recognised as overweight or obese (Binkin *et al.*, 2011). Further, there is also some indication that this norm may vary by culture (Marloes *et al.*, 2013). It is also possible that parents may have an external locus-of-control and seek to avoid responsibility (Marloes *et al.*, 2013). This research did not clarify the reasons why this phenomenon occurs. Irrespective of the reason why this misperception is so common, it would appear that a psycho-educational component of the programme targeting this and addressing these possible reasons – helping parents understand the relationship between health, fitness and weight – may be also be beneficial. This psycho-education may extend to include behavioural change work around parental behaviour patterns of feeding of themselves first, and then of their children. This is the case as children learn from observing and imitating behaviour, rather than the words of their key role models (Birch & Marlin, 1982; Birch & Davidson, 2001). As parents change the food culture at home systemic change can occur within the family in relation to food and healthy eating, and change food preferences (Birch & Marlin, 1982), food intake (Hearn *et al.*, 1998), and food choices (Ebbeling *et al*., 2002). Such a change in feeding patterns, therefore, would impact not only the choice of foods purchased and served; but other related issues such as the frequency and timings of meals; as well as the actual portion sizes deemed appropriate (Birch *et al*., 2001).

Indeed, extending the intervention to include psycho-education and behavioural changes to the child and family is not simply because of the relevance for the parent him/herself, but because by providing such parental and family support this enables more consistent messaging at home (Borra *et al*., 2003), thus reinforcing the programme message outside as well as inside the sessions. So the argument does not only apply to food but also health and fitness, and the role of physical exercise, as several other studies have also found the

link between parental attitudes, and behaviours towards PA (Gottleib & Chan, 1985; Sallis *et al.*, 1988; Anderssen & Wold, 1992; Wold & Anderssen, 1992; Vilhjalmasson & Thorlindsson, 1998); as is the same relationship mirrored in terms of sedentary behaviour (Baughcum *et al*., 1998; Smith *et al*., 2010; Skelton *et al*., 2012). Therefore, encouraging family-based interventions to include parent-child or even family-based activities is advised, as is extending this to include family therapy if the profile merits this. This acknowledges again that children learn from what their parents and key role-models actually *do* rather than *say* (Birch & Davidson, 2001).

Extending such behavioural change to the family also means that parents, siblings or other caregivers may be more supportive of the programme itself (Borra *et al*., 2003), and so more motivated to ensure the child's adherence. Such parental motivation has already been found to be linked to lower attrition (Rhee *et al*., 2005). Further, due to the intergenerational nature of obesity (Birch & Fisher, 2000; Epstein *et al*., 2001), such an investment may have benefits to future generations and thus cut health-care and economic costs in the future linked to the long-term health implications of obesity.

6.5.1 *Programme Design: by Cohort and by Year*

Satisfaction levels rose and attrition fell as the programme progressed over time. However, over the same time, the recruitment criteria changed resulting in younger aged children being recruited. Given that older children were more likely to drop out, there was the possibility that this alone explained the improvement in satisfaction over time seen in the Exit study. However the adjusted logistic model found that variables predicting attrition were the year of the programme, child self-efficacy and programmatic logistic factors, with age not independently predictive.

Similarly in the 'Routine' study multivariate logistic models see (table 3-11) when the effect of child age and time (year by cohort) were both entered into multivariable models the results showed that the year of the study was independently predictive of attrition.

This thus does seem to suggest that as the years progressed, the programme improved. This can be explained by the improvement of ACES training materials over time and coaches knowledge and skills also may have improved as they became more confident about what they are delivering, the spread of more locations for delivery of the programme across greater Glasgow with more venues.

This feedback process allowed for programme modification to be an ongoing process as a result of such informal ongoing review. Introducing such an ongoing cyclical evaluation protocol (Blackington & McLauchlan, 1995), and standardising the process and procedures throughout all child obesity programmes would facilitate even more efficient responsiveness and effective communication from decision-makers and thus promote higher participant motivation. The need to monitor and maintain motivation supports the continuation of the current practice of ongoing programme evaluation in order to be responsive to each participant, and their parents, and reflect the individual requirements of each cohort. Such an evaluation process would, however, require resources in terms of both planning and funding.

