Nutritional knowledge of parents and the packed lunch they provide their children

“Dissertation submitted in accordance with the requirements of University of Chester for the degree of Master of Science.”

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Abstract

**Aims:** To investigate if the level of Irish parents’/guardians’ nutritional knowledge reflects the foods they provide in their children’s packed lunch. Another aim of the study was to determine if parents’/guardians’ level of education reflects their level of nutritional knowledge. A final aim of the study was to determine whether boys or girls had healthier lunchboxes.

**Objectives:** To have the children complete a lunchbox questionnaire, and for the parents/guardians to complete a General Nutrition Knowledge Questionnaire for Adults.

**Study Population:** 35 8-9 year old children from a South Dublin primary school and their parents/guardians formed the study population.

**Methods:** A lunchbox questionnaire was completed by the children and a General Nutrition Knowledge Questionnaire for Adults was completed by the parents/guardians. SPSS was undertaken to determine whether any correlations existed between the level of nutritional knowledge and the foods provided; the level of nutritional knowledge and the level of education; and to determine any differences between the boys’ and the girls’ lunchboxes.

**Results:** The results from this study show that level of parental nutritional knowledge does not reflect the foods they provide in their child’s lunchbox (p>0.05). There was no
relationship found between level of nutritional knowledge and level of education (p>0.05), nor was there any significant difference (p>0.05) between the health status of the boys and girls lunchboxes. The standard of lunches was low, as was the level of nutritional awareness of the parents/guardians.

**Conclusion:** This study attempts to fill a gap in the literature, investigating whether the level of parental nutritional knowledge reflects the lunches they provide in their children’s packed lunch. The results from this study found that level of nutritional knowledge does not reflect the foods parents/guardians provide in packed lunches. Health promotion strategies are needed to target new areas in order to broaden nutritional awareness in the Irish adult population. Healthy lunchbox strategies are recommended to be employed by parents and/or schools in order to improve the nutritional quality of these meals.

**Key Words:** Lunchbox contents; Irish adults; Childhood obesity; Schoolchildren
Declaration of Original Work

This work is original and has not been previously submitted in support of a Degree, qualification or other course.

Signed……………………………………………….

Date………………………………………………..
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1. Introduction

Childhood obesity has become a challenging public health problem worldwide (WHO, 2009). In Ireland, childhood obesity is becoming such a problem that the President has spoken out for measures to be put into place in an attempt to prevent trends from getting any worse. President McAleese has stated that health professionals cannot fight this battle alone, and that parents have a key role to play in preventing this obese-friendly environment (irishtimes.com, 2009).

As a result of this concern regarding the levels of childhood obesity in Ireland, it was decided to investigate the level of nutritional knowledge in a sample of Irish parents/guardians, to determine whether this nutritional knowledge is being reflected in the packed lunches they provide for their children.

This study will review the published literature in this area in section 2. Sections 3 and 4 will provide details of the study’s methods and findings. These findings will be discussed in section 5, and concluded in section 6.
2. Literature Review

2.1 Childhood Obesity

Childhood obesity has become an epidemic worldwide with the World Health Organisation (WHO) reporting that approximately 22 million children are overweight (WHO, 2009). Obesity is a multi-factorial, chronic condition and the most common nutritional disorder in the world (Dehghan et al. 2005). Numerous theories are available regarding obesity onset, including suggestions that it is due to energy imbalance, while others argue that onset is due to an interaction between environmental factors and genetics (Ravussin & Bogardus, 2000). There is, however, a lack of scientific evidence to highlight any one principal cause (Dehghan et al. 2005). Obesity is an independent risk factor for premature death, putting sufferers at 2-3 times higher risk of dying prematurely than their lean counterparts (Thomas & Bishop, 2007). Obese individuals are also at increased risk of: type II diabetes (Health Promotion Unit, 2003); cardiovascular disease (National Heart Alliance, 2006); certain cancers (Fox, 2003); and decreased psychological well-being (Thomas & Bishop, 2007). Developing obesity in childhood can result in long-term health problems, and cause psychological stress and low self-esteem (Maziak et al. 2008). Overweight children are predicted to stay overweight into adolescence and statistics suggest that children have up to 79% increased risk of becoming obese adults (Whitaker et al. 1997).
Levels of childhood obesity in Ireland have reached challenging levels. Griffin et al. (2004) found that the incidence of overweight in young Irish adolescents has increased three fold since 1999. The number of overweight/obese children in Ireland was an estimated 327,000 in 2005 (IMO, 2006). These figures have been predicted to increase by 10,000 annually by the Department of Health and Children (DOHC) (DOHC, 2007). Attending to this escalating problem is a major priority (Ortega et al. 2007). Although the childhood years are a time of obesity development, they are also a time of obesity prevention as eating habits of children are determined during this period (Maziak et al. 2008). For this reason it is important to review the dietary habits of Irish children and determine their influence.

2.2 Dietary Habits of Irish Children

The Irish Heart Foundation (n.d.) reported that Irish school children are consuming too much fat, have insufficient calcium and iron intakes, and fail to achieve the recommended five portions of fruit and vegetables per day. Supporting these claims are the findings from the Health Behaviour in School-aged Children (HBSC) study (2006). The HBSC (2006) investigated the dietary habits of Irish children and found that 19% consume more than one portion of fruit per day, and 18% consume more than one portion of vegetables per day. Girls were found to have a 7% higher consumption of fruit and 4% higher consumption of vegetables compared to boys. 39% of Irish children were found to consume sweets on a daily basis and 26% reported drinking soft drinks at least once per day. With Irish children’s dietary habits being nutritionally imbalanced, and
today’s modern environment promoting the consumption of unhealthy food and sedentary lifestyle, it is of no surprise that rates of childhood obesity are increasing (Hunter, 2007). Research has suggested that promoting good health to school children is important, as educating children from an early age will enable them to make healthy food choices and develop healthy dietary habits, habits which should continue into later life (Carrier & Herbert, 2003; Hart et al. 2002). However, published interventions that have targeted children in an attempt to combat childhood obesity have experienced only occasional success, highlighting the need to approach the situation from another direction (Maziak et al. 2008). Various factors influence children’s eating habits including the media and their peers (Clark et al. 2007). One of the more influential factors however, is that of their parents.

2.3 Parental Influence on Dietary Habits

Parents are the main source of children’s habit development (Benton, 2004). Children’s attitudes towards food stem from that of their parents (Lazarou et al. 2008). Children develop their eating habits through the foods in which their parents make available, prepare and serve in their home (Bere & Klepp, 2004; Wardle, 1995). Children’s desire to expand their tastes of different foods is a result of their desire to mirror the dietary habits of their parents (Davison & Birch, 2001). In other words, parents act as role models for children in developing their eating habits, dietary beliefs, and attitudes towards food and healthy eating. Among the literature supporting these claims includes Bere & Klepp (2004). Bere & Klepp (2004) conducted a study to determine whether any
correlations exist between the fruit and vegetable intake of parents and their children. This study established a relationship \( (p<0.001) \) between parental intake of fruit and vegetables and that of their child’s intake. The quality of parents’ diets was seen to influence their children’s dietary behaviours when Lazarou et al. (2008) illustrated that those children whose parents reported frequently consuming unhealthy foods were more likely to consume unhealthy and fattening foods. Similarly, Brown & Ogden (2004) found the diets of both parents and children consisted of too many unhealthy foods and found a strong relationship between parent and child snack food intake. In contrast, Krisjansdottir and co-workers (2009) found a low correlation between parent and child intake of fruit and vegetables, although paternal fruit intake appeared to have a stronger influence than that of the mother’s, as the results showed that paternal fruit intake was positively related to children’s intake (Krisjansdottir et al. 2009). However, intake was measured by self-report.

Availability of food in the home has been reported to be associated with children’s intake (Wardle et al. 2005). Correlations between the availability of fruit and vegetables and children’s consumption have been reported throughout literature (Krisjansdottir et al. 2009). Hanson et al. (2005) found an association between fruit and vegetable availability and its consumption with girls; and between the availability of dairy in the home and its consumption with boys. This is also true for the availability of unhealthy foods. The presence of unhealthy food items in the house has been found to create a barrier to the intake of healthy foods (Campbell et al. 2007). Grimm et al. (2004) conducted a study to identify the factors influencing children’s consumption of
carbonated soft drinks due to the growing speculation around the contribution of these beverages to the childhood obesity crisis. The findings from their study showed that availability of soft drinks in the home and school settings were among factors influencing their consumption in 8-13 year old adolescents. While much of the research suggests that food availability determines what foods are consumed and in what quantity, Campbell and co-workers (2006) suggest that it may, in fact, be food intake that determines availability. However, Safefood (2009) found that if parents do not make the food available, the children will replace the food with something that is available.

The way in which parents prepare the food they make available for their children may also influence their child's dietary habits. Lazarou et al. (2008) found that children had a higher total fat intake when their parents failed to follow healthy preparation measures, such as cutting off excess fat from meat, compared to those who did follow healthy preparation guidelines. However, these preparation practices may be a result of the time pressures that parents are constantly under, as Kearney & McElhone (1999) found that time was the most commonly perceived barrier to eating healthily in a sample of European participants due to their busy lifestyle. Few people have time to prepare healthy meals, making convenience foods a popular choice for our ever adapting ‘on-the-go’ lifestyle (Campbell & Haslam, 2005). However, these convenience meals are generally higher in nutrients such as fat and sodium, which will inevitably lead to health problems over time, such as heart disease (Davison & Birch et al. 2001).
These findings provide support for the ‘role model’ influence that parents have over their children’s diets and attitudes towards food, emphasizing the need for parents to understand the importance of what and how they feed their children at an early age (Hart et al. 2003). However, a study conducted by Hart and co-workers (2003) found that parents have a short term focus on health consequences, and have little concern for the long term impact of dietary choices. The long term health consequences of the dietary choices parents make during this vital period need to be stressed to parents as they may contribute to the obesity crisis by negatively impacting on their child’s weight status.

2.4 Parental Influence on Children’s Weight

The development of children’s eating habits is largely determined by their parents, which inevitably comes with the consequence of influencing their children’s weight (Lazarou et al. 2008). The ability to identify whether a child is overweight is important for parents in order to recognize when the lifestyle habits of their child need to be altered in order to prevent the child suffering any of the related health consequences of excess weight. Literature suggests, however, that some parents do not have the ability to determine whether their child is overweight. Crawford et al. (2006) conducted a study in an attempt to determine whether the parents of 5-6 year old children could identify their child’s weight status correctly. A total of 3% of the study population correctly identified their children as overweight, despite an actual 23% of the children being overweight or obese; and 71% of the parents were reportedly unconcerned about their child’s weight (Crawford et al. 2006). This could be due to parents believing that children carry ‘puppy
fat’ when they are younger, and are under the illusion that the child will ‘grow into it’. Crawford et al. (2006) reported that various parents employed weight loss strategies for their children. Among the most common aspects of these strategies included: promoting healthy eating, reducing the consumption of ‘junk’ food, and providing healthy lifestyle education (Crawford et al. 2006). Aspects that were least commonly included in the weight loss strategies included: providing low fat meals/options, encouraging healthy snacks, and reducing the consumption of soft drinks (Crawford et al. 2006). It was established, however, that these weight loss strategies were put into place regardless of the child’s weight in an attempt to prevent weight gain in adolescence, suggesting that parents are unaware/unconcerned about the importance of obesity in childhood (Crawford et al. 2006). Those parents who are unable to identify weight issues in their children or who are unconcerned about the weight status of their child may be unwilling to adopt dietary changes or employ weight loss strategies as they see no need for change (He & Evans, 2007). Those parents/guardians who do take action and employ strategies in order to reduce their child’s weight or prevent further weight gain may not reap the desired outcomes as they may lack sufficient nutritional knowledge to design an appropriate and successful weight loss plan (Clark et al. 2007). Klesges et al. (1991) found that parents focus on reducing the ‘bad’ foods in their children’s diet but ignore increasing the consumption of ‘good’ foods, which was also seen in the study conducted by Crawford et al. (2006) when few parents reported encouraging their children to increase their consumption of fruit and vegetables, which may be due to parents being nutritionally unaware. This association between inadequate nutritional knowledge and weight status was also reported by Variyam (2001).
Variyam (2001) investigated the results obtained by the Diet and Health Knowledge Survey in an attempt to determine whether the level of parental nutritional knowledge was associated with the weight status of their children, by grouping the data received by the parents with the data received by their children. The results from this investigation established a correlation between the two, concluding that parents with higher levels of nutritional knowledge were less likely to have overweight children. The results found that of the parents who were aware of the health consequences related to low fibre intake, 26% of their children were overweight compared to 34% of children whose parents were unaware of these health consequences (Varyiam, 2001). One quarter of the study group claimed that choosing a diet high in grains was not a priority for them, with results showing that these parents had a 14% higher prevalence of overweight children compared to those who did rate grain consumption as a priority (Variyam, 2001). As part of the survey, subjects were required to state whether they agreed or disagreed to a statement claiming that some people were born to be fat and others were born to be thin (Varyiam, 2001). Of those who agreed with this statement, 33% had overweight children compared to 22% of those who disagreed with the statement. Although these results highlight the importance of educating parents about nutrition and how to identify if their child is overweight, it must be emphasized that increasing parental awareness of children’s weight status will not prevent the increasing rates of overweight and obesity in children (He & Evans, 2007).

