Overweight and obesity among Australian youth: Associations with family background and social networks

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Contents

Tables

Abstract

This study examines the relationship between family background and social networks, and overweight and obesity among Australian youth. Data on body mass index (BMI), social networks and family background from Wave 7 of the Household, Income and Labour Dynamics in Australia Survey (HILDA) was used. A subset of data was extracted for those aged 15 to 24 years: 873 males and 961 females. Results suggest overweight and obesity are associated with frequency of contact with friends and family, social support levels, marital status, living arrangements and having a partner. Associations were also identified with having a step parent, number of siblings, education level and the employment status of parents. For some variables the relationship differs by gender in its existence and its strength. The findings establish that there is a strong relationship between social networks and overweight and obesity among Australian youth.

Declaration

To the best of my knowledge, this dissertation contains no material previously published or written by another person, except where due reference is made in the text of the dissertation. This dissertation contains no material which has been accepted for another degree or diploma in any university or other institution.

Signed: _____ Date: _____

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Please note: This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (MIAESR). The findings and views reported in this paper, however, are those of the author and should not be attributed to either FaHCSIA or the MIAESR.

Chapter 1: Introduction

Using data from Wave 7 of the Household, Income and Labour Dynamics in Australia Survey (HILDA), this quantitative study of 15 to 24 year old Australians aims to identify associations between overweight and obesity, and aspects of family background and social networks. According to the World Health Organisation (WHO 2003), the increasing prevalence of overweight and obesity is an epidemic of global concern. Many environmental, social, economic and political factors interact to create what has been termed an 'obesogenic' environment (Access Economics 2008; Lobstein et al. 2004:5; Zeller et al. 2007). The 2007–2008 National Health Survey results showed that 38.1 per cent of the 18 to 24 year old population and 28.6 per cent of the 13 to 17 year old population in Australia are estimated to be overweight or obese (Australian Bureau of Statistics 2009).

The health of Australia's youth provides a significant indicator for Australia's future health. Adolescence and young adulthood is seen as a critical time for the development of lasting health behaviours (Nelson et al. 2008: 2205). Existing studies suggest overweight and obesity in young people are associated with a significant number of short and long term health, psychosocial, social and socioeconomic problems (Schwimmer et al. 2003; Falkner et al. 2001; Lobstein et al. 2004; AIHW 2007; Must and Strauss 1999; Dietz 1998; Gortmaker et al. 1993). Given these factors and an estimated total obesity cost of $58.2 billion in Australia in 2008 (Access Economics 2008: iv), it is not surprising that government is investing in early intervention and preventative health measures (AIHW 2008: i; National Preventative Health Task Force 2009: 90), and consider both obesity and the health of young people to be national health priorities (Gardner 2008: 42; Access Economics 2008: 1).

There is much existing Australian and international research on the relationship between overweight and obesity, and health risk behaviours such as drinking, smoking, physical activity and poor diet. There is a smaller but growing body of research on socioeconomic and other social factors, and their association with overweight and obesity. This study aims to contribute to this growing body of research. Theory regarding lower socioeconomic groups and obesity along with social causation hypothesis regarding social class and health are drawn upon (Swinnerton 2006; Burdess 2004; Australian Institute of Health and Welfare

2007: 69; Thirlaway and Upton 2009: 58), along with ecological systems theory and the Ecological Model of Predictors of Childhood Overweight (Davison and Birch 2001).

Results from this study suggest social networks and family background have a clear relationship with overweight and obesity among youth. In some instances, the existence and strength of the associations with overweight and obesity differ by gender. In general the findings were supported directly or indirectly by existing research. There were however some results contradictory to existing research and some occasions when comparable studies could not be sourced, thus potentially indicating new ground. Associations were found with social support, contact and relationships. In particular, overweight and obesity were found to be associated with lower levels of social support and very frequent or infrequent contact with friends and family. In addition, having a partner and living with someone in a relationship were both identified as being associated with obesity, while being married was found to be associated with overweight. Family structure also seems to play a role in overweight and obesity. Associations were found with living with only one biological parent, having two or three siblings and having a step parent, in particular a lack of satisfaction with a step parent relationship(s). Conversely, results suggest no such association exists between overweight and obesity and partner or parent relationship satisfaction, nor active club membership.

This study provides further evidence of other family background factors involved in the overweight and obesity equation. A youth's education and their parent's employment seem to be associated. Specifically, higher rates of overweight are associated with having a mother at age 14 who was not employed, and there is increased risk of both overweight and obesity among those who at 14 years of age had a father working as a labourer, trades worker or manager. In terms of education, failure to complete secondary school seems associated with overweight and not being enrolled in a post-school qualification is associated with obesity. Interestingly, it appears that when a youth is still attending school, those educated in the private sector are most at risk of obesity. However once they have left school, those who were educated in the government sector experience higher rates of overweight and obesity.

Following this introductory chapter, the second chapter is a literature review of existing studies, including limitations and knowledge gaps. The third chapter examines the research methodology including sampling strategy, data collection and analysis techniques. Chapter 4

provides an introduction to the research findings by describing the characteristics of the sample. Chapters 5 and 6 present and discuss the findings on social networks and family background and their association with overweight and obesity among youth. Chapter 7 provides a concluding summary along with social policy implications, limitations of this study and recommendations for future research. A bibliography and appendices follow. A summary of the tables and appendices is presented in the contents pages preceding chapter 1.

Chapter 2: Literature Review

This study aims to identify associations between overweight and obesity and aspects of family background and social networks among Australian youth. This literature review will begin by providing an overview of the overweight and obesity issue. This research project will then be situated in the context of sociological theory about social class and health inequalities and ecological systems theory. Key findings of relevant research studies will be contrasted and critiqued, and limitations and knowledge gaps acknowledged. The aim and research questions of this study will also be introduced.

The World Health Organisation (WHO) has identified the increasing prevalence of overweight and obesity as an epidemic of global concern (WHO 2003). The increases are greatest in economically developed countries but are occurring worldwide (Lobstein et al. 2004: 1). In 2005 it was estimated that globally 1.6 billion adults aged 15 and over were overweight, and 400 million adults were obese (WHO 2006). The primary reason for alarm over the overweight and obesity epidemic is that excess weight is a major risk factor for chronic illnesses such as diabetes, cardiovascular disease, osteoarthritis and some cancers such as colorectal, breast, kidney and uterine cancers (Gardner 2008; ABS 2007; Access Economics 2008; WHO 2003; National Preventative Health Task Force 2009: 86). The WHO (2003) attributes the overweight and obesity epidemic to societal and behavioural changes influenced by economic growth, modernisation, urbanisation and globalisation of food markets. For example, transportation and technology promote less physical activity, while higher incomes and urban life have led to diets higher in fat and sugar (WHO 2003).

Similar to other industrialised countries, Australia is experiencing increasing rates of disease related to overweight, lack of exercise, high cholesterol, processed foods, high salt intake and high blood pressure (Gardner 2008: 51). Based on key research surveys and reports, Access Economics (2008: iii) estimates that 3.71 million Australians, or 17.5 per cent of the population, were obese in 2008 with over 290,000 of them aged 5 to 19 years. The 2008 estimate equates to a 14.5 per cent increase on 2005 estimates (Access Economics 2008: iii). The National Health Survey 2004–2005 recorded that 54 per cent of all adults in Australia aged 18 years and over were either overweight or obese (cited in ABS 2007 :1). That equates to a 45 per cent increase since the 1995 National Health Survey (cited in ABS 2007: 1). Consequently, overweight and obesity cause significant social and economic cost to society.

Access Economics (2008: iv) estimates the total cost of obesity in Australia in 2008, including lost wellbeing, at $58.2 billion. Projections based on current overweight and obesity trends suggest that 1.75 million people aged 20 and over will die between 2011 and 2050 as a result of disease linked with overweight and obesity, and 10.3 million premature years of life will be lost at ages 20 to 74 (Gray and Holman 2009).

The urgency of this public health problem in Australia is recognised by recent government actions including the 2006 development of the Australian Better Health Initiative, a 5-year $500 million federal government program to reduce chronic disease and promote healthy weight (ABS 2007). Last year obesity was designated as a National Health Priority Area by Australian Health Ministers (Access Economics 2008: 1), and this year has seen moves to establish a $17.6 million National Preventative Health Agency for 2010–2013 to reduce overweight and obesity, smoking and risky drinking (Gordon 2009).

While obesity is most prevalent among the 55 to 64 age group in Australia (Access Economics 2008: 7; ABS 2008: 7), overweight and obesity rates in young people are on the rise. Based on the 2007–2008 National Health Survey results, the ABS estimates 38.1 per cent of the 18 to 24 year old population and 28.6 per cent of the 13 to 17 year old population are overweight or obese (ABS 2009). Some youth are taking major intervention measures, with Medicare records documenting a significant growth in morbidly obese 15 to 24 year olds undertaking gastric banding surgery, from 426 in 2006–2007 to 821 in 2007–2008 (Sheridan 2009).

The short term health problems associated with overweight and obesity in young people include increased susceptibility to cardiovascular disease, asthma, type 2 diabetes and poor psychological wellbeing (Reilly 2005: 335–336; Alberti et al. 2004:1798; Wardle and Cooke 2005). For example, an American study of 5 to 18 year olds by Schwimmer et al. (2003:1813) showed not only an inverse association between obesity in adolescence and physical functioning, but also social and psychosocial functioning. Furthermore, a study by Falkner et al. (2001: 36) found that relative to their average weight peers, adolescent obese females have stronger associations between weight and negative social, educational and psychological factors than obese boys. The long term health consequences include an increased risk of adult obesity, heart disease, diabetes, some cancers, gall bladder disease, osteoarthritis, endocrine

conditions, lipid abnormalities, hypertension, sleep apnoea and infertility (Lobstein et al. 2004; Reilly 2005: 336–337; Must and Strauss 1999; Dietz 1998). In addition, there appear to be long term socioeconomic correlates. An American longitudinal study by Gortmaker et al. (1993: 1008) showed that both males and females who were overweight during adolescence were less likely to be married as adults. In addition, Gortmaker et al. (1993) found that females who were overweight during adolescence were more likely to have higher household poverty, lower education and less income as adults. Conversely, a British study by Sargent and Blanchflower (1994: 681) found obesity in adolescence was associated with lower levels of education in both male and female adults. Similar to Gortmaker et al. (1993), Sargent and Blanchflower (1994: 682) also found obese female adolescents earn substantially less income as adults, regardless of whether or not they are obese as adults.

In Australia and other industrialised countries, there is a well recognised association between low socioeconomic status and higher rates of morbidity and mortality (Swinnerton 2006; Burdess 2004; Australian Institute of Health and Welfare 2007: 69; Thirlaway and Upton 2009: 58). Two of the contrasting schools of thought on the association between low socioeconomic status and morbidity and mortality are the health selection hypothesis and the social causation hypothesis (Burdess 2004: 181). The former proposes that health status helps determine social class and the latter, in which this research study is situated, proposes social class helps determine health status. It should be noted that family background can be used as a proxy measure of social class for adolescents and young adults who, at such a young age, may not have finished their education or entered the workforce, or may have done so only recently.