6.5.1.1 Programme Logistics

Such a needs analysis approach to programme design, which reflects the individualised needs and wants of participants, would also help anticipate and redress parental issues with programme logistics. Consultation with the cohort before finalising arrangement may for example avoid some issues that parents reported as reasons for attrition. For instance, (P. 12) reported, "If location was easier then would have attended all sessions. Struggling to attend due to distance and transport," or as (P. 2) complained, "The session venue was too far and the time was not good as it was late for the child."

Such consultation reduces parental logistical barriers for attending though not necessarily address their own psychosocial barriers that may result in focusing on logistical issues as valid reasons for programme attrition. Such an approach also reflects perhaps a difference in designer mind-set, in that it reflects a bottom-up partnership approach rather than top-down authoritarian approach between parent, child, and designers that is more likely to result in trust, engagement, cooperation and lower attrition; rather than an imposition on parents and child which may result in resistance and drop-out as it does needs meet needs, wants and expectations (Hesketh *et al*., 2005). Another example of how such an individualised approach would impact on the programme, is the need to have goal-setting sessions which establish goals that reflect child and parent targets rather than those imposed externally by experts, which the participants do not necessarily cognitively support or aspire to (Davis & Addis, 1999). Feedback for P.17 complained, "individuals help was missing instructors were doing things in groups and we did not get enough attention of the child needs and own goals."

It may be that there is a need as part of the ongoing cyclical evaluation to review goals during and post programme as child and parent beliefs and motivations evolve, and it would help also to avoid miscommunication.

When the impact of variation by cohort year and cohort by area are also considered alongside the programme logistical barriers identified by parents, it may strongly argue for the programme management to be decentralised, and local managers may require the authority and access to some funding to make localised programme changes on a cohort-by-cohort basis, and an area-to–area basis in order to better reflect the individualised target participant needs, wants and expectations Such an approach would allow the scheduling and location of the programme to match as many of the target populations preferences as possible, and so limit possible barriers to adherence.

6.6 Research Implications and Future Direction

It is important to clarify the definition and the concept of attrition in order to be able to compare research findings. Garfield (1989, p.168) highlighted:

> the use of varying definitions and criteria of drop-outs orprematureterminators makes it difficult to compare studies and to securemeaningfulgeneralizations…Even though individual investigators may clearly definetheir drop-out group…, the extreme variability among these operationaldefinitions leads to chaos. Unless we agree about the phenomenon we are studying,wecannot hope for any systematic progress.

A possible solution to this issue is to establish an agreed definition through a panel of international experts commissioned through a respected organization, such as the World Health Organization (WHO). There is an argument that this panel would benefit from the inclusion of participants and their families as several studies have reported variation between participant and programme definitions (Weisz *et al.*,1987; Cote *et al.,* 2004; Hampl *et al.*, 2011; Kitscha *et al.*, 2009; Braet, *et al*., 2010).

In determining this definition, consideration should be given as to the value of only including attendance as criteria (as has occurred to date). It may be that definitions may have to consider the length of programme, and develop different cut-off points accordingly. Also, it may be that further investigation is required to determine if there are any other determining factors that make some participants drop-out after the first or second session rather than later into the programme. To do this, a larger sample than in this study

is required. Additionally, it may be the outcome success is a defining factor that should also be included. In the process of coming to conclusions, it is vital to seek the participants and their families viewpoints, for those who chose to continue and those who chose to drop-out.

The benefits of being able to then identify reasons and predictors of attrition are three-fold. Firstly, such an awareness of predictors supports the identifying of those at risk of dropping-out at baseline. This then provides an opportunity to the programme to enhance support and provide motivational intervention for these targeted families. Secondly, a better understanding of parental reported reasons for attrition provides for programme designers to make the necessary changes to promote retention. Thirdly, study findings could be utilized in the recruitment process to actually exclude those at highest risk of drop-out. The latter approach could help ensure that the limited resources available are used for those most likely to adhere to the programme, and so are more likely to make changes. Thus, De Niet *et al*. (2011) altered their inclusion criteria from 8-14 years to 7-12 years as older aged children have been consistently reported as being more likely to drop-out. Due to the lack of definitiveness in identifying predictors, this researcher would prefer further research to evaluate the impact of providing support to these at risk families.