Level of parental education has also reportedly been associated with the weight status of their children. Crawford et al. (2006) found that mothers who had completed high school
and third level education were more likely to employ weight loss strategies than those who achieved primary education (Crawford et al. 2006). Reports in this area are inconsistent however, as paternal level of education was not found to be associated with employing preventative strategies against weight gain in a study conducted by Crawford et al. (2006), while He & Evans (2007) found no association between parental education and their ability to correctly identify their child’s weight status. Another potential influential factor of children’s weight is that of their own mothers. This suggestion has emerged from research claiming that mothers with higher weight status are more likely to feed their children more energy dense foods compared to nutrient dense varieties (Davison & Birch, 2001). Overweight mothers are more prone to disregard portion size recommendations and to feed their children foods high in fat as a result of the preparation process (Davison & Birch, 2001).

The health consequences and importance of childhood obesity need to be emphasized to parents in order for them to become more aware of their child’s weight status, and for health education to inform parents how to employ effective weight loss regimens (Crawford et al. 2006). Parents must have a good command of nutritional knowledge in order to know how to create and design nutritionally balanced weight loss strategies, as parents may be unaware of what constitutes a healthy diet, increasing the potential of putting their child at risk of becoming deficient in certain nutrients (Crawford et al. 2006). Poor nutritional knowledge may also contribute to a child’s weight status, for example; a lack of knowledge regarding portion sizes may lead to children overeating
(Davison & Birch, 2001). For this reason it is important to determine the level of nutritional knowledge in parents.

2.5 Nutritional Knowledge

Parental nutritional knowledge is important in the development of children’s eating habits (Rasanen et al. 2003). It has often been reported that while there are various factors influencing parental dietary decisions, their level of nutritional knowledge is a dominating factor, with those parents who are more nutritionally aware making healthier dietary decisions (Clark et al. 2007). If parents are to educate their children in areas such as food choice and portion control, it is important that they have been fully informed with trustworthy, up-to-date information. An adequate level of nutritional knowledge in parents is necessary in order to monitor the eating habits of children, as being aware of food composition and having the skill to make appropriate food choices is key in establishing healthy dietary habits and maintaining their child’s weight (Variyam, 2001). Parents are often the most important source of nutritional information for their children. Miles & Brennan (n.d.) found the children in their study regarded their parents as their main source of nutrition information. Gillman et al. (2000) also reported parents as the principal source of nutrition information when over three quarters of a sample of 9-15 year old American adolescents claimed that their parents were their primary source of nutrition information, and 98% reported finding their parents’ information useful and informative (Gillman et al. 2000). These figures and statistics emphasize the importance of ensuring parental nutritional knowledge is correct and up-to-date.
As previously stated, it is believed that those with high levels of nutritional knowledge make healthier dietary decisions than those with poor nutritional knowledge (Davison & Birch, 2001). These claims lead one to question whether improving an individual’s level of nutritional knowledge will lead to an improvement in their dietary choices (Worsley, 2002; Parmenter & Wardle, 1999). Wardle and co-workers (2000) found those adults with high levels of nutritional knowledge consumed significantly \((p<0.001)\) more fruit and vegetables and less fat than those with low levels of nutritional knowledge. Miles & Brennan (n.d) conducted a study investigating what foods are included in primary school lunchboxes and found that parents who were nutritionally aware purchased healthier foods for their children compared to those with low levels of nutritional knowledge. Literature in this area, however, has proven inconsistent as level of nutritional knowledge has failed to consistently reflect dietary behaviour (Taylor et al. 2005). In their study, Krisjansdottir et al. (2009) found that knowledge of expert recommendations was among the most frequently mentioned motivational factors in choosing foods among parents. Study results, however, found that parental knowledge of recommendations was not statistically significant \((p>0.05)\) with their children’s fruit and vegetable intake, suggesting that factors, such as cost and preference, override knowledge of nutrition (Krisjansdottir et al. 2009). In a study conducted by Gibson and co-workers (1998), maternal nutritional knowledge was found to be negatively associated with their children’s total intake, but positively associated with their fibre and fruit intake. However, no correlation was established between maternal knowledge and children’s confectionary intake (Gibson et al. 1998). Rasanen et al. (2003) conducted an intervention investigating the impact of nutrition counselling on families over 6 years.
Their study found that parents from both the intervention and control groups were highly aware of the relationship between coronary heart disease and nutrition, but lacked knowledge of the nutritional composition of food. If individuals lack this necessary information, it is unlikely that they will make appropriate dietary choices in order to prevent these diseases from occurring (Rasanen et al. 2003). These inconsistencies suggest that increasing nutritional awareness is not likely to exhibit a beneficial effect on dietary behaviour as nutritional knowledge is of little influence to food choice with other factors playing more dominant roles (Wardle et al. 2000).

City of Yarra & Nutrition Australia (2006) found that parents reported money, time and lack of nutritional knowledge as the primary barriers in providing their children with healthy foods. Kearney & McElhone (1999) found factors such as time and cost were commonly perceived barriers to eating healthily, as was the belief that there was no need to make adaptations to individual dietary habits, which was reported by 71% of the sample group. These barriers may be a result of people finding expert advice too complex and not realizing that incorporating recommendations, such as six servings of starchy foods daily, is not difficult to achieve. It has been reported that a large proportion of the general public find nutrition advice and healthy eating guidelines confusing as there is too much conflicting information, leading people to base their diet on what they consider as healthy themselves (Lake et al. 2007). For this reason, public health messages need to be tailored to accommodate all levels of education and nutritional knowledge of their target audience if the public are to understand what is expected of
them, as there is an unrealistic presumption from health professionals that the public understand what is being advised (Buttriss, 1997).

Literature has established a positive correlation between the level of parental education and the level of nutritional knowledge, with several reports demonstrating that higher levels of education are associated with greater levels of nutritional knowledge (Parmenter et al. 2000; Varyiam et al. 1999.). Individuals who are highly educated may be more exposed to sources of nutritional information and have a greater understanding of this information, allowing these individuals to make well informed dietary decisions (Hearty et al. 2007). Rasanen et al. (2003) claimed that level of education had a significant ($p<0.05$) influence on the nutritional knowledge of the parents involved in their study, with those with higher levels of education obtaining higher nutrition scores. However, education failed to distinguish between eating habits as those with the highest levels of education had higher intakes of fat (Rasanen et al. 2003). Parmenter and co-workers (2000) found those with no formal qualifications had significantly ($p<0.001$) lower levels of nutritional knowledge than those with a degree. Levy et al (1993) found that the more educated individuals were, the more aware of dietary fats and cholesterol guidelines they were. A study conducted by Variyam & Blaylock (1998) illustrated that those adults who had higher levels of education had more knowledge regarding nutrient content of foods, were more aware of diet related health problems and had higher healthy eating index scores (Variyam & Blaylock, 1998). Vereecken and co-workers (2004) established a relationship between maternal level of education and the consumption of fruits and vegetables in their children, however there was no relationship between education and soft drink consumption (Vereecken et al. 2004). Gibson et al. (1998) found maternal
nutritional knowledge was linked with children’s fruit consumption but not their vegetable consumption. However, results have been inconsistent in establishing a relationship between level of nutritional knowledge and level of education, with Wardle et al. (2000) and Variyam et al. (1999) reporting that their findings were independent of educational level.

While some studies have proved that maternal nutritional knowledge is associated with better quality diets in children, others suggest that interest in nutrition is more important (Worsley, 2002). The complexity of the transition from nutritional knowledge into dietary behaviour is further heightened by competing factors, such as personal beliefs and environmental influences (Rasanen et al. 2003). Another factor influencing dietary decisions is who the meal is being provided for.

2.6 Packed Lunches

Dinner is a family meal and is regarded as an important activity by most parents. According to surveys conducted in the US, more than 80% of parents claimed that eating dinner with their children is among the most important activities carried out together (Gillman et al. 2000). Due to dinner being regarded as a family meal involving the parents, it may lead to healthier foods being served to the children. This assumption stems from research conducted by St John Alderson & Ogden (1999) when they reported that mothers chose different foods for themselves than the food that they chose for their children. In their study, St John Alderson & Ogden (1999) found that mothers reported consuming more healthy foods than that of their children, and reported feeding their
children significantly more unhealthy foods than themselves. Mothers reportedly stated that nutrition, health, and long term health consequences of food choice were the dominant motivational tools in determining what foods to feed their children (St John Alderson & Ogden, 1999). These motivational tools, however, were in contrast to what foods were recorded. It may be concluded that while these mothers aim to provide their children healthy meals, they may lack the appropriate nutritional knowledge. However, when this conclusion is considered with the healthy diets reported for the parents themselves, it seems that this cannot be the case (St John Alderson & Ogden, 1999). Based on such research, one must ask the question; if parents are only choosing healthier food options when they are consuming the food, how would the nutritional quality of a meal that only their children consume rate? One example of such a meal is the school lunch.

Irish schools do not provide school meals, meaning the only food that the children consume during the school day is their packed lunch, typically comprising of a sandwich, a piece of fruit, a snack and a drink (Miles & Brennan, n.d). Despite school lunches providing approximately one third of children’s total energy intake, there have been few investigations into the quality of packed lunches (Seaman & Moss, 2006; Conway et al. 2002). Of the studies that have focused on the nutritional content of packed lunches, the general consensus is that they lack diet quality. This may be due to child food preferences, which are usually for energy dense, sugary foods, being the reason parents provide the foods they do in lunchboxes (Griffin & Barker, 2008; Wardle, 1995). This may explain the findings of the School Food Trust (SFT) claiming that children who
brought a packed lunch to school were more likely to have confectionary items, savoury snacks, or both (SFT, n.d.). Worsfold & Griffith (1992) reported that when analyzed, one-third of the lunchboxes in their study were found to be nutritionally inadequate, with the majority of meals being too high in fat and sugar and low in protein, calcium and vitamin C. Douglas (1999) conducted a nutritional analysis of the packed lunches of 11-12 year old students in Northern Ireland. The results displayed high levels of fat, particularly saturated fat, and low levels of fibre, iron and folate. Although levels of vitamin C and calcium were deemed sufficient, when fruit and cheese were excluded from the analysis levels of these micronutrients reduced dramatically (Douglas, 1999). These results suggest that the nutritional composition of lunchboxes relies heavily on such products. Conway et al. (2002) conducted a study investigating the nutritional content of packed lunches in a sample of American children. The study results found that over half of the study population had packed lunches exceeding the 30% total fat intake recommendation. Less than half the population had a portion of fruit, while vegetables were absent from 95% of lunches (Conway et al. 2002). Evans & Cade (2007) found diluted drinks were the most frequently included drinks in lunchboxes, despite not complying with the SFT food based standards. Fruit juices and milk based drinks, which the SFT recommend for inclusion, were reported the least. Based on the results of their study, Jefferson & Cowbrough (2004) claimed that the excess energy consistently reported in these studies is due to high fat, sugar laden foods replacing healthier choices such as fruit, vegetables and starchy foods. This exclusion of fruit and vegetables will make achieving the recommended five portions of daily fruit and vegetable more difficult for children (Evans & Cade, 2007). Clancy & Johnston (2003) conducted a study into the
foods children bring to school for their lunch and found that all children had at least one snack food in their lunchbox, and fruit was present in approximately 40% of lunches pre- and post-intervention. However, it is not the fault of the child for these suboptimal lunches, rather the person responsible for preparing the lunches, which is usually the parent/guardian. City of Yarra & Nutrition Australia (2006) found that parents reported that their priority is providing children with enough food, regardless of the nutritional composition, and that it was easier to pack crisps and chocolate in their children’s lunchbox than have to prepare fruit. These parents also claimed that a reason for providing these unhealthy foods in their child’s lunchbox is because they are nutritionally unaware of healthy alternatives to the foods their children like (City of Yarra & Nutrition Australia, 2006).