Since a seminal study by Garn and Clarke (1975), recognition has developed of an association between lower socioeconomic groups and obesity (Thirlaway and Upton 2009: 56; ABS 2008: 11; National Preventative Health Task Force 2009: 86; Dollman and Pilgrim 2005: 170). Some argue the social isolation of lower socioeconomic groups impacts just as negatively upon their health as poor access to goods and services (Swinnerton 2006: 76). A Canadian study by Veugelers and Fitzgerald (2005: 607) found obesity rates among children living in high income neighbourhoods are half of those living in low income neighbourhoods. However some research has challenged this notion such as a study of the American youth population by Troiano and Flegal (1998) which concluded no association between

overweight and social status, ethnicity or education. In addition, another study by Booth et al. (2001:162) found no consistent relationship between socioeconomic status and overweight and obesity among Australian children and adolescents.

Researchers Davison and Birch (2001: 161) at Pennsylvania State University in America have extended ecological systems theory into the Ecological Model of Predictors of Childhood Overweight. The ecological systems theory states that to obtain full understanding of the development of a characteristic in an individual, the ecological niche in which the individual lives must be taken into account (Davison and Birch 2001: 160). This translates into consideration of both the immediate and wider contexts in which a person lives, and the complex and dynamic interactions within and between these different contexts. Davison and Birch's (2001) Ecological Model of Predictors of Childhood Overweight acknowledges that a child's personal characteristics and their school, family, community and society contexts influence and are influenced by the development of overweight (Davison and Birch 2001: 160). My study will extend this theory to adolescents and young adults.

There is much existing Australian and international research on the relationship between overweight and obesity, and health risk behaviours such as drinking, smoking, physical activity and poor diet. However there is less research examining specific aspects of family background and social networks, and their association with overweight and obesity. The importance of taking economic and social factors into account to tackle the obesity problem has been recognised by Diabetes Australia (Access Economics 2008). Similarly, a report by the Australian Institute of Health and Welfare (2007) identified family capacity, social support and community participation as key social factors influencing the health of 12 to 24 year old Australians. Existing quantitative overweight and obesity research appears to be dominated by studies of adults and children, with only a small proportion examining adolescents and young adults. Also, several studies seem to be limited by sampling from small geographical areas. In comparison to the supply of quantitative overweight and obesity research, it appears there are relatively few qualitative studies examining family background and social networks. Examples of such qualitative studies include Williams et al. (2008) who found adolescents associate social stigma with overweight and Borra et al. (2003: 724) who found teachers believe that overweight children are isolated both socially and emotionally from their normal weight peers. In another example of qualitative research, Wills et al. (2006:

400) found young teenagers to be adamant that controlling their weight was their own responsibility and parents have no role in the matter.

My study will focus on youth aged 15 to 24 years. I deemed it appropriate to study this late adolescent and early adult population as one group because in Western countries today the journey into adulthood and independence has extended (Dockery 2009: 692, Arnett, 2000). An American paper by Nelson et al. (2008: 2205) identifies adolescents and young adults as an understudied age group on the subject of modifiable determinants of overweight and obesity. Here in Australia, a report published by AIHW (2006: 21) identified a lack of recent national data on overweight and obesity among children and adolescents, referring to the most recent studies as the 2004 NSW Schools Physical Activity and Nutrition Survey, the 2003 Western Australian Child and Adolescent Physical Activity and Nutrition Survey, and the 1995 National Nutrition Survey. Since then, the major surveys have been the 2007 National Children's Nutrition and Physical Activity Survey, and the 2007–2008 National Health Survey (National Preventative Health Task Force 2009: 86–87).

More research into the health of young Australians is essential because they provide a strong indication of Australia's future health. Adolescence and young adulthood is seen as a critical time to develop lasting health behaviors (Nelson et al. 2008: 2205). Specifically, adult obesity is more strongly linked to adolescent obesity than childhood obesity (Lobstein et al. 2004:50). According to the Australian Institute of Health and Welfare (2007: 69), research by the Canadian Institute for Health Information and by Eckersley et al. suggest an intricate web of environmental, social, economic and cultural factors during childhood and adolescence combine to effect health, health behaviour and wellbeing that continues into the adult years. Prevention and early intervention for the health and wellbeing of children and young people is considered a key component of policy making in Australia today (AIHW 2008: i; Gardner 2008: 42).

Existing studies on family background and overweight and obesity cover a variety of factors but do not necessarily measure them in the same way as my study, nor do many focus on the youth population in Australia. The principal context for human development is the family (Bronfenbrenner 1986) and thus family is a key factor in the healthy development of youth (Dockery et al. 2006: 691). Haveman and Wolfe (1995) suggest that decisions made by

parents on matters such as family structure, size and home neighbourhood, along with the resources they make available to their children and their timing can all influence a child's wellbeing. According to Rhee (2008: 13), research into parenting style and family functioning has developed recently. A study by Banis et al. (1988: 168,170) found families of obese children were less cohesive and displayed some elements of distress similar to dysfunctional families. In contrast, Falkner et al. (2001: 40) found obese students to have a propensity for functional family relationships and Gibson et al. (2007) found no relationship with poor family functioning. Gibson et al. (2007) did however find high maternal BMI and single-mothers to be association with an increased likelihood of overweight and obesity in children. Limitations of this study by Gibson et al. (2007) include a sample restricted to 6 to 13 year olds in the Perth metro area and a cross-sectional design.

There appears to be several studies that have examined parental education and income. For example, an American study of adolescents by Goodman (2003) found both these factors to be associated with overweight. This finding is supported by a Canadian study of children by Veugelers and Fitzgerald (2005) which found children whose parents had higher incomes and higher education levels were less likely to be overweight. A study of Australian children and adolescents by Wang et al. (2002b) found boys, but not girls, from the lowest income households with $17,500 or less were more likely to be overweight or obese compared to those from the highest income households with $67,500 plus. There are some limitations to the study by Wang et al. (2002b) such as it used old data from the 1995–1996 Australian National Nutrition Survey and National Health Survey, it analysed only two family background characteristics due to data set constraints, and the youth sample only included those aged 7 to 15 years. There are also limitations to the study by Veugelers and Fitzgerald (2005) such as a cross-sectional design which created uncertainties about cause and effect of the observed associations and a sample that only included grade five students attending school in the Nova Scotia geographical region. The Goodman (2003) study has its limitations too, including a sample restricted to one suburban school district in Greater Cincinnati and BMI classification using the percentile method as oppose to internationally recognised cut off scores developed by Cole et al. (2000).

DeMattia and Lee-Denney (2008: 87) argue that family and the home environment is the centre of many existing obesity programs and intervention strategies, and there needs to be more focus on the larger community within which the child lives. This is where my decision to examine social network factors comes into play. Social isolation, support and cohesion are recognised determinants of health (Stansfeld 1999). As Nelson et al. notes (2008: 2205) "much additional research is needed to understand the evolving social influences in the emerging adult years and the extent to which this may influence health behavior patterns".

Similar to family background, existing studies on social networks and overweight and obesity cover a variety of factors, but those that are common to my study are not necessarily measured in the same way, nor do many studies focus on the Australian youth population. Much literature in the area recognises that overweight and obesity are commonly associated with poorer psychosocial well-being (Lobstein 2004: 28; Must and Strauss 1999: S4; Puhl and Latner 2007; Wardle and Cooke 2005; Wilkins et al. 1998: 572). Specifically these associations include that they are the least desired friends of their contemporaries and socially isolated, they are stigmatised as lazy, lying and stupid, they have low-self esteem, negative self-image and delayed social development. A study by Epstein et al. (1996: 69) found social problems to exist for 45 per cent of obese boys and 28 per cent of obese girls. Another study of American secondary school students by Falkner et al. (2001: 32,40) concluded that obese students were less likely to spend time with friends and more likely to have negative social experiences. This study was limited by a geographically restricted sample of the Connecticut area and a sample that only included seventh, ninth and eleventh grade students. The study previously mentioned by Goodman et al. (2003: 1018) also found social status at school to be associated with overweight. Part of an American study by Beets et al. (2006) found that youth with higher BMIs reported lower levels of social support in terms of parents watching them undertake physical activity (Beets et al. 2006: 285). However again this study had limitations including that the sample was taken from one rural American school and included only fifth to eighth grade students living with both parents.

Research questions

In conclusion, my research study aims to add to existing overweight and obesity research through a quantitative study focused on Australian youth. I will draw on data collected between 2007 and 2008 for Wave 7 of the longitudinal Household, Income and Labour

Dynamics in Australia (HILDA) Survey. This data set has been used for several studies of youth and health, however none appear to have studied overweight and obesity. My key research questions are:

(i) Among 15 to 24 year olds in Australia, what is the nature of association between overweight and obesity and specific family background factors?

(ii) Among 15 to 24 year olds in Australia, what is the nature of association between overweight and obesity and specific social network factors?

Continually adding to overweight and obesity knowledge assists in developing and targeting public health policy, health education programs and community health services. The findings of this research could contribute to the type of debate, research, consultation and health surveillance activities that are proposed by the forthcoming National Preventative Health Agency (Gordon 2009; National Preventative Health Task Force 2009). Projections by Access Economics (2008: iii) forecasting a total of 4.6 million obese Australians (18.3 per cent of the population) by 2025 suggests overweight and obesity will continue to be an important population health issue for the foreseeable future.

Chapter 3: Methodology

My study used Wave 7 data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey, which was released in February 2009. This longitudinal annual survey is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs and is managed by the Melbourne Institute of Applied Economic and Social Research (MIAESR). A review of existing literature suggests the survey research method is popular for overweight and obesity studies. This is likely to be because survey research methods are well recognised for providing structured data collection and analysis, and employing co-variation and causation logic in analysis (De Vaus 2002:7). This research project did not require approval from the Monash University Standing Committee on Ethics in Research involving Humans because it used an existing data set. To conduct my research using the HILDA data, I obtained an Individual Deed of Licence for Australian Academic and Government Researchers from the Commonwealth Department of Families, Housing, Community Services and Indigenous Affairs. This included agreement to a set of conditions regarding secure data storage, intellectual property, confidentiality, privacy and indemnity.

3.1 Sampling strategy

The Wave 7 sample is a function of the original Wave 1 sample which involved a probability sample of national households living in private dwellings (Watson 2009:2). The sampling units, households, were selected in Wave 1 using multistage stratified cluster sampling. To begin, the sampling frame of Census Collection Districts (CDs) were stratified by state, by section of state, by metropolitan and non-metropolitan regions (only for the largest five states), and by statistical sub-division (Watson and Wooden 2002:6–7). Next, 488 CDs were selected from this sampling frame using a combination of the probability proportional to size method (determined according to the number of dwellings in the CD) and systematic sampling using a random starting point (Watson and Wooden 2002:7). Then according to area occupancy rates and expected response rates, a sample of between 22 and 34 dwellings were selected from each CD (Watson 2009:90). The first dwelling was randomly selected, and then systematic sampling was applied (Watson & Wooden 2002:8). Finally, up to three households were selected from each dwelling (Watson 2009:91).