Further research is required for qualitative research that may provide deep insight into the parental as well as child role in attrition would be helpful, so a mixed methods approach is advised. Input from the childshould be sought along with others reflecting an ecological model. Ultimately, a more interactional model is required to reflect the complexity of variables involved in predicting attrition, and consistent with the EST model, reflects the impact of factors within the child and within the wider family. This research needs to incorporate into it with equal rigour the psychosocial measurement, and so further standardisation of tools and procedures would again aid comparison of drop-out.

Further follow-up data is required in order to assess the long-term effectiveness of interventions, and identify how ‘success’ should be defined. Long-term follow-up appears to be particularly problematic given the low participation rates, despite longerterm support being offered by the majority of programmes. It is unclear why participation at the follow-up stage was so low across all of the programmes; increasing the participation rate at follow-up would give a greater understanding of the longerterm outcomes for the individual participants and the overall intervention.

This study highlited the needs for future studies in attrition to utilise the EST model in their design, and in so doing to seek input from the child, the parent and other community members such as coaches and teachers. For instance, the validity of the psychosocial parental reported child status would be further validated by the reinforcement of data for other informants as psychosocial issues are extremely situational (Achenbach *et al.*, 1987; Goodman *et al*., 2000). This would also allow for triangulation of results which would provide a more holistic overview and depth of understanding of programme attrition (Stake, 1995; Patton, 2002).

Additionally, a more interactional model needs to be developed that can examine how factors interact. For instance, further research needs to be applied to determine if pro-social skill deficits impact on parental motivation not just the child, and whether these in turn are linked to SES, and thus impact on programme attrition. If the programme is adapted to address depressive and anxiety symptomatology in the child and the parent respectively, then further research would be required to identify if this has made an impact. It may be in exploring reasons for attrition in-depth qualitative or mixed methods approaches would be more appropriate, with the researchers also being advised to have some counselling training in order to deal with such sensitive issues. It also would appear that assessment of psychosocial status by researchers would benefit from standardising of tools and procedures to promote ready comparison of results, and increase validity and reliability.

This need for standardising of tools in future research also applies in other areas. For instance, the same reliability issues with the primarily maternal recognition of their child's weight status occurred in this study as reported in other studies (Carnell *et al.*, 2005; Crawford *et al*., 2006; Fisher *et al.*, 2006; Jones *et al.*, 2011). Additionally, Jones *et al.* (2011) also found the image scales to be a more effective mechanism for obtaining reliable data. So, the researcher suggests that image scales rather than verbalisation (Zeller, *et al*, 2010; Jones, *et al*., 2011), along with actual BMI measurement (Marloes, *et al*., 2013), should be utilised in future research on childhood obesity programmes. This would not only be a more accurate measure of the child's weight status, but would also serve to draw the attention of the parents to recognising the actual weight status of their child. This needs to be supported by inclusion of the family in psycho-educational and behavioural change interventions themselves in order that the child receives aligned and congruent behavioural messages from family members about food, nutrition, exercise and lifestyle i.e. not just one

parent. Further research on the relationship between parental weight status and recognition of child weight status is advised; as is research on attribution for common mismatching of parental perceived child weight status versus actual child weight status to identify if these issues can be addressed with the programme, and so enhance retention. For instance, parental psychosocial assessment could also include locus-of-controlto determine to what extent parents are in denial to avoid personal responsibility and avoid changing behaviours within themselves and the family.

Future treatment programmes using wider data from school and community and based within community-settings are advised to break barriers with parents over recognition of their child's actual weight status. Family-based interventions also offer an opportunity to defuse potential parental shame, blame and stigmatization around recognition of their child's weight status (Carnell *et al*, 2005), whilst at the same time supports changing the family culture around food, nutrition, exercise and lifestyle (Birch & Davidson, 2001). This again reinforces, however, the need for personnel to be suitably trained to deal with such sensitive and psychological matters.

The significance of programme design and cohort by year and cohort by area suggest the need for longitudinal cohort studies on maintenance and follow-up to evaluate effectiveness of treatment. This would allow for any variations by cohort to be identified, and also to identify which improvements have had the most significant impact on attrition. There is, therefore, also a need for future survival studies by participant cohort and programme cohort to examine each factor, and the interaction between the two.