Literature has consistently supported claims that children’s packed lunches are nutritionally inadequate. Conway et al. (2002) stressed the need to investigate what foods are commonly provided in children’s packed lunches in order to gain a better understanding of children’s nutritional status allowing relevant and necessary health interventions be put into place. This is particularly important due to the fact that children consume these packed lunches five days of the week, for approximately 37 weeks of the year (Higgins et al. 2005). Literature has underlined the influence parents have on their children’s dietary habits and how the level of parental nutritional knowledge may control this influence. Variyam et al. (1999) found that maternal knowledge has a positive, significant influence on their child’s diet quality. As the literature has shown, there has been an established positive relationship between parental level of education and their
level of nutritional knowledge. Therefore, it is necessary to conduct a study which investigates the level of parental nutritional knowledge and determine whether this has any influence over the foods parents provide in their children’s packed lunch.

2.7 Study Aims

There have been few studies, if any, conducted in an attempt to assess the level of nutritional knowledge in the adult population in Ireland, as has there been few investigations into what foods parents provide their children in their packed lunch. This has lead to a gap in the literature as relatively little known about the relationship between the level of nutritional awareness of those parents/guardians who are responsible for providing their children food and the quality of their child’s diet in Ireland. For this reason, it was decided to conduct a study investigating whether the level of nutritional knowledge in Irish parents/guardians reflects the foods that they provide in their child’s packed lunch. The study’s aims were:

- To determine whether the level of parental nutritional knowledge reflects the foods parents/guardians provide in their children’s packed lunch;
- To determine whether level of parental education reflects the level of parental nutritional knowledge;
- To establish who had healthier lunches between the girls and the boys.
This study’s hypotheses were:

- Parents/guardians with high levels of nutritional knowledge will provide healthier packed lunches than those parents/guardians with poor levels of nutritional knowledge.
- Parents/guardians who have achieved higher levels of education will have higher levels of nutritional knowledge compared to those parents/guardians with lower levels of education;
- Girls will be provided with healthier lunches than boys.
3. Methods

3.1 Study Design

Data was obtained using two questionnaires, one of which was previously validated. Questionnaires are a commonly used method of data uptake due to their ease of analysis, their ability to target groups, they are inexpensive and they allow participant anonymity to be kept (Tashakkori & Teddlie, 2003). Data analysis was undertaken using a recognised statistics programme; Statistical Package for the Social Sciences (SPSS) Version 16.0. Ethical approval was obtained from the University of Chester Faculty of Applied and Health Sciences Research Ethics Committee (Appendix, 1).

3.2 Participants

i. Inclusion/Exclusion Criteria

Inclusion and exclusion criteria were determined prior to the recruitment process so that only the desired population would be targeted.

- Inclusion criteria: Children attending a South Dublin primary school; Children must be in fourth class; Parents/guardians who prepare the lunch of the participating children.
- Exclusion criteria: Children from classes above or below fourth class; Schools outside Dublin South.

ii. Recruitment

Various primary schools in the South Dublin region were approached requesting permission to conduct the present study in their school (Appendix 2). Information regarding the study’s aims, objectives and methodology was presented to each school principal to allow an informed decision to be made. One national primary school accepted the invitation, granting permission to enter two fourth cycle classes leading to a potential sample size of 58 parent and child participants (Appendix 3).

iii. Participants

Participants volunteered from a South Dublin primary school. The school is a mixed gender, public school. All the children, with the exception of one child, were white. The majority of participants were Irish.
3.3 Procedure

\textit{i. Consent}

Envelopes were distributed among each of the 58 eligible children to give to their parent/guardian. Each envelope contained a letter of invitation (Appendix 4), a participant information sheet (Appendix 5), and a consent form (Appendix 6). The letter of invitation briefly outlined the study aims and what would be required of the child and adult participants if consent was provided. The participant information sheet explained to the parents/guardians of eligible participants the aims of the study in further detail, why they were being recruited, emphasized that participation was voluntary, and explained how to withdraw from the study if desired. An envelope was provided with the consent form for its confidential return to the class teacher two school weeks from the day it was distributed among the classes.

\textit{ii. Pilot Study}

The lunchbox questionnaire was piloted before conducting the study (Appendix 7). The pilot sample group consisted of several children in fourth class attending a primary school in South Dublin, mirroring the characteristics of those eligible in the participating primary school. The pilot group completed the questionnaire with little difficulty. They were, however, unaware of the meaning of the word ‘questionnaire’. In an attempt to determine what word ‘questionnaire’ should be replaced with, a variety of suggestions
were offered to the pilot group, including ‘Lunchbox Survey’. The pilot group failed to understand the replacement words, leading to the conclusion that the questionnaires could be used as a beneficial learning aid in which the class will learn a new word following the researcher’s introduction to the study. By piloting the lunchbox questionnaire, the researcher was able to determine how long the lunchbox questionnaire would take the children to complete.

The General Nutrition Knowledge Questionnaire for Adults was also piloted to allow necessary adaptations be employed to suit the Irish population. The pilot group consisted of five Irish adults. The outcome of this pilot was that certain foods mentioned were not commonly consumed in Ireland, suggesting that some individuals may not be able to answer questions about these foods. As a result of this feedback, certain food items were removed from the final edition of the questionnaire (Appendices 11 and 12). Section five, the section regarding personal information, also underwent some changes. Certain questions, for example those regarding income, were removed as investigating this area was not an aim of the study. Other areas in this section were replaced, for example the stages of education, in order to reflect that of the Irish education system. This pilot study also allowed the researcher to estimate the time it would take to complete the questionnaire.
iii. **Introducing the Lunchbox Questionnaire**

Each of the participating school children received a lunchbox questionnaire (Appendix 8). The researcher gave a brief outline of the study, stating that it was to determine what foods are commonly packed in school children’s lunchboxes. The researcher explained that a ‘questionnaire’ was something that had a list of questions that needed answering by the person who it was given to. This definition was related to what was required of the subjects by stating that they had to answer the question of which foods were in their lunchbox that particular day. The children claimed to understand what was meant by this, and so were instructed on how to complete the questionnaire. The researcher used the same explanations and definitions for both classes to ensure uniform understanding of what was expected of the subjects.

iv. **Lunchbox Questionnaire**

A lunchbox questionnaire was created in order to determine what foods were included in the children’s lunchboxes. Validated lunchbox questionnaires found during the research process were based on weighing each food item of every child’s lunch and any leftover waste after lunch. These lunchbox questionnaires could not be utilized, however, as weighing what the children did/did not consume was not an aim of this study. The created lunchbox questionnaire was based on the work of Evans & Cade (2007), and consisted of eight simple questions. The first two questions were to determine the child’s sex and who packed their lunchbox on that particular day. The following questions
consisted of different lunchbox items, requiring the participant to ‘tick’ what food from
the list was present in their lunchbox. The lunchbox questionnaire was conducted after
morning registration so that no food would have been eaten from the children’s
lunchboxes, in an attempt to reduce the likelihood of the children guessing foods. The
children were instructed to ‘tick’ the foods that were present in their lunchbox; not the
foods that they liked or disliked. The children took home a General Nutrition Knowledge
Questionnaire for Adults to their parent/guardian, and it was stressed to the children that
the parent/guardian who packed their lunch on that particular day should complete the
questionnaire. The lunchbox questionnaires and the General Nutrition Knowledge
Questionnaires for Adults were numbered accordingly so that they could be paired up for
analysis.

v. Non-participating Children

After receiving permission from the school principal, the two class teachers and the lead
researcher met to discuss what activities could be undertaken for those whose
parents/guardians did not wish for their child and/or themselves to participate. At the
time of the study, the children were being encouraged to take up reading as a leisure time
activity, and so it was decided that the children who were not to participate in the study
would read from their library books for the estimated 20 minutes in which the
questionnaire would take.
vi. General Nutrition Knowledge Questionnaire for Adults

The General Nutrition Knowledge Questionnaire for Adults (Appendix 12) was an edited version of the general nutrition knowledge questionnaire for adults created by Parmenter & Wardle (1999) (Appendix 10). The reliability of the questionnaire was previously tested by Parmenter & Wardle (1999) and had proven highly reliable. The test-retest reliability also proved consistent. The questionnaire was made up of five sections. The first section was on expert advice, consisting of questions associated with what health professionals recommend for the general public. The second section consisted of questions based on the food groups, with participants being required to determine whether certain foods were high or low in certain nutrients. The third section was about choosing foods. In this section, participants were presented with a list of choices and were required to ‘tick’ which option they felt most appropriate to the scenario. The fourth section was on diet-disease relationships, and required participants to note what diseases they were aware of, if any, relating to too low/high an intake of certain nutrients. The fifth and final section consisted of personal questions. The questionnaire was predicted to take approximately 20 minutes to complete.

vii. Scoring System

The lunchbox questionnaire scoring system (Appendix 9), based on that used by Evans & Cade (2007), consisted of a plus/minus point system, depending on whether the foods were considered as healthy or unhealthy. Each food considered as healthy was awarded a
plus point, whereas each food considered as unhealthy was marked with a minus point. Foods that fell into more than one category were categorised into all eligible food groups and given a score for each one, for example; cheese was placed in both the protein and dairy groups. The categories determining the food groups were based on the food categories recommended by the School Food Trust (SFT) (School Food Trust, 2007). According to the SFT, primary school lunchboxes should contain at least;

- One portion of fruit and one portion of vegetables;
- One portion of milk or one portion of dairy;
- One portion of meat, fish, or other protein source;
- One portion of starchy food.