Household members have changed over the seven year period due to factors including deaths, births, people moving overseas and marriages or de-facto relationships beginning or ending (Watson 2009:2). Consequently, the Wave 7 data collected between August 2007 and February 2008 is no longer a random representative sample of all Australian households, and weights must be applied prior to analysis to correct this (MIAESR 2009a:16; Watson 2009:104). Analysis of attrition bias has identified low re-interview rates among people aged 15 to 24 years, born in a non-English speaking country, of Aboriginal or Torres Strait Islander descent, single, unemployed and working in low skilled occupations (MIAESR 2009a:16; Watson 2009:103–104).

A total of 7063 households provided interviews (Household Questionnaire) in Wave 7, equating to a 74.3 per cent response rate (MIAESR 2009a:12). From these households, a total of 12,789 individual interviews (New Person Questionnaire or Continuing Person Questionnaire) were completed (MIAESR 2009a:13). The New Person Questionnaire had a response rate of 79.7 per cent and the Continuing Person Questionnaire had an attrition rate of 5.3 per cent (MIAESR 2009a:14). Of the 12,789 individual respondents, 11,378 completed a Self Completion Questionnaire, equating to a response rate of 89 per cent (MIAESR 2009a:14). My study has selected only those respondents aged 15 to 24 years with BMI and gender information, resulting in a sample size of 1,834.

3.2 Data collection techniques

The Wave 7 HILDA data set was collected through five survey instruments: a Household Form, Household Questionnaire, New Person Questionnaire, Continuing Person Questionnaire and a Self Completion Questionnaire. The Household and Person Questionnaires were administered by an interviewer face-to-face with the exception of 8.5 per cent conducted over the telephone for various reasons (Watson 2009:93). Only household members aged 15 and over are interviewed with the relevant Person Questionnaire and asked to complete the Self Completion Questionnaire (Watson 2009:90). Refer to appendix 1 for a list of the selected survey questions used in this study. Questionnaire data was coded (refer to MIAESR 2009b), manually entered into a database and converted to SPSS, SAS and STATA format. Full detail of the coding, including the standard ten category codes for missing data, can be found in the HILDA User Manual (Watson 2009:19, 106).

3.3 Analysis techniques

The data was analysed using Statistical Package for the Social Sciences (SPSS). Frequency tables were created for each of the social network and family background variables of interest. Variables with a large number of response categories were collapsed to aid the search for patterns in the data. Where there were too few cases in a category, the category was combined with another or declared missing so as to avoid distortion of the chi-square statistic at the later stage of cross tabulation analysis. A second round of frequency tables (refer to Appendices 3 and 4) were created with a population weight applied. The population weight is discussed below.

Next, each of the family background and social network variables were cross tabulated by BMI and gender. Following convention, the total count '*n*' for males, females and persons from the unweighted sample was included in brackets in these cross tabulations of weighted data. This bivariate analysis examined for associations between these variables. Conclusions were not drawn from any cells with ten or less cases. Chi-square was used as a test of statistical significance. Where the *p* value was 0.05 or less, a finding was deemed statistically significant and thus likely to exist in the population. The *p* values between 0.05 and 0.1 were deemed to indicate a finding had weak statistical significance and thus a small likelihood of existence in the population. The *p* values above 0.1 were deemed to indicate the association would not exist in the wider population.

Respondents were grouped into three age brackets for initial analysis (refer table 4.2). Bivariate level analysis of BMI and single year age showed these groups had similar rates of overweight and obesity (refer to table 4.1). Age was also grouped in this way to separate 18 year old young adults from 15 to 17 year old adolescents. Furthermore, those aged 18 to 20 years were deemed to be in a transitional period between adolescence and adulthood, and consequently separated from those aged 21 and over.

Body Mass Index (BMI) scores were calculated by the Melbourne Institute of Applied Economic and Social Research using the self-reported height and weight of respondents. Respondents aged 18 years and over were classified as underweight, normal, overweight or obese according to international BMI score cut off points of less than 18.5, 18.5 to less than

25.0, 25.0 to less than 30.0 and 30.0 or more respectively (WHO 2003). However for those aged 15 to 17 years, different BMI score cut off points to one decimal place were used according to single year age and gender. These cut off points were sourced from a seminal paper by Cole et al. (2000) which established worldwide standard BMI definitions to two decimal places for overweight and obese male and female children according to half year age (refer to appendix 2). This research by Cole et al. (2000) is widely cited and applied, and is based on large nationally representative cross sectional growth studies conducted in Brazil, Great Britain, Hong Kong, the Netherlands, Singapore and the United States. Cole et al. (2000) did not develop a classification for underweight, so I have applied the adult classification for underweight to the 15 to 17 year olds. Underweight people have been excluded from the majority of the data analysis because the primary purpose of this research is to compare the overweight and obese segments of the population with those of normal weight. Exclusion of underweight cases reduces the sample size from 1834 cases to 1693 cases.

To counteract attrition bias and infer results of the sample to the wider Australian population, the Responding Person Population Weight developed by MIAESR was applied. This weight was chosen because the unit of analysis in my study is the individual and because the dependent variable BMI, upon which my study is focused, was collected at the responding person level through the Self Completion Questionnaire. MIAESR calculated the Responding Person Population Weight from the household-level weight, adjusted for person non-response and person level benchmarks (MIAESR 2009b:S264). The cross sectional responding person benchmarks are sex by broad age, state by part of state, state by labour force status, marital status and household composition (Watson 2009:66). These benchmarks are based on the Australian Bureau of Statistics figures for Estimated Residential Population and the Labour Force Survey (Watson 2009:66).

Before applying the Responding Person Population Weight to my study it was divided by one thousand, reducing it to a fraction of its original size. In its original form the Responding Person Population Weight creates a huge number of cases, making it impossible to use the chi-square statistic to test for the significance of the relationship between BMI and the independent variables of interest. A large number of cases consistently produce a chi-square *p*-value less than 0.05, indicating the relationship is statistically significant and thus likely to

exist in the wider population. By reducing the weight to a fraction of its original size the sample is still weighted to be representative of the wider population, but the total number of cases will not be too great to prohibit reliance on the chi-square test. When weighted, the sample changes from 1834 cases to 2117 cases. Furthermore, when the underweight cases are excluded while the weight is applied, the sample changes from 1693 cases to 1936 cases.

The population weight adjusted for the over-representation of females in the sample, reducing the proportion from 52.4 per cent to 50.2 per cent. The population weight also slightly decreased the proportion of 18, 19, 20 and 22 year olds, and slightly increased the proportion of 15, 16, 17, 21, 23, 24 year olds. In terms of BMI, the population weight slightly increased the proportion of underweight cases from 7.7 per cent to 8.6 per cent, normal cases from 59.5 per cent to 60 per cent, and overweight from 22.2 per cent to 22.3 per cent, while decreasing the proportion of obese cases from 10.5 per cent to 9.2 per cent.

A special note is required about the social support variable. This variable was computed from a combination of other variables and is the only variable to have had missing values imputed. Respondents were asked to agree or disagree on a seven point scale (seven being strongly agree) with a series of ten statements describing how much support they get from other people. Based on previous social connection research by Brandon (2008), I selected four of these statements as measures of social support: 'I often need help from other people but can't get it', 'I don't have anyone that I can confide in', 'I have no one to lean on in times of trouble', 'I often feel very lonely'. The higher a respondent scores on these questions, the lower their level of social support. Cross tabulations by gender and age were created for each of these four variables, enabling the calculation of a mean response for each age and gender. The missing cases were assigned to a response category according to the mean response for their particular age and gender. Once all 33 missing values were imputed, the four variables were added together to create a total score from 4 to 28 for each person. These responses were then collapsed into five categories with a portion of approximately 20 to 25 per cent of cases in each, the exception being the fifth category with only 13 per cent of cases.

A special note is also required about the family background analysis. I would have liked to analyse parent's education, however there were a huge number of missing cases for the three questions that asked a respondent about the education of their mother and father. These

questions were only introduced in Wave 5 and history variables have not been created for them (Watson 2009:4, 24). I would also have liked to analyse parent's country of birth however it was decided there were too few cases born in some regions of the world to make for a meaningful analysis.

Chapter 4: Characteristics of the sample

4.1 Frequency distributions of social network and family background variables

The aim of describing the distribution of responses for each of the social network and family background variables involved in this study is to provide a broad overview of the characteristics of the weighted sample before analysing their association with BMI. The frequency tables described here in chapter 4 (refer to appendices 3 and 4) were created after the weight had been applied and underweight youths had been excluded.

Results indicate 42.8 per cent of youths are currently an active member of a sporting, hobby or community based association (refer to table A3.1). The social support index suggests 63.7 per cent of youth have moderate (26.4 per cent), high (18.2 per cent) or very high (19.1 per cent) levels of social support (refer to table A3.2). The majority of youth appear to have frequent social contact with friends or relatives not living with them, with 24.7 per cent indicating they see friends or relatives about once a week, 39.4 per cent several times a week and 16.5 per cent every day (refer to table A3.3). A further 14.6 per cent indicated contact only occurred between one and three times per month and 4.8 per cent indicated it happened once or twice every three months or less.

In terms of marital status, results indicate a mere 3 per cent of youth are married (refer to table A3.4). A further 9.7 per cent have never married but are living with someone in a relationship. The majority, 87.2 per cent, have never married and are not living with someone in a relationship. The weighted survey data suggests 38.6 per cent of youths have a partner and 61.4 per cent do not (refer to table A3.5). In terms of the quality of the relationship with their partner, 90.2 per cent indicated they are satisfied (refer to table A3.6). Satisfaction is also high for relationships with parents, with 87.5 per cent indicating they are satisfied (refer to table A3.7). A significant proportion of the weighted sample, 20.1 per cent, have step parents (refer to table A3.8). Of those with step parents, 69.1 per cent are satisfied with the quality of the relationship (refer to table A3.9).

A significant proportion of youth, 71.8 per cent, were living with both their parents when they were fourteen years old (refer to table A4.1). A further 19.1 per cent were living with

one of their parents and no step parent when they were 14 years old, while only 9 per cent were living with one of their parents and a step parent. Of those who were not living with both their parents when they were 14 years old, 82.1 per cent reported it was because their parents separated or divorced (refer to table A4.2). For the remainder of the weighted sample the primary reasons were deceased parents or parents never marrying or living together. Results suggest 32.6 per cent had one sibling, 31.3 per cent had two siblings, 16.2 per cent had three siblings and 13.2 per cent had four or more siblings (refer to table A4.3). Only 6.6 per cent were only children.

Results suggest that at 14 years of age, 24.4 per cent of youth had fathers who were trade and technician workers, 21.5 per cent were professionals and 19.1 per cent were managers (refer to table A4.4). A further 18.7 per cent were labourers or machinery operators and drivers, and 16.2 per cent were community and personal service workers, clerical and administrative workers or sales workers. Frequencies of the mother's occupation suggest a very different pattern (refer to table A4.5). Some 47.5 per cent were community and personal service workers, clerical and administrative workers or sales workers. A further 29.4 per cent were professionals, 11.7 per cent were labourers or machinery operators and drivers and 6.9 per cent were managers. Only 4.5 per cent were technicians or trades workers. In terms of labour force status of parents when youth were 14 years old, 93.6 per cent of fathers and 71.3 per cent of mothers were employed (refer to table A4.6 and A4.7).