6.7 Conclusion

This research highlighted that there was an association between engagement with the programme and child age, child psychosocial status, the time when and where the programme was delivered and other logistics. Whilst attrition rates are still problematic, the longer this programme ran, the more attrition reduced. Overall, there was high satisfaction with the programme from both parents and children, and this increased with time. Similarly, parental satisfaction improved over time. This is in response to parental qualitative feedback on the programme, and reflects the effectiveness of the evaluation process. With regards to these findings a number of recommendations are made for future research in weight management programmes like ACES.

Chapter 7. Recommendation Summary

Based on the findings of this research and on the discussions based on these results, as given above, this study has a series of recommendations for both providing and evaluating family-based weight management interventions in the future.

7.1 Recommendations for future programme design

- **Child Age and gender**; In this study older children (aged 13-18 years) were most likely to be disengaged. Future programmes should be age-specific, designed to meet the differing interests and expectations of varying age groups.

- **Psychosocial problems, social skills and conduct problems;** Programme personnel must have strong interpersonal skills to motivate the child and build child self-esteem.
The programme should be designed in phases, starting with individual activities and moving onto group activities only when the child feels secure and confident enough to handle group interactions.

- **Expectation and family needs;** An orientation session is recommended for future programmes to help clarify roles and responsibilities for all participating parties.

- **Parental recognition of child weight:** The Body Image Scale should be used in any designed intervention in order to know to what extent the families are aware of their child's weight status.

- **Parental Knowledge Attributes and Skills:** Future programmes should include psycho-education and behavioural change work around parental behaviour patterns of feeding of themselves, firstly, and then of their children. This will enable more consistent messaging at home, reinforcing the programme message outside as well as inside the sessions.

7.2 Recommendation for delivering

- Coaches Knowledge Attributes and Skills: Future programmes should prioritise and nurture effective, supportive coach-child communication by requirung appropriate multi-disciplinarian skill sets of coaches. Adequate training is needed to improve their skills in cognitive behavioural therapy (CBT) and motivational interviewing (MI) techniques.

- Programme content: Future programmes should have fitness equipment available so that children can exercise as part of their treatment care. Coaches should teach exercise techniques and suggest exercise routines for children to apply at home. Programmes may wish to partner with community-based fitness centres to offer subsidized gym memberships to families.

- Logistic barriers: Evening and weekend appointment times should be offered to families and programmes and appointments should not take place after school time. Programmes and appointments should take place at sites closer to participants' homes and free parking and/or bus tickets could be offered to enhance engagement.

7.3 Recomendation for evaluation

- Long term evaluation: Follow-ups should be for longer than six months as longer programmes are more cost effective and improve family engagement. There should be ongoing – in other words frequent and continuous – evaluation of materials, activities and sessions to generate responsiveness to participants' needs.

- Future survival studies by participant cohort and programme cohort are required to examine variations between cohort years and the programme improvements that prove effective.

- Evaluation Process; Future programmes should use randomised control trials that focus on attrition, adherence, and reasons for non–attendance and non-engagement rather than the effectiveness of outcomes.

- Piloting intervention before delivering it and testing tools is recommended for more informative data collection and constrictive evaluation.

7.4 Recommendation for Attrition studies

- There should be an agreed standardised definition of attrition in future programmes to ensure consistency and comparability.

- In line with Epstein's (2007) recommendation, there should be long follow-up studies of up to 10 years post-treatment.

- A standard evaluation model – such as the 'Standard Evaluation Framework' by National Obesity Observatory – should be used evaluate the process and the procedures of all child obesity programmes.

- Studies should use intervention-mapping to better evaluate family-based childhood weight management programmes or utilise the EST model in design and evaluation.

- In determining their attrition definition, studies should consider the length of programme, and develop different cut-off points accordingly.

- Further larger studies are required to discover other determining factors for dropping-out after the first or second session rather than later into the programme.

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Appendices

Appendix 1: West of Scotland Research Ethical Approval on the Study Protocol

Appendix 2: ACES Baseline Assessment Routine Paper

Appendix 3: Entry Survey Study (Information sheet, Consent form, Entry questionnaire)

Appendix 4: ExitSurvey (Information sheet, Consent form, Exit questionnaire completer (Version), Exit questionnaire completer (Version)