A lunchbox is considered healthy if it comprises of all these food groups. Unhealthy food items were categorised according to the healthy eating pyramid, and what the SFT considered inappropriate for lunchboxes. There are no recommended portion sizes for children, and for this reason it was decided that the presence of each of these food groups was classed as a portion, allowing the plus or minus point to be given.
Table 3.1 Healthy and Unhealthy Lunchbox Items

<table>
<thead>
<tr>
<th>Healthy Lunchbox Items</th>
<th>Unhealthy Lunchbox Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandwiches/rolls/bagels/pitas/wraps</td>
<td>Sweets</td>
</tr>
<tr>
<td>Salads</td>
<td>Chocolate bars</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Processed fruit bars</td>
</tr>
<tr>
<td>Yoghurts/fromage frais</td>
<td>Cereal bars</td>
</tr>
<tr>
<td>Fruit</td>
<td>Crisps and crisp like products</td>
</tr>
<tr>
<td>Nuts/seeds with no added salt</td>
<td>Bombay mix</td>
</tr>
<tr>
<td>Plain popcorn</td>
<td>Salted popcorn</td>
</tr>
<tr>
<td>Water</td>
<td>Cakes/Muffins/Pastries</td>
</tr>
<tr>
<td>Milk</td>
<td>Biscuits</td>
</tr>
<tr>
<td>Pure fruit/vegetable juices</td>
<td>Flavoured water</td>
</tr>
<tr>
<td>Yoghurt/milk based drinks</td>
<td>Squash/cordials</td>
</tr>
<tr>
<td>Smoothies (with less than 5% added sugar)</td>
<td>Fizzy drinks</td>
</tr>
<tr>
<td></td>
<td>Sports drinks</td>
</tr>
</tbody>
</table>

Adapted from School Food Trust (2007)

The General Nutrition Knowledge Questionnaire for Adults (Parmenter & Wardle, 1999) has its own validated scoring system (Appendix 13) with points being awarded for correct or partially correct answers. This scoring system was adapted to suit the changes of the edited questionnaire (Appendix 14).

3.4 Analysis

Statistical testing was applied to analyse the data. Analyses were undertaken using SPSS version 16.0. The independent/dependent variables varied depending on the hypothesis. The first hypothesis claimed that the lunches provided will depend on the level of parental nutritional knowledge, meaning that the independent variable was the level of
nutrition knowledge and the dependent variable was the packed lunches provided. The second hypothesis claimed that the level of parental nutritional knowledge will depend on the individual’s level of education, meaning that the independent variable was level of education and the dependent variable was the level of nutrition knowledge. Descriptive statistics were conducted for each of the statistical tests undertaken and for each section of the General Nutrition Knowledge Questionnaire for Adults. To determine whether the hypotheses were true, correlations and a test of difference were undertaken. Parametric testing was applied to those data that were normally distributed, and the non-parametric equivalent was applied to those data that were not normally distributed. To determine whether the data was normally distributed, the Kolmogorov-Smirnov figures were consulted as there were less than one hundred subjects in the sample group. The $p<0.05$ level of significance was used. A Pearson’s correlation was conducted to determine whether there was a relationship between level of parental nutritional knowledge and the foods they provide their children in their packed lunches. A Spearman’s rho was undertaken in order to establish any correlations between parental level of nutritional knowledge and level of education. An Independent T-Test was carried out to determine whether girls were provided with healthier lunches than boys. Graphs and tables were produced for data that was not being statistically assessed.
4. Results

Of the 58 potential participants, 66% provided consent for both the lunchbox questionnaire and the General Nutrition Knowledge Questionnaire for Adults, of which 92% completed and returned both questionnaires.

4.1 Demographics of study population

i. Age

The most commonly reported age bracket for the parents/guardians was 35-44 years. Using the age groups marked, the average age of the adult participants was calculated as 38 years. Primary school children in fourth class are between 8-9 years old.

ii. Gender

More boys than girls completed the lunchbox questionnaire, 19 and 16 respectively. The children determined who packed their lunch. Using this data, it is believed that 28 females and 7 males completed the General Nutrition Knowledge Questionnaire for Adults. However, the sex of the parent/guardian was not investigated.
iii. **Ethnic Origin**

The study population was made up of Irish citizens. 97% of the population was white.

iv. **Level of Education**

The trend for level of education increased from Primary to Secondary – Leaving Certificate, peaked at this point, and began to decline until reaching zero at Postgraduate Degree.

*Table 4.1 Section 5 Question 2*

<table>
<thead>
<tr>
<th>Level of Education</th>
<th>Number of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>2</td>
</tr>
<tr>
<td>Secondary – Junior Certificate</td>
<td>3</td>
</tr>
<tr>
<td>Secondary – Leaving Certificate</td>
<td>11</td>
</tr>
<tr>
<td>FAS Learning Course</td>
<td>4</td>
</tr>
<tr>
<td>Diploma</td>
<td>9</td>
</tr>
<tr>
<td>Degree</td>
<td>6</td>
</tr>
<tr>
<td>Postgraduate Degree</td>
<td>0</td>
</tr>
</tbody>
</table>
v. Health/Nutrition Qualifications

9% of the adult population had previous health/nutrition related qualifications, as highlighted by Table 4.2 below.

Table 4.2 Section 5 Question 3

<table>
<thead>
<tr>
<th>Health/Nutrition Qualifications</th>
<th>Number of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Nurse</td>
<td>1</td>
</tr>
<tr>
<td>Dental</td>
<td>1</td>
</tr>
<tr>
<td>First Aid Instructor</td>
<td>1</td>
</tr>
</tbody>
</table>

4.2 Lunchbox Questionnaire Results

Table 4.3 below demonstrates the descriptive statistics for the lunchbox questionnaire results, displaying the average, the lowest and the highest score.

Table 4.3 Descriptive Statistics

<table>
<thead>
<tr>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.63</td>
<td>0.478</td>
<td>-5</td>
<td>7</td>
</tr>
</tbody>
</table>
Every lunch contained at least one portion of starchy food. 24 lunchboxes contained a protein portion and 25 lunchboxes contained fruit. 18 lunchboxes contained no dairy portion and 30 contained no vegetable portion. Figure 4.1 highlights these figures.

Figure 4.1 Number of food groups in lunchboxes
ii. Multiple Food Portions

Figure 4.2 below illustrates how many lunchboxes contained more than one portion from the food groups recommended for inclusion in lunchboxes by the SFT. Five lunchboxes contained both a portion of fruit and a portion of vegetables. Eight lunchboxes contained more than one portion of fruit, and two lunchboxes contained more than one vegetable portion. Three lunchboxes contained more than one portion of protein, which was mainly in the form of ham and cheese sandwiches, and five contained more than one dairy portion. Two lunches contained at least one item from each food group.

![Lunchboxes with more than one Food Group](image)

*Figure 4.2 Lunchboxes with more than one food group*
iii. **Unhealthy Foods**

The unhealthy food items which were reported in the lunchbox questionnaire are illustrated in Figure 4.3. Crisps were the most common unhealthy food item brought to school, closely followed by cereal bars. Chocolate and biscuits were also frequently reported. Four children were provided with cakes and one child brought salted popcorn as a snack food. 27 lunchboxes contained at least one unhealthy food, and 11 had more than one unhealthy item.

![Figure 4.3 Unhealthy food items](image-url)
iv. **Drinks**

The drinks in which the children brought as part of their lunch are outlined in Figure 4.4. Every child brought at least one drink to school. 66% brought water in their lunchbox. One child had a fizzy drink. Drinks included in ‘Other’ consisted of various cordial drinks, such as Ribena.

![Drinks in Lunchboxes](image_url)

*Figure 4.4 Drinks included in lunchboxes*
v. Differences between genders

Figure 4.5 visually illustrates the similarities and differences between the lunches provided for girls and boys. Boys had more dairy and protein portions in their lunch, whereas girls had more fruit portions. Vegetables were absent from all the boys’ lunches. Overall, girls tended to have more unhealthy food items than boys.

*Figure 4.5 Difference between boys and girls lunchboxes*
4.3 General Nutrition Knowledge Questionnaire for Adults Results

Overall, the parents scored an average of 61% (SD = 1.99%) in the General Nutrition Knowledge Questionnaire for Adults. Six parents/guardians scored below 50%, and the remaining 29 parents/guardians scored above 50%. The lowest score was 36% and the highest score was 81%.

I. Section 1

Section 1 assessed awareness of expert advice and recommendations. Table 4.4 below demonstrates the descriptive statistics for section 1, displaying the average, the lowest and the highest number of correct answers out of a total of 11 questions.

Table 4.4 Descriptive Statistics

<table>
<thead>
<tr>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.51</td>
<td>0.23</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>
The first question in this section was to investigate whether participants were aware of what foods the population should be eating more or less of. Table 4.5 below highlights the findings from this question.

Table 4.5 Section 1 Question 1

Do you think health experts recommend that people should be eating more, the same amount, or less of these foods?

<table>
<thead>
<tr>
<th>Food</th>
<th>Answered Correctly</th>
<th>Answered Incorrectly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>34</td>
<td>1</td>
</tr>
<tr>
<td>Sugar</td>
<td>33</td>
<td>2</td>
</tr>
<tr>
<td>Meat</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Starch</td>
<td>2</td>
<td>33</td>
</tr>
<tr>
<td>Fatty Foods</td>
<td>34</td>
<td>1</td>
</tr>
<tr>
<td>Fibre</td>
<td>33</td>
<td>2</td>
</tr>
<tr>
<td>Fruit</td>
<td>35</td>
<td>0</td>
</tr>
<tr>
<td>Salt</td>
<td>32</td>
<td>3</td>
</tr>
</tbody>
</table>

These results show a high level of awareness to increase fruit, vegetable and fibre intake, and reduce the consumption of sugary, salty and fatty foods. 94% of participants were unaware that consumption of starchy foods should be increased, and the majority of the sample group believed levels of meat consumption should remain the same.
ii. **Question 2**

The second question was to determine whether participants were aware of how many portions of fruit and vegetables should be consumed on a daily basis. Table 4.6 below highlights the findings from this question.

**Table 4.6 Section 1 Question 2**

How many servings of fruit and vegetables a day do you think health experts are advising people to eat?

<table>
<thead>
<tr>
<th>Answers given</th>
<th>Number of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Blank</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.6 illustrates that 86% of participants understood expert advice to consume 5-6 portions of fruit and vegetables daily. This high percentage was to be expected as only one individual answered the previous question regarding fruit and vegetable consumption incorrectly.
iii. Questions 3 & 4

Questions three and four in this section were to determine whether individuals were aware of what type of fat and dairy foods they should be consuming. Tables 4.7 and 4.8 highlight the findings from these questions.

Table 4.7 Section 1 Question 3

Which fat do experts say is most important for people to cut down on?

<table>
<thead>
<tr>
<th>Saturated Fat</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyunsaturated Fat</td>
<td>2</td>
</tr>
<tr>
<td>Monounsaturated Fat</td>
<td>2</td>
</tr>
<tr>
<td>Blank</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.8 Section 1 Question 4

What version of dairy foods do experts say people should eat?

<table>
<thead>
<tr>
<th>Lower Fat</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Fat</td>
<td>1</td>
</tr>
<tr>
<td>Mixture of full and low fat</td>
<td>8</td>
</tr>
<tr>
<td>Neither, dairy should be cut out</td>
<td>1</td>
</tr>
<tr>
<td>Not Sure</td>
<td>1</td>
</tr>
</tbody>
</table>
These results also illustrated a relatively high level of awareness of recommendations to reduce levels of saturated fat in the diet, and increase the consumption of lower fat dairy products.

II. Section 2

Section 2 involved answering questions on food groups. Tables and graphs in this section outline the number of adults who answered questions correctly, unless otherwise stated. Table 4.9 below demonstrates the descriptive statistics for section 2, displaying the average, lowest and highest amount of correct answers obtained from the sample group out of 66 questions.

*Table 4.9 Descriptive Statistics*

<table>
<thead>
<tr>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>40.94</td>
<td>1.39</td>
<td>23</td>
<td>56</td>
</tr>
</tbody>
</table>
The results from question 1 found that participants were relatively aware of whether foods were high or low in added sugar. The highest number of correct answers was obtained for ice cream, where 88% correctly identified it as being high in added sugar. Orange squash received the most incorrect answers with 34% of adults believing it is low in added sugar. Figure 4.6 illustrates the number of participants that answered question one correctly.

![Figure 4.6 Section 2: Question 1]
ii. **Question 2**

The most common question answered incorrectly in question 2 was for low fat spread, where 86% of subjects marked it as being low in fat. Bread was incorrectly marked as being high in fat by 74% of subjects. 63% of subjects believed cottage cheese was high in fat, and 57% believed that polyunsaturated margarine was low in fat. Figure 4.7 illustrates the number of participants that answered question two correctly.