In terms of education, 29.3 per cent are still attending school (refer to table A4.8). Of these youths, 64.0 per cent are attending government schools and 36.0 per cent are at Catholic or other non-government schools (refer to table A4.9). Among the other 70.7 per cent of youth respondents who are not at school, 68.9 per cent previously attended government schools and 31.1 previously attended Catholic and other non-government schools (refer to tables A4.8 and A4.10). Only 69.2 per cent of youth respondents who had left school reported they had completed Year 12 (refer to table A4.11). The remaining 30.8 per cent completed Year 11 or less. Of those youth who have left school, 40.8 per cent are currently enrolled in a post-school qualification (refer to table A4.12) and 87.6 per cent were employed for some proportion of the financial year prior to the interview (refer to table A4.13). Of those youth who have left school and worked for some period in the previous financial year, 40.1 per cent are studying a post-school qualification (refer to table A4.14).

4.2 BMI cross tabulations by age and gender

Before presenting and discussing the cross tabulation results in detail, an overview of the weighted sample will also be provided in terms of the prevalence of BMI, and the relationship between BMI, gender and age. The next two tables (tables 4.1 and 4.2) are the only time data is presented for the weighted sample prior to the exclusion of the underweight cases. The purpose is to provide an overview of overall BMI distribution among the youth population and thus a context in which results of the following chapters can be placed. As outlined in the methodology chapter, underweight people were excluded from the detailed analysis as the primary purpose of my research was to compare associations of the overweight and obese segments of the population with the normal weight population. Tables 4.1 and 4.2 below provide an overview of the prevalence of underweight, normal weight, overweight and obesity in the weighted sample according to age and gender.

Results suggest overweight in Australian youth is most prevalent among those in their early twenties, and least prevalent among those in their mid-teens (15 to 17 years old). Overweight appears to be most prevalent among those aged 21 with 29.7 per cent overweight (refer to table 4.1), while 17 year olds had the lowest overweight rate at 15.9 per cent. Obesity rates seem highest among those aged 22 (14.1 per cent), while obesity rates seem lowest among those aged 15 (5.9 per cent). The *p* value indicates that the association found in the weighted sample between BMI and age is likely to exist in the population.

Table 4.1: BMI of 15 to 24 year old Australians by age, 2007–2008

BMI classification	Age last birthday at date of interview										Total
	15	16	17	18	19	20	21	22	23	24	
Underweight	16.6	10.4	12.2	8.1	8.0	7.3	5.2	8.1	6.4	3.6	8.5
Normal weight	60.4	62.5	60.6	64.8	57.8	61.1	58.5	54.1	56.7	62.4	60.0
Overweight	17.2	16.4	15.9	20.0	27.8	23.8	29.7	23.8	26.6	23.4	22.3
Obese	5.9	10.8	11.4	7.1	6.4	7.8	6.6	14.1	10.3	10.7	9.2
Total	100	100	100	100	100	100	100	100	100	100	100
	(N= 135)	(N= 224)	(N= 203)	(N= 201)	(N= 186)	(N = 173)	(N = 184)	(N= 169)	(N= 192)	(N= 167)	(N = 1834)
	(chi-square = 67.284, p = 0.000)										

Note 1: the N figure is from the unweighted sample

Table 4.2 below enables an examination of BMI by age group and gender. It suggests that the prevalence of overweight increases with age among male youth. The pattern for male obesity appears to be different, with the lowest rates among those aged 18 to 20 years, and the highest rates among those aged 15 to 17 years. For females, both overweight and obesity rates increase with age.

Table 4.2: BMI of 15 to 24 year old Australians by age group and gender, 2007–2008

BMI classification	Age group			Total
	15 to 17 years	18 to 20 years	21 to 24 years	
Male				
Underweight	11.2	5.4	1.9	5.9
Normal	57.4	62.4	59.0	59.4
Overweight	17.9	27.5	29.8	25.3
Obese	13.5	4.7	9.3	9.4
Total	100.0	100.0	100.0	100.0
	(N = 264)	(N = 269)	(N= 340)	(N= 873)
	(chi-square = 52.430, p = 0.000)			
Female				
Underweight	14.3	10.2	9.9	11.4
Normal	65.3	60.8	56.9	60.7
Overweight	14.6	19.8	22.4	19.1
Obese	5.8	9.2	10.8	8.8
Total	100.0	100.0	100.0	100.0
	(N = 298)	(N = 291)	(N = 372)	(N = 961)
	(chi-square = 17.480, p = 0.008)			
All				
Underweight	12.6	7.8	5.8	8.5
Normal	61.3	61.4	58.0	60.0
Overweight	16.3	23.7	26.0	22.2
Obese	9.8	7.1	10.2	9.2
Total	100.0	100.0	100.0	100.0
	(N = 562)	(N = 560)	(N = 712)	(N = 1834)
	(chi-square = 42.891, p = 0.000)			

Note 1: the N figure is from the unweighted sample

The data suggests overweight is more prevalent among male youth (25.3 per cent) than female youth (19.1 per cent) and that this pattern remains true within each of the three age groups (refer to table 4.2). Obesity is almost equally prevalent among male and female youth (9.4 per cent and 8.8 per cent respectively). When broken down by age group there are similar obesity rates between males and females in the 21 to 24 age bracket, but in the 18 to 20 age group obesity rates are higher for females, and in the 15 to 17 age group they are

higher for males. The *p* value of 0.00 for males and 0.01 for females indicates that the relationship between gender, weight and age group is likely to exist in the population.

4.3 Summary

This chapter has described the family background and social network characteristics of the weighted sample. The distribution by age and by gender of underweight, normal weight, overweight and obesity cases within the weighted sample has also been described. This descriptive background information provides some context in which the overweight and obesity findings presented in the following chapters can be interpreted.

Chapter 5: Social networks, overweight and obesity

This chapter presents and discusses the results from the investigation into the relationship between social networks and overweight and obesity. Social contact and support appear to be associated as do living arrangements and some relationships. Conversely, active club membership and satisfaction with relationships with partners and parents do not appear to be associated.

5.1 Community, friend and family networks

According to table 5.1 below, there is no association between youth overweight and obesity and active membership to a sporting, hobby or community based association. However

Table 5.1: Active membership status (of a sporting, hobby or community-based club or association) by body mass index of 15 to 24 year old Australians by gender, 2007–2008

BMI classification	Currently an active member?		Total
	Yes	No	
Male			
Normal	64.0	61.7	62.9
Overweight	26.9	27.0	27.0
Obese	9.0	11.3	10.1
Total	100.0	100.0	100.0
	(N = 385)	(N = 433)	(N = 818)
	(chi-square = 1.456, p = 0.483)		
Female			
Normal	71.6	66.8	68.4
Overweight	21.4	22.0	21.8
Obese	7.0	11.2	9.8
Total	100.0	100.0	100.0
	(N = 284)	(N = 580)	(N = 864)
	(chi-square = 4.484, p = 0.106)		
All			
Normal	66.8	64.6	65.5
Overweight	24.8	24.2	24.4
Obese	8.4	11.3	10.0
Total	100.0	100.0	100.0
	(N = 669)	(N = 1013)	(N = 1682)
	(chi-square = 4.330, p = 0.115)		

Note 1: the N figure is from the unweighted sample. Note 2: missing cases (11.4 weighted cases) excluded. All missing cases were Refused/Not stated. Refer to table A3.1 in appendix.

further examination of other aspects of social networks, including levels of support and frequency of contact, indicate associations do exist between social network factors and overweight and obesity (refer to tables 5.2 and 5.3).

Data in table 5.2 below shows a statistically significant association between lower levels of social support and obesity in both males and females ($p < 0.05$). The high chi-square statistics related to each of the p values in table 5.2 indicate the large magnitude of the association. The strength of the relationship is greater among females, with rates at 6.1 per cent among those with very high levels of support and 15.8 per cent among those with very low levels of support. There is also an association between overweight and social support levels, but the nature of the association varies by gender and the strength of the relationship is greater in males. Overweight appears to be more prevalent among females with high to low levels of

Table 5.2: Social support index by body mass index of 15 to 24 year old Australians by gender, 2007–2008

BMI classification	Social support indicator					Total
	Very high	High	Moderate	Low	Very low	
Male						
Normal	66.5	71.8	60.1	65.2	48.8	63.0
Overweight	28.2	23.5	26.0	24.6	35.8	26.9
Obese	*5.3	*4.7	13.9	10.3	15.4	10.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 159)	(N = 146)	(N = 223)	(N = 191)	(N = 104)	(N = 823)
	(chi-square = 28.696, p = 0.000)					
Female						
Normal	75.7	68.9	67.3	63.5	67.7	68.4
Overweight	18.2	24.0	20.2	26.6	16.5	21.5
Obese	6.1	7.1	12.6	9.9	15.8	10.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 165)	(N = 169)	(N = 219)	(N = 194)	(N = 123)	(N = 870)
	(chi-square = 18.182, p = 0.020)					
All						
Normal	71.0	70.3	63.2	64.3	58.8	65.7
Overweight	23.3	23.8	23.5	25.6	26.1	24.3
Obese	5.7	5.9	13.3	10.1	15.2	10.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 324)	(N = 315)	(N = 442)	(N = 385)	(N = 227)	(N = 1693)
	(chi-square = 31.206, p = 0.000)					

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample.
Note 2: no missing cases as values for missing cases were imputed (refer to Methodology).

support, and lowest among those with very high or very low levels of support. Conversely, male overweight is clearly most prevalent among those with very low levels of support, with 35.8 per cent experiencing overweight compared with 28.2 per cent of those with very high support and 23.5 per cent of those with high support.

Evidence in table 5.3 below suggests an association exists between overweight and obesity and frequency of contact with friends and family. It should be noted that the statistical significance of the association among females is only weak ($p = 0.066$). The high chi-square statistics for females, males and 'all' youth confirms the large magnitude of the association (refer to table 5.3).

Table 5.3: Frequency get together socially with friends or relatives not living with you by body mass index of 15 to 24 year old Australians by gender, 2007–2008

BMI classification	Frequency get together socially with friends or relatives					Total
	Every day	Several times per week	About once a week	Between 1 and 3 times per month	Once or twice every 3 months or less	
Male						
Normal	50.5	68.9	64.4	63.7	59.6	63.0
Overweight	31.3	25.2	25.6	25.9	29.8	26.8
Obese	18.2	5.9	10.0	10.4	*10.5	10.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 125)	(N = 329)	(N = 200)	(N = 116)	(N = 38)	(N = 808)
	(chi-square = 28.132, $p = 0.000$)					
Female						
Normal	71.5	70.4	68.4	60.4	62.9	68.2
Overweight	17.1	22.2	22.1	22.2	*28.6	21.7
Obese	11.4	7.4	9.5	17.4	*8.6	10.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 107)	(N = 331)	(N = 242)	(N = 150)	(N = 34)	(N = 864)
	(chi-square = 14.648, $p = 0.066$)					
All						
Normal	58.9	69.7	66.4	62.0	60.9	65.5
Overweight	25.8	23.7	23.7	24.0	29.3	24.3
Obese	15.3	6.6	9.9	14.0	*9.8	10.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 232)	(N = 660)	(N = 442)	(N = 266)	(N = 72)	(N = 1672)
	(chi-square = 27.812, $p = 0.001$)					

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (25.5 weighted cases) excluded. All missing cases were Refused/Not stated. Refer to table A3.3 in appendix.

Table 5.3 above indicates that overweight appears most prevalent among youth who see friends and family only once or twice in a 3 month period or less (29.3 per cent). The association differs by gender, with female overweight associated with any level of contact less frequent than every day, and male overweight associated with everyday contact (31.3 per cent) or contact less than once a month (29.8 per cent). The strength of the association in males and females is very similar. The findings for obesity (refer to table 5.3) imply those youth with very frequent or infrequent contact experience the highest rates of obesity. Again the nature of the association differs by gender, but the strength of association is similar in males and females. Obesity rates are highest among females with contact less than once a week (17.4 per cent) and in contrast they are highest among males with contact every day (18.2 per cent).

In summary, there is strong evidence of an association between youth overweight and obesity and social support and social contact. Specifically, overweight and obesity are associated with lower levels of social support and very frequent or infrequent contact with family and friends.

5.2 Relationships and living arrangements

There is evidence in the following tables of a number of associations between romantic and step parent relationships, and overweight and obesity. Table 5.4 below shows an association exists between overweight and being married. Conversely, obesity is associated with those youth who have never married but are living with someone in a relationship. It should be noted that the statistical significance of the association among males is only weak ($p = 0.071$). The high chi-square statistics for females and 'all' youth confirm the large magnitude of the association.

The association between living with someone and obesity is replicated in both males and females, although it is slightly stronger in females (refer to table 5.4 below). In contrast, the existence of the association with overweight varies according to gender. There is a strong association among females and no association among males. Overweight rates are at 36.8 per cent among married females compared to 18.4 per cent of females living with someone in a relationship and 21.4 per cent of females not living with someone.

Table 5.4: Marital status by body mass index of 15 to 24 year old Australians by gender, 2007–2008

BMI classification	Marital status			Total
	Married (in a registered marriage)	Not living with someone in a relationship[1]	Never married but living with someone in a relationship	
Male				
Normal	59.1	64.1	52.1	63.1
Overweight	*27.3	26.7	28.8	26.9
Obese	*13.6	9.2	19.2	10.1
Total	100.0	100.0	100.0	100.0
	(N = 29)	(N = 664)	(N = 130)	(N = 823)
	(chi-square = 8.636, p = 0.071)			
Female				
Normal	52.6	70.3	60.5	68.4
Overweight	36.8	21.4	18.4	21.7
Obese	*10.5	8.4	21.1	10.0
Total	100.0	100.0	100.0	100.0
	(N = 46)	(N = 647)	(N = 177)	(N = 870)
	(chi-square = 23.545, p = 0.000)			
Persons				
Normal	54.2	66.9	57.2	65.6
Overweight	33.9	24.2	22.5	24.3
Obese	*11.9	8.9	20.3	10.1
Total	100.0	100.0	100.0	100.0
	(N = 75)	(N = 1311)	(N = 307)	(N = 1693)
	(chi-square = 28.206, p = 0.000)			

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
[1] Not living with someone in a relationship includes separated, divorced and never married.
Note 1: the N figure is from the unweighted sample.
Note 2: no missing cases.

To further investigate the interaction between romantic relationships and overweight and obesity, the next factor examined was whether or not a youth had a partner. Table 5.5 below suggests that a statistically significant association ($p < 0.05$) exists between partner status and youth obesity. There is no association with overweight. While the difference in obesity rates according to partner status is only 3.7 percentage points (the difference between 8.6 per cent and 12.3 per cent), there is deemed to be an association here because the percentage point difference equates to rates that are almost 50 per cent higher among those with a partner. There is a statistically significant ($p < 0.05$) association between obesity and partner status present in males, but there is no association in females. Table 5.5 indicates that male obesity

Table 5.5: Partner status by body mass index of 15 to 24 year old Australians by gender, 2007–2008

BMI classification	Partner status		Total
	Have a partner	No partner	
Male			
Normal	58.2	65.2	62.9
Overweight	27.3	27.1	27.1
Obese	14.5	7.7	10.0
Total	100.0	100.0	100.0
	(N = 331)	(N = 483)	(N = 814)
	(chi-square = 12.013, p = 0.002)		
Female			
Normal	67.8	68.1	68.0
Overweight	21.6	22.1	21.9
Obese	10.6	9.8	10.1
Total	100.0	100.0	100.0
	(N = 422)	(N = 439)	(N = 861)
	(chi-square = 0.161, p = 0.923)		
All			
Normal	63.6	66.5	65.4
Overweight	24.1	24.9	24.6
Obese	12.3	8.6	10.1
Total	100.0	100.0	100.0
	(N = 753)	(N = 922)	(N = 1675)
	(chi-square = 6.856, p = 0.032)		

Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (28.2 weighted cases) excluded. All missing cases were Refused/Not stated. Refer to table A3.5 in appendix.

rates almost double when they have a partner, rising from 7.7 per cent to 14.5 per cent. In comparison, overweight rates among males remain constant regardless of whether or not they have a partner.

The last measure of romantic relationships and their association with overweight and obesity was a youth's satisfaction with the relationship with their partner. The results in table 5.6 below imply that the association found in the sample between youth overweight and partner satisfaction is not statistically significant ($p > 0.05$). Conclusions could not be drawn about youth obesity because there were too few cases who were not satisfied, thus providing no point of comparison with obesity rates among those satisfied. Overweight and obesity rates

Table 5.6: Satisfaction with relationship with partner by body mass index of 15 to 24 year old Australians by gender, 2007–2008

BMI classification	Satisfaction with relationship with partner		Total
	Not satisfied	Satisfied	
Male			
Normal	66.7	57.2	58.2
Overweight	*24.2	27.6	27.3
Obese	*9.1	15.2	14.5
Total	100.0	100.0	100.0
	(N = 34)	(N = 297)	(N = 331)
	(chi-square = 1.327, p = 0.515)		
Female			
Normal	76.9	66.8	67.7
Overweight	*10.3	23.0	21.8
Obese	*12.8	10.3	10.5
Total	100.0	100.0	100.0
	(N = 37)	(N = 385)	(N = 422)
	(chi-square = 3.379, p = 0.185)		
All			
Normal	72.2	62.7	63.6
Overweight	16.7	25.0	24.2
Obese	*11.1	12.3	12.2
Total	100.0	100.0	100.0
	(N = 71)	(N = 682)	(N = 753)
	(chi-square = 2.855, p = 0.240)		

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (1198.5 weighted cases) excluded. Missing cases include 1170 cases not applicable ie. without partners and 28 Refused/Not stated. Refer to table A3.6 in appendix.

by gender were inconclusive for the same reason. The possible links between relationship quality and overweight and obesity were examined further through an analysis of parent relationship satisfaction and step parent relationship satisfaction (refer to tables 5.7 and 5.9 below).

It is evident from table 5.7 below that there is no association between overweight or obesity and a youth's satisfaction with their relationship with their parents. This remains the case when the data is analysed by gender. In contrast, tables 5.8 and 5.9 below provide evidence of an association between step parents and overweight and obesity. Firstly, table 5.8

Table 5.7: Satisfaction with relationship with parents by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Satisfaction with relationship with parents		Total
	Not satisfied	Satisfied	
Male			
Normal	65.5	62.4	62.8
Overweight	26.5	27.1	27.0
Obese	*8.0	10.5	10.2
Total	100.0	100.0	100.0
	(N = 97)	(N = 679)	(N = 776)
	(chi-square = 0.807, p = 0.668)		
Female			
Normal	62.3	68.3	67.6
Overweight	24.6	22.2	22.5
Obese	13.2	9.5	10.0
Total	100.0	100.0	100.0
	(N = 118)	(N = 719)	(N = 837)
	(chi-square = 2.137, p = 0.344)		
All			
Normal	63.6	65.3	65.1
Overweight	25.9	24.7	24.8
Obese	10.5	10.0	10.1
Total	100.0	100.0	100.0
	(N = 215)	(N = 1398)	(N = 1613)
	(chi-square = 0.245, p = 0.885)		

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (113.3 weighted cases) excluded. Missing cases include 81 not applicable ie. parents deceased, 30 refused/not stated, and 3 Multiple response SCQ. Refer to table 3.7 in appendix.

demonstrates a statistically significant association is present between step parent status and female obesity ($p < 0.05$). Of those female youths with a step parent, 14.6 per cent are experiencing obesity compared with just 8.8 per cent of those without a step parent. While the corresponding chi-square statistic of 8.596 indicates that the magnitude of the association with female obesity is not large, it exists nonetheless. As for female overweight and male overweight and obesity, it appears that there are no associations with step parent status.

Next, the relationship between overweight and obesity and a youth's satisfaction with their step parent relationship(s) was investigated. It was determined from table 5.9 below that there

Table 5.8: Step parent status by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Step parent status		Total
	Has a step parent(s)	No step parent	
Male			
Normal	63.3	63.0	63.1
Overweight	27.7	26.9	27.0
Obese	9.0	10.1	9.9
Total	100.0	100.0	100.0
	(N = 195)	(N = 615)	(N = 810)
	(chi-square = 0.221, p = 0.895)		
Female			
Normal	60.6	70.1	67.9
Overweight	24.9	21.0	21.9
Obese	14.6	8.8	10.2
Total	100.0	100.0	100.0
	(N = 226)	(N = 631)	(N = 857)
	(chi-square = 8.596, p = 0.014)		
All			
Normal	61.8	66.4	65.4
Overweight	26.2	24.1	24.6
Obese	12.0	9.5	10.0
Total	100.0	100.0	100.0
	(N = 421)	(N = 1246)	(N = 1667)
	(chi-square = 3.416, p = 0.181)		

Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (35 weighted cases) excluded. 34 Refused Not Stated and 2 Multiple SCQ response. Refer to table A3.8 in appendix.

is an association in the sample between youth overweight and not being satisfied with their step parent relationship(s), however it was not a statistically significant association (p = 0.377). The other association identified, between male overweight and not being satisfied with their step parent relationship(s), is statistically significant although weak (p = 0.088). The chi-square statistic of 4.866 indicates that the magnitude of this association is not great, but nonetheless it exists. The difference in the prevalence of overweight among males satisfied and those not satisfied is indeed noteworthy. Of those males not satisfied with their step parent relationship 38.8 per cent are overweight, compared with only 23.9 per cent of those who are satisfied.