![Figure 4.7 Section 2: Question 2](image)
iii. **Question 3**

The level of knowledge was relatively high in question 3. Nuts and porridge were the two foods most commonly placed in the wrong food group, with 49% of the sample population being unaware that nuts were not part of the starchy food group, and 51% being unaware that porridge was a starchy food. Figure 4.8 below highlights the number of participants that answered this question correctly.

![Figure 4.8 Section 2: Question 3](image-url)
iv. Question 4

Question 4 investigated whether the adults were aware of which foods are high in salt. All subjects were aware that sausages are high in salt. 46% of parents/guardians incorrectly reported that meat is high in salt. 11 subjects believed that frozen vegetables are high in salt. Figure 4.9 illustrates the number of participants that answered question four correctly.

![Bar graph showing the number of correct answers for different food items in Question 4.](image)

*Figure 4.9 Section 2: Question 4*
v. **Question 5**

There was a high level of nutritional awareness for question 5, with few foods being incorrectly labelled regarding their protein content. Cream, butter and cheese were the least known protein foods; however a large proportion of the sample group answered these correctly.

*Table 4.10 Section 2 Question 5*

**Do you think these are high or low in protein?**

<table>
<thead>
<tr>
<th></th>
<th>Answered Correctly</th>
<th>Answered Incorrectly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cream</td>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td>Butter</td>
<td>26</td>
<td>9</td>
</tr>
<tr>
<td>Beans</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Fruit</td>
<td>29</td>
<td>6</td>
</tr>
<tr>
<td>Cheese</td>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td>Chicken</td>
<td>33</td>
<td>2</td>
</tr>
</tbody>
</table>
There were few incorrect answers regarding the level of fibre in certain foods. The most incorrectly answered food was corn flakes, with 51% of participants believing they are a high fibre food. Nuts and fish were incorrectly categorized by 11 adults. Figure 4.10 illustrates the number of participants that answered question one correctly.

![Do you think these are high or low in fibre?](image)
vii. **Question 7**

The most common incorrect answer in question 7 was for sunflower margarine with 51% of subjects reporting it as high in saturated fat. This was closely followed by red meat and olive oil. Chocolate received the most correct answers (n = 29).

![Bar chart showing correct answers for different fatty foods](image)

*Figure 4.11 Section 2: Question 7*

viii. **Question 8**

66% of subjects were unaware that some foods contain a lot of fat but no cholesterol. 34% correctly agreed to this statement, while 31% disagreed, 31% were unsure and 1 participant left the answer blank.
ix. Question 9

60% of parents/guardians were aware that both liver pate and quiche are not healthy alternatives to red meat. There was less consistency regarding the foods that are healthy alternatives, with 69% of adults being aware that baked beans are a healthy alternative, 54% aware that nuts are, and 49% being aware that low fat cheese is a healthy alternative to red meat.

x. Question 10

77% of participants knew that a glass of unsweetened fruit juice counts as a helping of fruit.
xii. Question 12

Over half the sample group (51%) believed that brown sugar was a healthy alternative to white sugar.

xiii. Question 13

40% agreed with the statement that there is more protein in a glass of whole milk compared to a glass of skimmed milk. 22% of adults were unsure of the answer to this question.
Almost every adult answered question 14 incorrectly. 91% of the sample group was unaware that polyunsaturated margarine does not contain less fat than butter.

Table 4.12 Section 2 Question 14

<table>
<thead>
<tr>
<th>Question 14</th>
<th>Polyunsaturated margarine contains less fat than butter</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) agree</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>(b) disagree</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>(c) not sure</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Left Blank</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

94% of the parents/guardians were aware that wholegrain bread contains the most vitamins and minerals out of the varieties stated.
The lack of knowledge regarding margarine and butter was reinforced when 83% of the parents/guardians answered question 16 incorrectly. 17% were aware that both margarine and butter are similar in calorie content.

Table 4.13 Section 2 Question 16

<table>
<thead>
<tr>
<th>Question 16</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which do you think is higher in calories: butter or regular margarine?</td>
<td></td>
</tr>
<tr>
<td>(a) butter</td>
<td>24</td>
</tr>
<tr>
<td>(b) regular margarine</td>
<td>3</td>
</tr>
<tr>
<td>(c) both the same</td>
<td>6</td>
</tr>
<tr>
<td>(d) not sure</td>
<td>2</td>
</tr>
</tbody>
</table>
xvii. Question 17

46% of participants were aware that olive oil contains mostly monounsaturated fat, despite some claiming that olive oil was high in saturated fat in question 7.

*Table 4.14 Section 2 Question 17*

<table>
<thead>
<tr>
<th>Question 17</th>
<th>A type of oil which contains mostly monounsaturated fat is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) coconut oil</td>
<td>0</td>
</tr>
<tr>
<td>(b) sunflower oil</td>
<td>9</td>
</tr>
<tr>
<td>(c) olive oil</td>
<td>16</td>
</tr>
<tr>
<td>(d) palm oil</td>
<td>0</td>
</tr>
<tr>
<td>(e) not sure</td>
<td>9</td>
</tr>
<tr>
<td>Left Blank</td>
<td>1</td>
</tr>
</tbody>
</table>

xviii. Question 18

54% agreed that there was more calcium in whole milk than in skimmed milk. It is however, the opposite that is true.
Question 19 involved asking which of certain nutrients had the most calories for the same weight. Results showed that 18 subjects were unaware that the correct answer was fat, with a high proportion of subjects (n = 8) stating sugar as the answer.

![Pie Chart](Figure 4.12 Section 2: Question 19)

*Figure 4.12 Section 2: Question 19*
xx. Question 20

Over half the population (57%) correctly stated that hard fats contain more saturated fat than other types of fat.

*Table 4.15 Section 2 Question 20*

**Harder fats contain more:**

<table>
<thead>
<tr>
<th></th>
<th>Number of Correct Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monounsaturates</td>
<td>0</td>
</tr>
<tr>
<td>Polyunsaturates</td>
<td>2</td>
</tr>
<tr>
<td>Saturates</td>
<td>20</td>
</tr>
<tr>
<td>Not Sure</td>
<td>12</td>
</tr>
<tr>
<td>Blank</td>
<td>1</td>
</tr>
</tbody>
</table>
Question 21 illustrated that 22 of 35 subjects were unaware that polyunsaturated fats were found mainly in vegetable oils.

Table 4.16 Section 2 Question 21

<table>
<thead>
<tr>
<th>Question 21</th>
<th>Polyunsaturated fats are mainly found in</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a) vegetable oils</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>(b) dairy products</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>(c) both (a) and (b)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(d) not sure</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Left Blank</td>
<td>1</td>
</tr>
</tbody>
</table>

III. Section 3

Section 3, Choosing Food, revealed no particular trend with regards nutritional knowledge. Table 4.17 below demonstrates the descriptive statistics for section 3, displaying the average, the lowest, and the highest amount of correct answers out of a total of 10 questions.
Table 4.17 Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.29</td>
<td>0.401</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

i. Question 1

Question 1 was answered incorrectly by over half of the study population, 54% of subjects. 43% of subjects were swayed by the ‘distracter’ item and claimed that a muesli bar was the best option for a low fat, high fibre snack, as opposed to raisins.

Figure 4.13 Section 3: Question 1
ii. Question 2

71% of the adults were aware that beans on wholemeal toast was the best choice for a low fat, high fibre light meal.

iii. Question 3

Over half the study population (54%) answered question 3 incorrectly. 19 parents/guardians were unaware that two thick slices of bread with a thin slice of cheese was healthier than two thin slices of bread with a thick slice of cheese.

iv. Question 4

Question 4 was answered well. 80% of adults correctly stated that a large amount of pasta with a small amount of sauce was the healthier of the two options.
v. **Question 5**

Question 5 received the most correct answers, with 86% of the subjects being aware that grilled turkey was the healthiest option.

![Bar chart showing food choices](image)

*Figure 4.14 Section 3: Question 5*

vi. **Question 6**

Two-thirds of subjects correctly marked that thick cut chips were the best choice to reduce fat in the diet. Of those who answered the question incorrectly, the majority (83%) believed that thin cut chips were the correct answer.
vii.  Question 7

Subjects were required to mark what could be the best option for a sweet snack for someone trying to reduce sugar consumption. 77% of subjects correctly identified the banana with plain yoghurt as the most appropriate choice.

viii. Question 8

60% of parents/guardians correctly stated that the baked apple was the healthiest pudding out of four options.
ix. **Question 9**

Question 9 showed that 66% of participants were unaware which type of cheese out of four available options would be the best choice for a low fat option. Two participants left this question blank.

![Bar chart showing cheese choices](chart)

*Figure 4.15 Section 3: Question 9*

x. **Question 10**

Almost two-thirds of the sample group (63%) chose the mushroom omelette for the best low salt meal. Almost 40% believed stir fry with soy sauce to be the lowest salt option.
IV. Section 4

Section 4 investigated participant knowledge regarding diet-disease relationships. Table 4.18 below demonstrates the descriptive statistics for section 4, displaying the average, lowest, and the highest amount of correct answers out of 17 questions.

Table 4.18 Descriptive Statistics

<table>
<thead>
<tr>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.89</td>
<td>0.405</td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
</table>
i. **Question 1**

Question 1 asked which diseases the subject was aware of relating to an inadequate fruit and vegetable intake. This was the most inconsistently answered question of section 4. 46% of the participants answered this question as either ‘no’, ‘unsure’, or incorrectly. Cancer, scurvy and bowel cancers were the three most commonly reported health consequences. Figure 4.16 below illustrates the reported diseases.

![Graph showing reported diseases](image)
The health consequences of insufficient fibre in the diet were the best known answer of the diet-disease relationships. Bowel and digestion problems were the most commonly stated answers.

Figure 4.17 Section 4: Question 2
iii.  Question 3

24 of the 28 subjects who answered question 3 regarding consuming too much sugar in the diet mentioned diabetes, with dental problems being mentioned on five occasions.

Figure 4.18 Section 4: Question 3
iv. **Question 4**

Question 4 found 14 of 27 subjects mentioned high blood pressure as a result of consuming too much salt in the diet. This was closely followed by heart disease, which was mentioned on 10 occasions.

![Frequency of Reported Diseases](image)

*Figure 4.19 Section 4: Question 4*
v. **Question 5**

54% of subjects mentioned obesity as a disease associated with too much fat in the diet. Heart disease followed closely behind obesity being reported on 14 occasions.

![Diagram showing the frequency of reported diseases](image)

*Figure 4.20 Section 4: Question 5*

vi. **Remaining Questions**

When asked whether eating more fibre, fruit and vegetables would assist in reducing the risk of developing certain cancers in question 6, relatively few subjects answered incorrectly (31%), suggesting that they were aware that increasing consumption of these would be beneficial. Subjects were aware of the association between saturated fat, salt, fruit and vegetable consumption and heart disease, as 91% of the adults correctly answered question 7. A low number of subjects (n = 19) were aware of antioxidants. Of the 54% of subjects who claimed to be aware of these vitamins, one parent/guardian
correctly answered question 10. Four of those who marked that they had heard of antioxidants marked ‘unsure’ for each option.

4.4 Statistical Testing

i. Level of Nutritional Knowledge and Health Status of Lunchboxes

An aim of the study was to determine whether any relationship exists between the level of parental nutritional knowledge and the health status of their child’s lunchbox. Statistical testing had to be undertaken in order to determine whether a relationship exists between parental nutritional knowledge and the health status of their child’s lunch. Before deciding on what statistical test to undertake, the level of data was first determined. The level of data for the lunchbox questionnaire was interval as it had order and distance, but had no origin. The level of data for the General Nutrition Knowledge Questionnaire for Adults was ratio as it had order, distance and an origin. These levels of data mean parametric statistical testing was applied. A Pearson’s correlation was undertaken as correlations are undertaken when investigating whether any relationships exist between data, and the data has been established as parametric. When undertaking parametric statistical testing, descriptive statistics must be conducted to determine whether or not the data is normally distributed.