Table 5.9: Satisfaction with relationship with step parent by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Satisfaction with relationship with step parent(s)		Total
	Not satisfied	Satisfied	
Male			
Normal	57.1	65.9	63.6
Overweight	38.8	23.9	27.8
Obese	*4.1	10.1	8.6
Total	100.0	100.0	100.0
	(N = 54)	(N = 141)	(N = 195)
	(chi-square = 4.866, p = 0.088)		
Female			
Normal	60.0	60.9	60.6
Overweight	25.3	24.6	24.9
Obese	14.7	14.5	14.6
Total	100.0	100.0	100.0
	(N = 81)	(N = 145)	(N = 226)
	(chi-square = 0.017, p = 0.992)		
All			
Normal	58.9	63.2	61.8
Overweight	30.6	24.2	26.2
Obese	10.5	12.6	12.0
Total	100.0	100.0	100.0
	(N = 135)	(N = 286)	(N = 421)
	(chi-square = 1.952, p = 0.377)		

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (1535.6 weighted cases) excluded. Missing cases include 1501 not applicable ie. no step parents, remainder are Refused/not stated and Multiple SCQ response. Refer to table A3.9 in appendix.

In summary, there is a clear relationship between overweight and obesity and living arrangements and relationships. Specifically, living with someone in a relationship is associated with obesity and marriage is associated with overweight, particularly among females. Furthermore, having a step parent is associated with female obesity and not being satisfied with a step parent relationship(s) is associated with overweight among males.

5. 3 Discussion of social network results

Social networks are clearly playing a part in the overweight and obesity equation for Australian youth. This finding can be supported by Davison and Birch's (2001) Ecological Model of Predictors of Childhood Overweight which acknowledges family, school and wider social contexts of community interact with the development of overweight. While no association was found to exist with active club membership or relationship satisfaction with partners or parents (refer to tables 5.1, 5.6 and 5.7), there does appear to be many other aspects of social networks that are associated with overweight and obesity including social support levels and frequency of social contact (refer to tables 5.2 and 5.3). In particular, overweight is more likely among those married and those not satisfied with their step parent relationship (refer to tables 5.4 and 5.9). Similarly, the prevalence of obesity is greater among those with a partner, those never married but living with someone, and those with a step parent (refer to tables 5.5, 5.4 and 5.8). For some of these social network factors the existence and strength of their relationship with overweight and/or obesity differs between genders, and thus it is best to refer to the individual tables for full detail of the relationships.

There is considerable evidence that social isolation is associated with ill health and that social support is beneficial to health (Stansfeld 1999:155). A significant proportion of existing research into the relationship between social support and physical morbidity has specifically concerned cardiovascular disease such as stroke and heart disease (Standfeld 1999:163). Perhaps the reason I found some social network factors to hold no association with overweight and obesity is that not all aspects of social networks specifically impact on BMI or the youth population.

In my study, the patterns of the association between overweight and obesity and frequency of social contact and levels of social support are not easily described, but an association clearly exists (refer to tables 5.2 and 5.3). Similarly, a study by Bourke et al. (2009: 90) examined healthy behaviours in young people and concluded that social acceptance and social participation are associated. In a study specifically examining BMI, Falkner et al. (2001: 32) found that compared with their 'average weight' contemporaries, obese American adolescent girls and boys were 1.63 and 1.91 times respectively less likely to hang out with friends in the last week. Likewise I found higher rates of overweight and obesity among those with social

contact less than once a week (refer to table 5.3). However I also found that males with social contact every day have high rates of overweight and obesity. Perhaps social occasions for male youth involve higher levels of unhealthy risk behaviours such as smoking, drinking and unhealthy food, thus high levels of social inclusion could be just as detrimental to their weight as social isolation. Indeed a qualitative study of rural 14 to 18 year olds by Bourke et al. (2009: 89) found it was preferable to be involved in unhealthy activities with friends than to be socially isolated.

Other research into social support includes studies by Strauss and Pollack (2003) and Falkner et al. (2001). In their study, Strauss and Pollack (2003: 746,751) found overweight adolescents received fewer friendship nominations and were less central to social networks than their normal weight peers, indicating they are more socially isolated. Certainly the data in my study suggests obesity in females and obesity and overweight in males are associated with perceived lower levels of social support (refer to table 5.2). Similarly, a study of American teenagers by Falkner et al. (2001: 37) found obese males feel their friends care about them a little or not at all. Contradictory to my study, Falkner et al. (2001: 37) also found obese females feel their friends care about them. The difference in results could perhaps be explained by the fact Falkner et al. (2001) was only measuring social support from friends, where as I measured total social support from all sources. It is also interesting to consider the different reasons why overweight rates in females appear to be lowest among both those with very high and very low social support (refer to table 5.2). Perhaps females with high social support are less overweight due to a balanced lifestyle and few health risk behaviours, while those with low social support are less overweight due to depression, anxiety or eating disorders.

Parental relationships and their interaction with overweight and obesity provide some interesting findings. Bourke et al. (2009: 89) found higher prevalence of poor health behaviours among young people who have experienced rejection from a parent, suggesting an association between parental relationship satisfaction and BMI is possible. However, when Falkner et al. (2001: 36) looked specifically at BMI, no statistically significant association was found with the relationship satisfaction females have with their parents and males have with their mothers. Similarly, my study found a youth's satisfaction with their parental relationships is not associated with overweight or obesity (refer to table 5.7). In contrast to

my findings on parental relationship satisfaction, an association with step parent relationship satisfaction was evident (refer to table 5.9). Not being satisfied with a step parent relationship seems to be associated with higher rates of overweight in the male youth population. In females, their level of satisfaction with their step-parent(s) relationship is not associated with BMI, but having a step parent(s) is associated with higher rates of obesity. These findings appear consistent with a longitudinal study of youth by Lee et al. (2009: 523) which reported a marginally significant negative relationship between living in a step parent home and remaining obese over a 5 year period.

Another highly significant relationship, the romantic relationship, certainly seems to play a role in the equation for youth overweight and obesity. An American study by Pearce et al. (2002: 386, 390) found obese adolescent females were less likely to date than their peers, but obese adolescent males were just as likely to date as their peers. It would seem female obesity is associated with not dating while male obesity is not associated with dating. Conversely, my study found no association in females between obesity and having or not having a partner, but did find an association between male obesity and having a partner (refer to table 5.5). The difference in results could be due to the Pearce et al. (2002) study measuring dating status as opposed to partner status, and sampling only Year 9 to Year 12 students. Also, perhaps the associations present in dating behaviour of younger years are diluted in my results by the changed dating and partnering behaviours of young adulthood. As for a youth's satisfaction with their relationship with their partner, my study found this is not likely to be associated with overweight (refer to table 5.6). By contrast, a recent female obesity study by Sobal et al. (2009: 36) found a negative association to exist between female obesity and relationship happiness, and a positive association to exist between female obesity and relationship conflict and relationship communication. However Sobal et al. (2009: 36) placed these findings in context: only a fifth of the cross sectional and change models showed a statistically significant association between weight and partner relationship quality.

Marital status was the other measure of romantic relationships in this study. It appears youth obesity is associated with not being married but living with someone in a relationship (refer to table 5.4). Conversely, youth overweight is associated with being married, particularly in females (also refer to table 5.4). In contrast, the results of an American study of adults aged 20 to 64 years by Sobal et al. (1992: 915) found no association between obesity in females

and marital status. However, similar to my study Sobal et al. (1992: 915) also found married men were more likely to be obese than those never married or previously married. The difference in results could be because the associations for adolescent and young adult females differ from those of the general adult population studied by Sobal et al. (1992).

In summary, there is evidence that social support, contact and relationships are playing a role in the overweight and obesity epidemic among youth. The existence and strength of the relationship between social network factors and overweight and/or obesity differs by gender. Social support levels and frequency of social contact were found to have various associations with overweight and/or obesity. Specifically, overweight is more likely among those married and those not satisfied with their step parent relationship. Similarly, the prevalence of obesity is greater among those never married but living with someone, those with a partner and those with a step parent.

Chapter 6: Family background, overweight and obesity

This chapter presents and discusses the results from the investigation into the relationship between family background and overweight and obesity. Living arrangements again appear to be associated, as does family structure, parental socioeconomic status and a youth's education.

6.1 Living arrangementsin early adolescence

It is evident from table 6.1 below that there is a statistically significant association between youth overweight and obesity and living arrangements when 14 years old. Overweight is

Table 6.1: Living arrangements when 14 years old by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Living arrangements at 14 years of age			Total
	Lived with both own mother and father	Lived with one biological parent and one step parent	Lived with one biological parent and no step parent	
Male				
Normal	64.1	62.0	59.1	63.1
Overweight	26.5	22.5	29.8	26.8
Obese	9.3	15.5	11.0	10.1
Total	100.0	100.0	100.0	100.0
	(N = 569)	(N = 73)	(N = 164)	(N = 806)
	(chi-square = 4.342, p = 0.362)			
Female				
Normal	70.9	66.7	61.4	68.5
Overweight	20.5	18.2	27.2	21.6
Obese	8.6	15.2	11.4	9.9
Total	100.0	100.0	100.0	100.0
	(N = 581)	(N = 108)	(N = 157)	(N = 846)
	(chi-square = 9.746, p = 0.045)			
All				
Normal	67.3	64.3	60.4	65.7
Overweight	23.7	20.5	28.4	24.3
Obese	9.0	15.2	11.2	10.0
Total	100.0	100.0	100.0	100.0
	(N = 1150)	(N = 181)	(N = 321)	(N = 1652)
	(chi-square = 12.539, p = 0.014)			

Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (32.7 weighted cases) excluded. Includes 31 'Other' category declared missing and 1 'Don't know' declared missing. Refer to table A4.1 in appendix.

most prevalent among those living in sole parent families (28.4 per cent) while obesity is most prevalent among those living with one biological parent and a step parent (15.2 per cent). Analysis by gender reveals that this association is present in both males and females in the sample, however the association is statistically significant for females only (p <0.05). The rates of female overweight and obesity are nearly identical to those for the youth population overall, with overweight rates at 27.2 per cent for those living with a sole parent, and obesity rates at 15.2 per cent for those living with one biological parent and one step parent (refer to table 6.1 above).

In terms of the reasons why a youth did not live with both parents at age 14, the results suggest no association with obesity (refer to table 6.2 below). However the data does provide evidence of a statistically significant association between overweight and reasons other than divorce or separation. Overweight rates are at 23.6 per cent among those who did not live with both their parents at age 14 because they were separated or divorced. By comparison 36.6 per cent are overweight among those who did not live with both their parents at age 14 for reasons other than separation or divorce. These other reasons included deceased parents and parents never marrying or living together.

Analysis by gender in table 6.2 indicates the association exists in the sample for both males and females, however it is only statistically significant for males (p = 0.037). There is a striking difference of 16.5 percentage points between overweight rates in males, with 41.2 per cent overweight among those whose parents were separated or divorced when they were 14 years old, and 24.7 per cent overweight among those who were not living with both their parents for other reasons.

In summary, these results signify an important association between youth overweight and obesity and living arrangements in early adolescence. They also intimate an association between family structure and overweight and obesity.