The Tests of Normality (Appendix 15) illustrated that the data was normally distributed, meaning the Pearson’s correlation could be conducted. After following the correct
procedure to generate the Pearson’s correlation data, the ‘Sig. (2-tailed)’ data was consulted to determine whether the relationship was statistically significant ($p<0.05$).

**Table 4.19 Pearson’s Correlation**

<table>
<thead>
<tr>
<th></th>
<th>parent</th>
<th>children</th>
</tr>
</thead>
<tbody>
<tr>
<td>parent</td>
<td>Pearson Correlation</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>35,000</td>
</tr>
<tr>
<td>children</td>
<td>Pearson Correlation</td>
<td>.079</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.650</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 4.19 highlights that the relationship between level of nutritional knowledge and the health status of the lunchboxes is not significant, $p>0.05$. Cohen & Holliday (1996) created a means of interpreting coefficients, as outlined in Table 4.20. The $r$ value obtained from Table 4.19 is 0.079, indicating a very low positive correlation between the two factors.
Table 4.20 Interpretation of Coefficients (Cohen & Holliday, 1996)

<table>
<thead>
<tr>
<th>r Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 – 0.19</td>
<td>A very low correlation</td>
</tr>
<tr>
<td>0.20 – 0.39</td>
<td>A low correlation</td>
</tr>
<tr>
<td>0.40 – 0.69</td>
<td>A modest correlation</td>
</tr>
<tr>
<td>0.70 – 0.89</td>
<td>A high correlation</td>
</tr>
<tr>
<td>0.90 – 1.00</td>
<td>A very high correlation</td>
</tr>
</tbody>
</table>

The findings from these results demonstrate that the food included in children’s lunchboxes is not a reflection of parental nutritional knowledge.

**ii. Level of Nutritional Knowledge and Level of Education**

Another aim of the study was to determine whether there is a relationship between the level of parental nutritional knowledge and their level of education. Statistical testing had to be undertaken in order to determine whether a relationship exists between parental nutritional knowledge and their level of education. Before deciding on what statistical test to undertake, the level of data was first determined. The level of data for the General Nutrition Knowledge Questionnaire for Adults was ratio as it had order, distance and an origin. The level of data for the stage of education was ordinal as it failed to fit the criteria of ratio or interval data as it has no distance, meaning that non-parametric testing was applied. A Spearman’s rho was undertaken as correlations are undertaken when the researcher is investigating whether any relationship exists between data, and Spearman’s rho is the non-parametric equivalent. Non-parametric tests have no assumptions to be met. After following the correct procedure to generate the Spearman’s rank correlation
data, the ‘Sig. (2-tailed)’ data was consulted to determine whether the relationship is statistically significant ($p<0.05$).

**Table 4.21  Spearman’s Rank Correlation**

<table>
<thead>
<tr>
<th>Correlations</th>
<th>parent</th>
<th>education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman's rho</td>
<td>parent Correlation Coefficient</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>35</td>
</tr>
<tr>
<td>education</td>
<td>Correlation Coefficient</td>
<td>-0.030</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td><strong>866</strong></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 4.21 highlights that the relationship between level of nutritional knowledge and level of education is not significant, $p>0.05$. Cohen & Holliday (1996) created a means of interpreting coefficients, as outlined in Table 4.22. The $r$ value obtained from Table 4.21 is -0.030, indicating a very low negative correlation between the two factors.

**Table 4.22 Interpretation of Coefficients (Cohen & Holliday, 1996)**

<table>
<thead>
<tr>
<th>$r$ Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 – 0.19</td>
<td>A very low correlation</td>
</tr>
<tr>
<td>0.20 – 0.39</td>
<td>A low correlation</td>
</tr>
<tr>
<td>0.40 – 0.69</td>
<td>A modest correlation</td>
</tr>
<tr>
<td>0.70 – 0.89</td>
<td>A high correlation</td>
</tr>
<tr>
<td>0.90 – 1.00</td>
<td>A very high correlation</td>
</tr>
</tbody>
</table>
The findings from this statistical test demonstrate that level of education does not determine level of nutritional knowledge.

iii. Health Status of Boys and Girls

The final aim of the study was to determine whether the boys or the girls had healthier lunches. Statistical testing had to be undertaken in order to determine whether there was a significant difference between the health status of the girls’ lunches and the boys’ lunches. Before deciding on what statistical test to undertake, the level of data was first determined. The level of data for the lunchbox questionnaire was interval as it had order and distance but it had no origin. An Independent Samples T-Test was the statistical test of choice for analyzing the data, as the participants are being compared to investigate whether there is a gender difference between the health status of the lunchboxes. Independent Samples T-Tests are parametric statistical tests, and therefore certain assumptions must be met before undertaking one. The assumptions are:

- The data must be normally distributed as parametric tests assume the data is normally distributed, meaning data that is not normally distributed may over- or under-estimate statistic values (Hinton et al. 2004);
- The sample participants must be randomly selected from various populations so that statistic inference can be met. This allows the results to be more applicable to the general population and reduces bias (Williams & Wragg, 2004);
The spread of the scores must be relatively uniform, known as ‘homogeneity of variance’ (Williams & Wragg, 2004).

If these assumptions have been violated, the non-parametric equivalent must be undertaken (Williams & Wragg, 2004). The samples were randomly selected from their populations, meaning the assumption of normal distribution and homogeneity of variance must be met. The Tests of Normality (Appendix 15) and the Test of Homogeneity of Variance (Appendix 15) illustrated that the data met each of the assumptions and so the Independent Samples T-Test was conducted. In order to interpret the statistics generated from the Independent Samples T-Test, the table labelled ‘Independent Samples Test’ (Table 4.23) was consulted. The figure in the ‘Sig. (2-tailed)’ column in the ‘Independent Samples T-Test’ table was consulted, as this value determines any differences between means (Williams & Wragg, 2004).
The data displayed in Table 4.23 shows that there is no significant difference between groups ($p>0.05$).

These results show that there is no significant difference between the girls and the boys, meaning the hypothesis must be rejected as the girls did not have healthier lunches than that of the boys.
5. Discussion

5.1 Lunchboxes

Lunchboxes were investigated in an attempt to determine what foods are most commonly provided in children’s packed lunches. There were various reasons for focusing on lunches as opposed to other meals, including:

- Research has suggested that parents feed their children less healthy foods than what they eat themselves (St John Alderson & Ogden, 1999);
- Lunch accounts for approximately one third of a child’s energy intake and so should be nutritionally adequate to fulfill their dietary needs (Seaman & Moss, 2006);
- There is little available published research investigating the foods provided in lunchboxes in the Irish population.

After assessing the contents of the packed lunches, the study found that the standard of lunches was low. Only 6% of lunches complied with the recommended food group standards by including at least one portion from each food group, results which are in line with that of Evans & Cade (2007). Claims made by previous research, such as Gibson et al. (1998), stating that confectionary is a major contributor to a child’s diet and that unhealthy items are winning the battle against healthy options, are seen to be true in this study.
i. Starchy Foods

Every lunchbox contained a starchy food. This finding is of no surprise, however, as sandwiches are a staple of Irish school lunches. With the exception of one child, sandwiches were present in all lunchboxes. Only one lunch consisted of multiple starchy food portions.

ii. Protein Foods

At least one protein food was included in 24 of the lunchboxes. The most commonly reported protein food was ham. A total of 11 lunches had no protein foods, and only three lunchboxes contained more than one portion of protein. Protein is important during childhood for growth, repair, and other functions, such as enzyme and hormone production, making its inclusion in packed lunches important (Webster-Gandy et al. 2006).

iii. Dairy Foods

Dairy foods were absent from 18 lunchboxes. This is a cause for concern as dairy is important for bone health, and youth is the most important time for developing bone mass density (Thomas & Bishop, 2007). Cheese was the most commonly reported dairy item. The lack of dairy foods, such as yoghurts, may be due to the lack of refrigeration systems in school to keep foods cool, as many studies have reported this as an important barrier.
for the inclusion of yoghurts (Evans & Cade, 2007; Griffin & Barker, 2008). Five lunchboxes had more than one dairy portion.

iv. Fruit

71% of lunchboxes contained at least one fruit portion. This high figure is in stark contrast to the findings of the 2006 HBSC survey where only 19% of children reported consuming at least one portion of fruit daily, and only 30% of 3rd and 4th class children reported consuming at least one fruit portion daily. It is also an improvement on the findings of Clancy & Johnston (2003) where approximately 40% of children were provided with fruit in their lunchbox. These results imply that health promotion campaigns to promote the consumption of fruit, such as ‘Food Dudes’ and ‘Incredible Edibles’ have proven successful.

v. Vegetables

Vegetable portions were present in a mere five lunchboxes (14%), two of which had multiple portions. This figure is a further reduction on the HBSC survey (2006) findings which showed 18% of children reported consuming vegetables at least once per day, and approximately 22% of 3rd and 4th class children consumed at least one vegetable portion daily. These low levels of vegetable consumption found in both the present study and the HBSC survey (2006) have been reported throughout literature. Conway et al. (2002), for example, found only 5% of packed lunches in their study contained any vegetables.
Evans & Cade (2007) stated only 20% of their population had a vegetable portion. Vegetables were found only in the sandwiches of those who reported having vegetables in their lunchbox, with no child recording them as a snack food. One possible reason for excluding vegetables from sandwiches is that they may make the bread go soggy. Evans & Cade (2007) claim that the exclusion of fruit and vegetables from lunchboxes, such as that noted in this study will make it more difficult for children to achieve the recommended five portions of fruit and vegetables on a daily basis.

vi. Unhealthy Foods

The majority of lunchboxes (77%) had at least one unhealthy item, which is an improvement on the findings of Clancy & Johnston (2003) where they found 100% of the children had at least one unhealthy snack. Crisps were the most commonly reported unhealthy item (32%), followed by cereal bars (22%), while sweets were the least popular with virtually no children reporting that sweets were in their lunchbox. These findings are in line with those of Jefferson & Cowbrough (2004) where 69% of children reported crisps or a savory snack. The popularity of crisps may reflect their cheap price and convenience, costing less than fruit and vegetables and having a long shelf life (Evans & Cade, 2007). Of the 27 lunchboxes that had an unhealthy item; 11 children had more than one unhealthy item in their lunchbox; 4 had unhealthy items and no fruit or vegetables; 26 were missing at least one portion from other food groups but still had at least one unhealthy food item; and, 2 lunchboxes contained only one starchy food, but had multiple unhealthy items. Those with no fruit or vegetables in their lunchbox had at
least one unhealthy item. These trends fit research such as Jefferson & Cowbrough (2004) which states that unhealthy foods are replacing fruit and vegetables in lunchboxes (Jefferson & Cowbrough, 2004).

vii. Drinks

Surprisingly, water was the most frequently reported beverage accounting for 66% of reported drinks, and only one child had a fizzy drink. These drinks may have been a result of parents being aware of their child’s lunchbox being analyzed and so made a conscious effort to change the drinks usually provided. However, with such a large proportion of children consuming unhealthy items, this is unlikely to be the reason. Similarly to Evans & Cade (2007), there were no milk-based drinks in lunchboxes. This is of concern as calcium is important during childhood for the development of bones and teeth. Evans & Cade (2007) suggested that this may be due to a lack of fridges in schools to keep the milk cool. However, in this south Dublin primary school there is a lunchtime milk system in which children can opt to pay to have a carton of milk delivered to their class at lunchtime. Some of the children may avail of this system but neglected to tick milk in the drinks list as it wasn’t in their lunchbox at the time of assessment.
viii. Differences between genders

There was no significant difference ($p>0.05$) in the health status of the lunchboxes between the girls and the boys with results from the study illustrating that boys and girls are provided with relatively similar foods in their packed lunches. Boys reported more protein foods than girls, whereas girls reported having more fruit and none of the boys had any vegetable portions, with the five lunchboxes containing vegetables all belonging to girls. These findings are in line with results from the HBSC survey where it was established that girls consume more fruit and vegetables than boys (HBSC, 2006). Girls reported more unhealthy foods overall than boys. Dairy and fruit portions were relatively similar for both boys and girls. The absence of any difference between the two genders was surprising as research has suggested that girls consume healthier lunches than that of the boys. Conway et al. (2002) analysed packed lunches in an American school and concluded that girls had significantly less calories and energy intake than boys. This raises the question whether a significant difference would have emerged if a more comprehensive nutritional analysis of the lunchboxes had been conducted. It is possible that a more comprehensive analysis of the lunchboxes in this study would have found a significant difference; however this study concentrated solely on food groups, which may underestimate the actual nutritional composition of lunchboxes.
Lunchbox Summary

In summary, the packed lunches from this study indicate that the inclusion of a sandwich in a lunchbox is important, acting as the body of the meal. However, once the sandwich has been prepared and packed, there appears to be a reliance on energy dense, convenient foods and snacks to provide the rest of the lunchbox items. This may be due to various factors including, cost and convenience of these snack foods compared to fresh fruit and vegetables. Parents need to become aware of how to make appropriate substitutions to their child’s lunch. However, these changes may prove difficult as Griffin & Barker (2008) found that parents reported the lunch-making process more habit than an enjoyable experience, and Mintel (2009) released a report stating that parents believed that the contents of packed lunches should be left up to them. It is important to note that these results are based on what foods were reportedly included in the lunchboxes. No nutritional analysis was conducted and foods consumed were not assessed, as investigating foods consumed was not an aim of this study but to investigate the foods provided by parents/guardians.

5.2 General Nutrition Knowledge Questionnaire for Adults

The results from the General Nutrition Knowledge Questionnaire for Adults demonstrated that there was no significant \( p>0.05 \) relationship between nutritional knowledge and the foods provided in the children’s lunches.
Section one of the General Nutrition Knowledge Questionnaire for Adults was of particular importance as it focused on expert advice. Participants were required to state if experts recommend an increase or decrease in the consumption of certain foods and identify what type of fat and dairy products should be consumed. All adults correctly stated that fruit consumption should increase; with only one adult being unaware that vegetable intake should be increased. The recommendation to reduce the amount of fatty food in the diet was correctly identified by 34 participants. The majority of parents/guardians correctly stated that sugar and salt should be reduced and fibre foods should be increased. Surprisingly, only two adults were aware that starchy foods should be increased, while 20 were unaware that meat consumption should be reduced. This lack of knowledge regarding the intake of starchy foods is similar to previous research, for example Buttriss (1997) reported that participants of her study were unaware of public health messages to increase starchy foods, and Parmenter et al. (2000) found almost 90% of participants were unaware of the same advice. In their investigation into the level of nutritional knowledge in a sample of English adults, Parmenter et al. (2000) found that 51% of respondents were unaware of advice to reduce saturated fat intake and approximately 30% were unaware of recommendations to consume five portions of fruit and vegetables. These results are in stark contrast to the results of the present study as 86% of adults were aware of advice to reduce saturated fat intake and to consume five fruit and vegetable portions daily.
This section indicates that public health interventions, such as ‘Take 5 Steps….to a Healthier You’ (DOHC, 2005), a strategy promoting the consumption of fruit and vegetables and the reduction of fatty foods in an attempt to prevent obesity, have been successful at increasing awareness of these recommendations. It has been suggested that individuals who are unaware of the food pyramid recommendations may find adhering to health professional advice difficult (Variyam, 2001). However, this does not seem to be the case in this study as the packed lunches assessed did not reflect the level of nutritional knowledge of the parents/guardians. Only five lunchboxes contained vegetables, despite 97% of the adults being aware that vegetable consumption should be increased. Despite a high number of parents/guardians being aware to reduce fat, salt and sugar consumption, 27 lunches reportedly contained at least one unhealthy item, of which were high in at least one of these nutrients. There was no trend found for parents/guardians who answered questions in section 1 correctly and the foods they provided their children.

ii. Section 2 Analysis

Knowledge regarding food groups and composition was assessed in section 2. Question 1 showed a reasonable level of awareness regarding what counted as a food high in added sugar. However, orange squash was frequently regarded as being low in added sugar which is of concern as diluted drinks were commonly included in the packed lunches. Safefood (2009) reported that parents considered diluted drinks as a healthy alternative to fizzy drinks, and Cade et al. (2006) suggested that individuals may consider fruit drinks
as fruit juices, suggesting that parents are unaware of the nutritional composition of popular children’s beverages.

An unacceptably high number of adults (n = 30) incorrectly stated that low fat spread is low in fat. This may have been due to participant error as some individuals may have been reading and answering too quickly, allowing the words ‘low fat’ to stick out for the answer (Parmenter et al. 2000). It also may be due to a lack of knowledge of food labelling with people believing a product labelled as ‘low fat’ means that it is low in fat rather than a lower fat option (Lobstein & Davies, 2008). This highlights the need to educate parents in reading labels on food items. Unlike England, Ireland does not avail of food labelling systems, such as the Traffic Light System. These food labelling systems may help individuals to become more aware of food compositions and how to make appropriate substitutions. It may also educate the parents on understanding the terminology used on the labels, as the ‘healthier’ option is not always ‘healthy’ (Lobstein & Davies, 2008).
However, these labelling systems contain certain flaws, for example; the Traffic Light labels may mark cheese as red for fat and salt despite being an important source of calcium; and, they may cause people to generalize food groups and presume that all cheeses are high in fat. This may explain why 63% of the study population thought that cottage cheese was high in fat. 74% of parents/guardians incorrectly believed bread was high in fat. Low carbohydrate diets are often promoted by the media as a result of a celebrity losing weight through excluding carbohydrates from their diet (www.tescodiets.com, n.d.). As a result of these articles, people may believe that carbohydrate foods, such as bread, are high in fat.

Despite only 2 individuals correctly stating that the consumption of starchy foods should increase, question three was answered relatively well. The majority of subjects were aware of which foods were part of the starchy food groups. However there were some exceptions. Approximately half of the study population (51%) was unaware that porridge
is classed in the starchy food group. The classification of nuts also caused some confusion with 49% of the population being unaware that they were not part of this food group. This is in line with Parmenter et al. (2000) as approximately half their study group believed that nuts were a starchy food.

The level of knowledge regarding the level of salt in certain foods was disappointing. All parents/guardians were aware that sausages were high in salt and only 4 were unaware that pasta was low in salt. 34% believed kippers were low in salt. Surprisingly, 11 adults believed frozen vegetables were high in salt. An unexpectedly high number of adults (n = 15) were unaware that cheese was high in salt, which is higher than the findings of Parmenter et al. (2000). A high proportion of parents/guardians (46%) believed meat was high in salt, which is unacceptable. This may be due to the knowledge that meat products and processed meat, such as sausages, are high in salt. The responses may have been somewhat different had the question specified ‘fresh’ meat.

The adults had a good level of knowledge regarding protein containing foods. The parent/guardian sample group also had a relatively good command of what foods were high and low in fibre, with the exception of corn flakes. Over half the study population (51%) believed that corn flakes were high in fibre. These results are in line with Parmenter et al. (2000). This belief may be due to people classing maize alongside grains. However, maize is refined during the manufacture of corn flakes, and refined grains are not enriched with fibre after the milling process to replace what has been lost (www.mypyramid.gov, n.d.).
Knowledge regarding healthy alternatives to foods was inconsistent. 60% of parents/guardians were aware that liver pate and quiche are not healthy alternatives to red meat. However, approximately half the sample population was not aware that nuts and low fat cheese were healthy alternatives. Over half the sample group (51%) believed that brown sugar was a healthy alternative to white sugar. This may be a result of health professionals promoting the consumption of brown varieties of other foods, such as bread, rice and pasta.

Knowledge regarding fats and fatty foods does not seem to be clearly understood. 63% and 68% of adults failed to identify what foods polyunsaturated fat and saturated fat were mainly found in. However, 57% of subjects correctly stated that hard fats contain more saturated fat than other types of fat. Over half of the study population (57%) wrongly believed that polyunsaturated margarine was low in fat and 91% incorrectly claimed it contained less fat than butter. 51% classed sunflower margarine as high in saturated fat, while 69% of the sample group believed butter was more calorie dense than regular margarine; both of which are incorrect. 46% of adults correctly reported olive oil to be high in monounsaturated fat, despite some adults claiming that it was high in saturated fat in question 7. These results suggest that the participants guessed answers, and failed to relate back to previous questions, answering each one separately. Another reason for some of these results could be due to the terminology used in each question. People may consider polyunsaturated margarine as low in fat due to public health messages, for example the Food Pyramid, encouraging the shift from saturated fat to polyunsaturated and monounsaturated varieties.
This may have lead people to believe that polyunsaturated margarine is low in fat because it is better for our health as it is being encouraged by health professionals. Similarly, individuals may believe that polyunsaturated margarine has less fat than butter due to the inclusion of the buzz word ‘polyunsaturated’, which is being promoted as a healthy alternative to saturated fat, which may have lead people to believe that products containing this type of fat are lower in fat because they are being encouraged and promoted as a healthy alternative. Sunflower margarine may have been considered a high saturated fat product because the question failed to mention buzz words such as ‘saturated fat’, ‘polyunsaturated fat’ or ‘monounsaturated fat’ in the title of the food, as was the case for questions regarding polyunsaturated margarine, meaning people could not undertake an elimination process to decide what type of fat it is high in. The
participants may have presumed that because a high fat product such as margarine was included in the saturated fat category, it must be this type of fat that it is high in. This further reinforces the need to clarify nutritional terminology. This confusion between type of fats and the difference between margarine and butter has been consistently reported throughout literature. In 1997, Buttriss reported that subjects in her study believed that sunflower margarine was low in fat (Buttriss, 1997). In 1998, Variyam & Blaylock found that a mere 30% of participants in their study were aware that polyunsaturated fats were liquid and that saturated fats were solid. In 2000, Parmenter and co-workers further highlighted the lack of knowledge in this area when they reported that over 70% of subjects thought that butter contained more calories than polyunsaturated margarine.

A large proportion of subjects (23%) believed that sugar was the most calorific of all the options, with fewer than half the sample group stating fat as the answer. This finding is important in creating new health promotion campaigns. The high number of adults believing that sugar is the most calorific may be a result of new attention being brought to the consumption of sugar in our diets. Both adults and children are consuming large amounts of food from the top shelf of the food pyramid, with the HBSC reporting that 39% of Irish children consume sweets at least once daily and 26% consume soft drinks at least daily. The Survey of Lifestyle, Attitudes & Nutrition in Ireland (SLÁN) 2007 reported that 86% of Irish adults consume more than three servings of foods from the top shelf of the food pyramid, foods which should be consumed sparingly (Morgan et al. 2008; HBSC, 2006). It may also be a result of the new attention that is being put on soft
drinks and their potential contribution to the obesity crisis due to their high empty kilocalorie content (Grimm et al. 2004).