Table 6.2: Why youth not living with both parents when 14 years old by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Why you were not living with both your own parents at age 14		Total
	Parents separated or divorced	Other reason	
Male			
Normal	63.7	45.1	60.2
Overweight	24.7	41.2	27.8
Obese	11.6	*13.7	12.0
Total	100.0	100.0	100.0
	(N = 212)	(N = 42)	(N = 254)
	(chi-square = 6.574, p = 0.037)		
Female			
Normal	64.9	52.0	62.8
Overweight	22.7	32.0	24.3
Obese	12.4	*16.0	13.0
Total	100.0	100.0	100.0
	(N = 246)	(N = 42)	(N = 288)
	(chi-square = 3.024, p = 0.220)		
All			
Normal	64.4	48.5	61.6
Overweight	23.6	36.6	25.9
Obese	12.0	14.9	12.5
Total	100.0	100.0	100.0
	(N = 458)	(N = 84)	(N = 542)
	(chi-square = 9.361, p = 0.009)		

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (1368.4 weighted cases) excluded. Missing cases include 1368 not asked because living with both parents. Refer to table A4.2 in appendix.

6.2 Employment and occupation of parents

The socioeconomic status of a youth's family was measured via examination of the employment status and occupation of a youth's parents. Table 6.3 below implies that there is no association between youth overweight and obesity and whether or not a youth's father was employed when the youth was aged 14. In contrast, table 6.4 below provides evidence of a statistically significant association between overweight among males and their mother's

Table 6.3: Employment status of father when youth was 14 years old by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Employment status of father when youth was 14 years old		Total
	Employed	Not employed	
Male			
Normal	63.1	72.7	63.6
Overweight	27.2	*18.2	26.7
Obese	9.7	*9.1	9.7
Total	100.0	100.0	100.0
	(N = 702)	(N = 38)	(N = 740)
	(chi-square = 1.889, p = 0.389)		
Female			
Normal	68.8	70.8	68.9
Overweight	21.2	20.0	21.1
Obese	10.0	*9.2	10.0
Total	100.0	100.0	100.0
	(N = 713)	(N = 64)	(N = 777)
	(chi-square = 0.116, p = 0.944)		
All			
Normal	65.8	71.6	66.2
Overweight	24.4	20.2	24.1
Obese	9.8	*8.3	9.7
Total	100.0	100.0	100.0
	(N = 1415)	(N = 102)	(N = 1517)
	(chi-square = 1.516, p = 0.469)		

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (215.5 weighted cases) excluded. Missing cases include 102 standard missing case categories and 114 cases declared missing as 'Father not living with respondent so don't know' or 'Father was deceased'. Refer to table A4.6 in appendix.

employment status when they were 14 years old. Specifically, it appears that those males whose mother's were not employed when they were 14 years of age are at greater risk of being overweight, with 31.4 per cent of such males overweight compared with only 24.5 per cent of males whose mothers were employed (refer to table 6.4 below). It should be noted that the p value of 0.082 for males indicates that the statistical significance of the association is weak. There were no overweight or obesity associations found in females.

Table 6.4: Employment status of mother when respondent was 14 years old by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Employment status of mother when youth was 14 years old		Total
	Employed	Not employed	
Male			
Normal	66.0	58.4	63.9
Overweight	24.5	31.4	26.4
Obese	9.5	10.2	9.7
Total	100.0	100.0	100.0
	(N = 546)	(N = 223)	(N = 769)
	(chi-square = 4.999, $p = 0.082$)		
Female			
Normal	70.3	66.4	69.1
Overweight	20.6	20.5	20.6
Obese	9.1	13.1	10.3
Total	100.0	100.0	100.0
	(N = 575)	(N = 245)	(N = 820)
	(chi-square = 3.288, $p = 0.193$)		
All			
Normal	68.0	62.5	66.4
Overweight	22.7	25.9	23.6
Obese	9.3	11.7	10.0
Total	100.0	100.0	100.0
	(N = 1121)	(N = 468)	(N = 1589)
	(chi-square = 5.319, $p = 0.070$)		

Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (144.3 weighted cases) excluded. Missing cases include 120 standard missing cases, 7 cases 'Mother not living with respondent so don't know' and 17 cases 'Mother deceased'. Refer to table A4.7 in appendix.

It followed that the occupation of a youth's parents be examined next. Data in table 6.5 below shows a statistically significant relationship between overweight and the occupation of a youth's father when the youth was 14 years old. Precisely, overweight is most prevalent, about 30 per cent, among those youth who fathers were employed as labourers or trades workers. The chi-square statistic of 29.539 suggests the magnitude of the association is large.

Analysis by gender suggests that within the female and male sub-populations there is a statistically significant association ($p < 0.05$) between overweight and obesity and a father's occupation. The large size of the chi-square statistics for both males and females indicates the large magnitude of the association (refer to table 6.5 below).

Table 6.5: Father's occupation when respondent was aged 14 years by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Father's occupation when youth was 14 years old					
	Managers	Professionals	Technicians & Trades Workers	Community & Personal Service, Clerical & Administrative, & Sales Workers	Machinery Operators, Drivers and Labourers	Total
Male						
Normal	59.1	66.7	63.3	71.2	56.8	63.1
Overweight	26.0	22.6	32.6	18.7	33.7	27.3
Obese	14.9	10.7	*4.1	10.1	9.5	9.6
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 136)	(N = 157)	(N = 180)	(N = 115)	(N = 142)	(N = 730)
	(chi-square = 25.689, p = 0.001)					
Female						
Normal	74.3	76.1	59.4	74.5	59.1	68.4
Overweight	21.5	14.7	26.4	17.5	26.2	21.2
Obese	*4.2	9.1	14.2	8.0	14.8	10.3
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 138)	(N = 160)	(N = 196)	(N = 121)	(N = 150)	(N = 765)
	(chi-square = 28.441, p = 0.000)					
All						
Normal	65.8	71.8	61.4	72.8	57.7	65.7
Overweight	24.0	18.4	29.6	18.1	30.3	24.4
Obese	10.2	9.9	8.9	9.1	12.0	10.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 274)	(N = 317)	(N = 376)	(N = 236)	(N = 292)	(N = 1495)
	(chi-square = 29.539, p = 0.000)					

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (238.7 weighted cases) excluded. Missing cases all fall into the standard missing case categories. Refer to table A4.4 in appendix.

The association between a father's occupation and overweight is stronger in males than in females. However the nature of the association is the same for both genders in that overweight is associated with fathers employed as trade workers or labourers in both males and females (refer to table 6.5). In contrast, the nature of the association with obesity differs by gender. In males, obesity is most prevalent among youth with managerial fathers (14.9 per cent). Obesity in females, like overweight, is most prevalent among those whose father's

were employed as trades workers or labourers (about 14 per cent). The association with obesity is stronger among females than males.

In striking contrast to the results for a father's occupation, no statistically significant associations were identified between overweight and obesity and a mother's occupation when a youth was 14 years of age. While table 6.6 shows that associations are present in the sample between a mother's occupation and overweight and obesity, none of these associations were statistically significant ($p > 0.05$) and thus they are not likely to exist in the population.

Table 6.6: Mother's occupation when respondent was aged 14 years by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Mother's occupation when youth was 14 years old					
	Managers	Professionals	Technicians & Trades Workers	Community & Personal Service, Clerical & Administrative, & Sales Workers	Machinery Operators, Drivers and Labourers	Total
Male						
Normal	69.8	69.7	58.1	61.1	68.7	65.0
Overweight	22.6	23.9	32.6	27.5	22.2	25.7
Obese	*7.5	6.4	*9.3	11.4	*9.1	9.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 45)	(N = 220)	(N = 29)	(N = 321)	(N = 74)	(N = 689)
	(chi-square = 8.958, $p = 0.346$)					
Female						
Normal	80.7	68.5	62.1	69.3	64.4	69.1
Overweight	*15.8	22.2	*17.2	21.6	19.5	20.9
Obese	*3.5	9.3	*20.7	9.1	16.1	9.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 57)	(N = 199)	(N = 25)	(N = 341)	(N = 88)	(N = 710)
	(chi-square = 12.290, $p = 0.139$)					
All						
Normal	75.2	69.3	59.7	65.2	66.7	67.0
Overweight	19.3	23.2	26.4	24.6	21.0	23.5
Obese	*5.5	7.5	*13.9	10.2	12.4	9.5
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 102)	(N = 419)	(N = 54)	(N = 662)	(N = 162)	(N = 1399)
	(chi-square = 11.632, $p = 0.168$)					

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample.
Note 2: missing cases (349.9 weighted cases) excluded. Missing cases all fall into standard missing case categories. Refer to table A4.5 in appendix.

In summary, the evidence suggests parental socioeconomic status is related to youth overweight and obesity. Specifically, fathers employed as trades workers or labourers are associated with youth overweight and obesity, and fathers employed as managers are associated with youth obesity in males. Mothers who were not employed when a youth was 14 years old are also associated with overweight in males. Conversely the results signify no association between overweight and obesity and a mother's occupation or whether or not a father was employed.

6.3 Siblings

According to the results in table 6.7 below, there are no statistically significant associations between sibling numbers and overweight and obesity in the youth population overall.

Table 6.7: Number of siblings by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Sibling status					Total
	No siblings	1 sibling	2 siblings	3 siblings	4 or more siblings	
Male						
Normal	67.2	65.6	55.7	62.8	69.2	62.3
Overweight	19.7	28.5	31.0	24.4	26.0	27.8
Obese	*13.1	5.9	13.3	12.8	*4.8	9.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 40)	(N = 250)	(N = 272)	(N = 143)	(N = 101)	(N = 806)
	(chi-square = 20.737, p = 0.008)					
Female						
Normal	65.1	70.3	71.6	61.3	68.8	68.7
Overweight	25.4	21.0	18.3	26.8	19.4	21.1
Obese	*9.5	8.7	10.1	12.0	11.8	10.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 46)	(N = 264)	(N = 249)	(N = 166)	(N = 133)	(N = 858)
	(chi-square = 7.128, p = 0.523)					
All						
Normal	65.1	68.0	63.0	61.9	68.7	65.3
Overweight	23.0	24.7	25.1	25.4	22.1	24.5
Obese	11.9	7.3	11.9	12.7	9.2	10.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
	(N = 86)	(N = 514)	(N = 521)	(N = 309)	(N = 234)	(N = 1664)
	(chi-square = 12.186, p = 0.143)					

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample. Note 2: missing cases (51 weighted cases) excluded. Missing cases all fall into standard missing case categories. Refer to table A4.3 in appendix.

However analysis by gender proves that there is in fact a statistically significant association among males ($p = 0.008$). The chi-square statistic of 20.737 indicates the large magnitude of the association. Obesity appears to be most prevalent among those with two or three siblings, with about 13 per cent of such males classified as obese. These rates are more than double that of the 5.9 per cent obesity rate for those with one sibling. Overweight is most prevalent among those with two siblings, 31.0 per cent, followed closely by those with one sibling, 28.5 per cent. Those with no siblings appear to experience the lowest rates of overweight. With regards to females, there is an association in the sample between overweight and the number of siblings, however it is not statistically significant.

In summary, it appears that the number of siblings a male youth has is related to their risk of overweight and obesity. Only children appear to be least at risk, and conversely those with two or three siblings seem to be most at risk.

6.4 School attendance and education

The final area of family background investigated was school attendance and education. This included analysis of factors such as school sector, highest level of school completed and enrolment in post-school qualifications.