The results from this section suggest that health campaigns need to shift their focus onto other areas as the message of increasing fruit and vegetable consumption has apparently been well received at least in theory, however, as judging from the lunchboxes, this knowledge seems to be lacking in practice. Campaigns should target steps into putting this knowledge into action to increase awareness of how to incorporate these healthy eating messages into everyday life, as this may be a barrier that is preventing the transition between theory and behaviour.

iii. Section 3 Analysis

Section three consisted of ten questions in which participants had to choose a food they considered the healthiest option in the given scenario. The questions in this section varied considerably. Over half of the study population (54%) incorrectly answered the question regarding high fibre, low fat snacks. 43% of adults were taken in by the distracter item reporting that the muesli bar was the correct answer. Participants made this same mistake in the Parmenter et al. (2000) study. This may reflect the promotion of grains and nuts for a healthy heart. However, nuts are high in certain types of fat such as polyunsaturated fat, providing further evidence suggesting that these adults are incapable of determining the nutritional composition of a food. 54% of the study population incorrectly reported that two thick slices of bread with a thin slice of cheese was a
healthier snack than two thin slices of bread with a thick slice of cheese. This suggested that individuals were unaware of portion control, however the results from question 4 suggest this may not be the case as 80% of adults correctly stated that a large amount of pasta with a small amount of sauce was the healthier of the two options. Approximately two-thirds of parents/guardians correctly identified thick cut chips as the best option to reduce fat in the diet, and that the mushroom omelette was the best option to reduce salt intake. However, a large proportion of adults (40%) incorrectly reported stir fry with soy sauce to be the optimal low salt option, providing further support for the need of simplistic food labelling strategies to be put into place. 66% of the population was unaware of which type of cheese was the most appropriate for a low fat option, supporting the findings in section 2 that illustrate these adults are unaware of the fat composition of cheese.

iv. Section 4 Analysis

Section 4 was important as it allowed the researcher to determine whether the parents/guardians were aware of major health conditions associated with suboptimal intakes of various foods and nutrition. The results from this section demonstrate a poor level of awareness of diet-disease relationships.

The relationship between inadequate fruit and vegetable consumption and health consequences was the most inconsistently answered question. Some adults gave vague answers such as ‘lack of nutrients’, while others reported the development of diabetes
was a consequence of low fruit and vegetable intake. This suggests that the public are
unaware of reasons as to why they are being advised by health professionals to increase
their consumption of these foods. If they lack this knowledge, they are unlikely to be
motivated. This may reflect the lack of vegetables included in the lunches of their
children. Encouragingly, cancer and bowel problems were among the most frequently
reported risk factors. Parmenter et al. (2000) also found that knowledge in this area was
lacking as they reported that 41% of their subjects were unaware of the links between
fruit and vegetable intake and health problems.

A large proportion of adults were aware of the health risks related to inadequate fibre
intake. The most commonly reported health consequence was bowel problems.
Surprisingly, only 3 adults mentioned cancer as a health consequence. This low figure
was surprising due to the recent promotion of bowel cancer awareness, with the Irish
Cancer Society developing campaigns to increase public awareness of bowel cancer,
declaring April as Bowel Cancer Awareness Month (www.cardi.ie, 2009). The most
commonly reported bowel problems included constipation and irritable bowel syndrome.

86% of those who mentioned a health condition related to sugar consumption mentioned
diabetes. It is possible that the public have become more aware of diabetes as a health
condition due to health campaigns such as ‘Life’s Better Under 7’ (Condon, 2009).
Health awareness messages emphasize the importance of having blood sugars clinically
checked. This may have lead individuals to believe that sugar is the cause for type II
diabetes onset, as opposed to overall diet and lifestyle. Surprisingly only five participants
mentioned dental problems. This may be due to tooth decay not being regarded as a major health condition or disease. These results are in line with Parmenter et al. (2000).

24 of 27 adults were aware that high blood pressure and heart problems are associated with high salt intakes. The Irish Heart Foundation, along with SafeFood, launched ‘Time to Cut Down on Salt’ in 2004 which outlined the risk factors of consuming too much salt. By publishing the shocking statistics regarding the number of deaths annually in Ireland due to consuming too much salt, this public health message has apparently proved successful for increasing awareness of the health problems associated with salt consumption. However, this knowledge has failed to translate into behaviour as the packed lunches contained various high salt foods. Parents may therefore be unaware that these health consequences of salt consumption are also relevant for their children.

A mere 19 (54%) parents/guardians mentioned obesity when asked about major health problems or diseases associated with consuming too much fat. Shockingly, only two adults mentioned cancer as a result of fat intake. This suggests that individuals are unaware of the total health consequences of consuming too much fat in their diet.

A moderate proportion of subjects (69%) stated that they were aware that consuming fruit, vegetables and fibre would reduce/prevent the risk of cancer onset in question six. However, these results fail to link up to previously answered questions, such as question 2 in section 4 where cancer as a health consequence of inadequate fibre intake was only reported on three occasions, suggesting that people were guessing their answers when
they were provided with a ‘prompter’. This was also the case with question 7 when 91% correctly identified that reducing saturated fat, salt and increasing fruit and vegetables would prevent heart disease. However, heart disease was only mentioned once for fruit and vegetable consumption, on 10 occasions for fat consumption and 14 occasions for salt consumption. Questions 9 and 10 regarding antioxidant vitamins were poorly answered, mirroring the results of Parmenter et al. (2000). Parmenter et al. (2000) suggested that this was a result of how recent the discovery of these vitamins was. However, nine years on from their study and the public are still unaware of what these vitamins are. This is further evidence for public health messages to begin to promote new areas. Almost half of the sample group claimed they had not heard of antioxidant vitamins, and of those that claimed they had heard of them only one parent/guardian answered question 10 correctly. Buttriss (1997) reported that public health messages have focused on macronutrients and not enough on micronutrients, which may still be the case judging by this lack of knowledge.

General Nutrition Knowledge Questionnaire for Adults Summary

The results from the General Nutrition Knowledge Questionnaire for Adults demonstrate that the level of nutritional knowledge in Irish parents/guardians is poor. The findings consistently highlighted that subjects were unaware of the nutritional composition of foods when they were not provided with ‘prompters’. These results suggest that when left to apply their nutritional knowledge to food choice without the help of providing options for them to choose from, Irish adults are unlikely to make appropriate decisions.
It also emerged that the majority of individuals are unaware of why they are being told to consume the foods they are, with section 4 displaying a poor level of understanding between diet-disease relationships. None of the participants answered all questions correctly in sections 1, 2 and 4. Parmenter et al. (2000) stated that the minimum amount of nutrition information that people should know is expert recommendations, however the adults were not even completely aware of this. It is important to note, however, that these results cannot be generalized to the entire Irish adult population, but provide a basis for public health interventions and highlight the areas that future public health interventions which need to be targeting.

5.3 Level of Education

This study failed to establish a correlation between the level of parental nutritional knowledge and their level of education ($p>0.05$). Those with higher levels of education are often regarded as having higher levels of nutritional knowledge, and in turn make healthier dietary decisions than those with low levels of education (Variyam & Blaylock, 1998). Jenkins & Horner (2005) found that parental level of education plays an important role in developing healthy eating patterns, and Hearty et al. (2007) found that men with primary education were more likely to have a negative attitude to healthy eating. The level of education reported in this study was quite similar between adults which may be a reason why no relationship was established. In order for the general population to understand public health messages, however, health professionals must accommodate for all levels of education.
5.4 Study Limitations

Despite study strengths such as a high response rate, and using a validated nutrition knowledge questionnaire, this study had some limitations worth mentioning.

- The study was conducted during the final weeks of summer term, meaning that most schools had a busy schedule with activities such as class tours and sports days. Due to the lack of time and amount of pressure on teachers during this period, only one primary school accepted the invitation. The sample size was small as permission was granted to enter only two fourth classes, limiting the potential sample group to 58 participants.

- The sex of the parent/guardian was not investigated. This was for two reasons; 1) investigating gender differences was not an aim of the study, and; 2) the children reported who packed their lunch that day so it was presumed they understood the instructions to give it to the correct parent. Including the sex would have strengthened reliability as the need for presumptions would have been excluded.

- The response rate may have been higher had the children not forgotten their consent forms on numerous occasions. Those who did respond may have been more motivated parents/guardians with an interest in health.
The lunchbox questionnaire was created for this study only, meaning that the findings cannot be comprehensively compared to other studies.
6. Conclusion

6.1 Conclusion

This study attempted to fill the gap in the literature by determining whether Irish parental nutritional knowledge reflects the foods parents/guardians provide in their children’s packed lunch. The results showed that no significant relationship exists between these two variables. The lunches in this study were found to consist of various unhealthy items and in many cases, few healthy foods. The consumption of foods high in fat, sugar and salt on a daily basis is likely to lead to health conditions, and contribute to the current obesity crisis, particularly when intake of fruit, vegetables and other nutrient dense foods are so low. Packed lunches provide a substantial amount of energy to the child’s total intake, highlighting the importance for parents/guardians to make appropriate substitutions to the packed lunches. However, this study highlighted that parents/guardians are not making appropriate dietary choices and are not putting their nutritional knowledge into practice when preparing their child’s packed lunch. In order to successfully alter the nutritional status of lunches, parents need to be nutritionally aware of the contribution of different foods to the diet.

After analyzing the results obtained from the General Nutrition Knowledge Questionnaire for Adults, this study found that public health messages to increase the consumption of fruit, vegetables and fibre foods, and to reduce intakes of sugar, salt, and fat have apparently been well received by the adult population. However, these results also found
that public health messages to increase the consumption of starchy foods and to reduce
the consumption of meat have not been well received, with the majority of the adult
population being unaware of these recommendations. Knowledge regarding food
composition and food choices was found to be inconsistent in this study. While
knowledge that fruit juice counts as a portion of fruit, and wholegrain bread has the most
vitamins and minerals was well known, approximately half the population were unaware
that brown sugar is not a healthier alternative to white sugar, or aware of the
compositional differences between whole milk and skimmed milk. Of particular concern,
however, was the lack of nutritional knowledge regarding types of fat and fatty foods,
such as butter and margarine, further highlighting the importance to change the direction
of public health messages. The results showed that parental awareness regarding diet-
disease relationships was poor. If individuals lack the reason why they are being
couraged to increase/decrease consumption of certain foods, they are unlikely to be
motivated to adhere to expert advice. Public health messages could be advertised on
television so as to reach all socio-economic levels in such a way that people of all levels
of education can fully comprehend what is being asked of them. In a time when there has
never been so much nutrition information available, the public’s level of nutritional
knowledge is poor. However, we must ask if this is the fault of the individual for
refusing to translate the available information into behaviour, or if it is the fault of health
experts repeating the same messages again and again and failing to move forward to
promote new areas.
6.2 Practical Implications

The results of this study provide an outline, although vague, of the level of nutritional knowledge of Irish adults. These results should be used to identify the areas of public health that need addressing the most urgently, for example; information regarding different types of fats and where they are found. These results also provide further support for the few studies that have investigated packed lunches in the Irish population, stating that lunchboxes contain too many unhealthy items. This highlights the need for action to be taken amongst parents and schools to restrict these items in lunchboxes, and to increase the importance of the packed lunch to parents/guardians as being an important contributor to children’s total energy intake.

6.3 Areas for Further Research

- It is necessary to conduct a large scale study investigating the true level of nutritional knowledge within the Irish adult population, as this study provides only an outline, meaning these results cannot be generalized to the entire population.

- There is a need to conduct a larger and more comprehensive study to determine the true nutritional composition of school lunches in Ireland, and to determine whether parents are feeding their children less healthy foods than what they feed themselves.
There is a need to determine what information the general population would find useful to increase public nutritional awareness, for example; would they find food labelling strategies useful in increasing their awareness of food composition.
7. References


Mintel Press Release: Mintel Oxygen Reports.


Appendices
Appendix 1: Ethical Approval
Appendix 2: Letter to School
Appendix 3: Letter of permission from school
Appendix 4: Letter of invitation
Appendix 5: Participant Information Sheet
Appendix 6: Consent form
Appendix 7: Pilot lunchbox questionnaire
Appendix 8: Lunchbox questionnaire
Appendix 9: Lunchbox scoring system
Appendix 10: General Nutrition Knowledge Questionnaire for Adults before changes
Appendix 11: Changes made to the General Nutrition Knowledge Questionnaire for Adults
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Appendix 13: Scoring system: General Nutrition Knowledge Questionnaire for Adults before changes
Appendix 14: Scoring system: General Nutrition Knowledge Questionnaire for Adults after changes
Appendix 15: Statistical Package for the Social Sciences