The findings from table 6.8 below are that there is a statistically significant association ($p < 0.05$) between overweight and obesity and whether or not a youth is still at school. The association between having left school and being overweight is present in both the male and female sub-populations. Overweight rates among males not at school are almost 50 per cent higher than males still at school (20.1 per cent compared with 29.6 per cent), where as rates are only 35 per cent higher for females. This is evidence that the association with overweight is stronger in males than in females. In terms of obesity, the nature of the association differs by gender. The data suggests females experience higher rates of obesity when they are no longer at school, while males experience higher rates of obesity when they are still at school. However the strength of the association with obesity is very similar in both genders, with rates almost doubling in each case respectively. For example, female obesity rates rise from 6.4 per cent among those still at school to 11.5 per cent among those not at school, and the scenario for males is reversed.

Table 6.8: Still at school or not at school by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	School attendance status		Total
	Not at school	Still at school	
Male			
Normal	62.3	64.8	63.0
Overweight	29.6	20.1	26.9
Obese	8.0	15.1	10.1
Total	100.0	100.0	100.0
	(N = 600)	(N = 223)	(N = 823)
	(chi-square = 17.223, p = 0.000)		
Female			
Normal	65.1	76.2	68.4
Overweight	23.4	17.4	21.6
Obese	11.5	6.4	10.0
Total	100.0	100.0	100.0
	(N = 625)	(N = 245)	(N = 870)
	(chi-square = 12.113, p = 0.002)		
All			
Normal	63.6	70.4	65.6
Overweight	26.7	18.9	24.4
Obese	9.7	10.8	10.0
Total	100.0	100.0	100.0
	(N = 1225)	(N = 468)	(N = 1693)
	(chi-square = 13.199, p = 0.001)		

Note 1: the N figure is from the unweighted sample.
Note 2: no missing cases. Refer to table A4.8 in appendix.

The next aspect of education examined was type of school or sector. Tables 6.9 and 6.10 below show school sector results for those youth still attending school and for those no longer at school respectively.

There is clear evidence in table 6.9 of a statistically significant association ($p < 0.05$) between obesity and current attendance at a Catholic or private school. Obesity rates are 14.4 per cent among those at Catholic or private schools compared with 8.4 per cent at government schools. There is no association among youth between being overweight and the school sector of attendance. Analysis by gender reveals there is no statistically significant association among females, but there is such an association between school sector and obesity in males (p = 0.011). At 22.4 per cent, obesity rates among males attending Catholic or private schools are

substantially higher than the 9.8 per cent obesity rate present in males attending government schools (refer to table 6.9).

Table 6.9: School sector attended by youth currently at school by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	School sector attending		Total
	Government	Catholic or other non-government	
Male			
Normal	70.1	57.0	65.1
Overweight	20.1	20.6	20.3
Obese	9.8	22.4	14.6
Total	100.0	100.0	100.0
	(N = 145)	(N = 74)	(N = 219)
	(chi-square = 9.032, p = 0.011)		
Female			
Normal	78.3	71.9	76.1
Overweight	14.7	22.9	17.5
Obese	7.1	*5.2	6.4
Total	100.0	100.0	100.0
	(N = 166)	(N = 77)	(N = 243)
	(chi-square = 3.126, p = 0.210)		
All			
Normal	74.1	63.9	70.4
Overweight	17.5	21.8	19.1
Obese	8.4	14.4	10.5
Total	100.0	100.0	100.0
	(N = 311)	(N = 151)	(N = 462)
	(chi-square = 7.562, p = 0.023)		

*Cell contains 10 or less cases and thus a conclusion cannot be drawn from this cell.
Note 1: the N figure is from the unweighted sample. Note 2: missing cases (5.2 weighted cases) excluded. Missing cases fall into 'Other, not included above (in the three sector categories provided)'. Refer to table A4.9 in appendix.

The pattern of association between sector and overweight and obesity among those no longer at school is almost a complete reversal of the pattern just presented for those still attending school. The data in table 6.10 implies that among those no longer attending school, there is a statistically significant association (p = 0.008) in existence between overweight and previous attendance at a government school. Conversely there is no association between obesity and school sector.

Table 6.10: School sector attended by youth not at school by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	School sector attended		Total
	Government	Catholic or other non-government	
Male			
Normal	60.6	66.5	62.4
Overweight	31.1	26.3	29.7
Obese	8.3	7.2	8.0
Total	100.0	100.0	100.0
	(N = 415)	(N = 181)	(N = 596)
	(chi-square = 2.185, p = 0.335)		
Female			
Normal	61.3	72.3	64.9
Overweight	25.1	20.2	23.5
Obese	13.7	7.5	11.7
Total	100.0	100.0	100.0
	(N = 442)	(N = 175)	(N = 617)
	(chi-square = 8.798, p = 0.012)		
All			
Normal	60.9	69.4	63.6
Overweight	28.3	23.2	26.7
Obese	10.8	7.3	9.7
Total	100.0	100.0	100.0
	(N = 857)	(N = 356)	(N = 1213)
	(chi-square = 9.671, p = 0.008)		

Note 1: the N figure is from the unweighted sample. Note 2: missing cases (11.7 weighted cases) excluded. Missing cases include 10 'Other, not included in above' and 2 'Don't know'. Refer to table A4.10 in appendix.

An examination of the relationship by gender indicates there is no statistically significant association among males (refer to table 6.10). However it is a different story for females, with a statistically significant association (p = 0.012) present between school sector and both overweight and obesity. Of those females who attended private schools only 7.5 per cent are now obese, compared with 13.7 per cent of those who attended government schools. Similarly, overweight rates are 20.2 per cent among those who attended private schools compared with 25.1 per cent of those who attended government schools (refer to table 6.10). The association with female obesity is stronger than the association with female overweight.

The last element of education to be investigated was education level. The data in tables 6.11 and 6.12 concerns only those youths no longer at school, providing information on the highest year of school completed and whether or not a youth has enrolled in post-school qualifications.

Beginning with the highest year of school completed, table 6.11 provides evidence of a statistically significant association between overweight in youth and not completing school. It should be noted that the statistical significance of the association is weak ($p = 0.055$). At 30.8 per cent, overweight rates are approximately 20 per cent higher for those who failed to complete school compared to 24.8 per cent among those who did finish. An analysis by gender reveals no statistically significant association among the male population. By contrast, females

Table 6.11: Highest year of school completed (by those who have left school) by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Highest year of school completed		Total
	Year 12 or equivalent or senior secondary	Year 11 or equivalent or less	
Male			
Normal	62.6	62.3	62.5
Overweight	29.4	30.0	29.6
Obese	8.0	7.8	7.9
Total	100.0	100.0	100.0
	(N = 376)	(N = 223)	(N = 599)
	(chi-square = 0.026, $p = 0.987$)		
Female			
Normal	68.5	54.5	65.0
Overweight	20.6	32.1	23.5
Obese	10.9	13.3	11.5
Total	100.0	100.0	100.0
	(N = 442)	(N = 183)	(N = 625)
	(chi-square = 11.318, $p = 0.003$)		
All			
Normal	65.6	59.2	63.6
Overweight	24.8	30.8	26.7
Obese	9.6	10.0	9.7
Total	100.0	100.0	100.0
	(N = 818)	(N = 406)	(N = 1224)
	(chi-square = 5.805, $p = 0.055$)		

Note 1: the N figure is from the unweighted sample. Note 2: a missing case (0.245 weighted case) excluded. Part missing case was 'Refused/not stated'. Refer to table A4.11 in appendix.

do have a statistically significant association between not completing school and overweight. At 32.1 per cent, the risk of overweight increases by more than 50 per cent for females who do not complete school, compared with a rate of 20.6 per cent among those who do complete school.

The results in table 6.12 again indicate an important relationship between education level and unhealthy weight in females. Among youth overall there is no association between enrolment in a post-school qualification and overweight or obesity. However a breakdown by gender shows there is in fact a statistically significant association ($p = 0.030$) between female obesity and not enrolling in a post-school qualification. At 14.1 per cent, obesity rates among females who are not enrolled in post-school qualifications are 75 per cent higher than among those who are enrolled (8.0 per cent).

Table 6.12: Enrolment status in post-school qualifications by body mass index of 15 to 24 year old Australians by gender, 2007–2008

	Currently enrolled in a post-school qualification		Total
	Enrolled	Not enrolled	
Male			
Normal	61.3	63.0	62.3
Overweight	31.9	28.1	29.6
Obese	6.7	8.9	8.0
Total	100.0	100.0	100.0
	(N = 214)	(N = 386)	(N = 600)
	(chi-square = 1.895, $p = 0.388$)		
Female			
Normal	69.6	61.6	64.9
Overweight	22.5	24.3	23.5
Obese	8.0	14.1	11.5
Total	100.0	100.0	100.0
	(N = 255)	(N = 370)	(N = 625)
	(chi-square = 7.009, $p = 0.030$)		
All			
Normal	65.4	62.4	63.6
Overweight	27.2	26.3	26.7
Obese	7.3	11.3	9.7
Total	100.0	100.0	100.0
	(N = 469)	(N = 756)	(N = 1225)
	(chi-square = 6.026, $p = 0.049$)		

Note 1: the N figure is from the unweighted sample. Note 2: no missing cases. Refer to table A4.12 in appendix.

In summary, education appears to be an important factor in youth overweight and obesity. Specifically, current attendance at a private school, attendance at a government school, not completing school and not enrolling in higher education are all associated with increased risk of overweight and/or obesity.

6.5 Discussion of family background results

From the analysis presented above it is evident that family background factors are playing a role in determining overweight and obesity among Australian youth. This finding can be supported by Davison and Birch's (2001) Ecological Model of Predictors of Childhood Overweight which acknowledges family as one of the key contexts interacting with the development of overweight. While no association was identified with a father's employment status or a mother's occupation (refer to tables 6.3 and 6.6) many other family background aspects were found to be associated. Akin to the social network findings, the existence and strength of the associations between some family background variables and overweight and obesity differs by gender.

Similar to the step parent findings of the previous chapter, the importance of family structure in the overweight and obesity equation emerges again, this time in the form of living arrangements during early adolescence and the number of siblings (refer to tables 6.1, 6.2 and 6.7). Previous research by Lee et al. (2009: 523) identified a marginally significant negative relationship in youth between living in a step parent home and remaining obese over a 5 year period. Other research by Gibson et al. (2007) found single mothers in particular to be associated with an increased likelihood of overweight and obesity in children. My study found that youth living with sole parents at age 14 years, particularly females, experience higher rates of overweight and obesity (refer to table 6.1). My results also suggest that among those youth not living with both their parents at age 14, reasons other than separation or divorce were associated with overweight, particularly in males (refer to table 6.2). Family structure and living arrangements may not be directly associated with overweight and obesity, but perhaps they are related indirectly through the effect they have on family functioning. Wilkins et al. (1998: 573) has shown that family functioning is poorer, in terms of task accomplishment and control in mothers, when children are overweight or obese. Similarly, Zeller et al. (2007: 126) found an association between obese children and adolescents and

greater family conflict. Mothers of obese children and adolescents reported higher interpersonal conflict, less cohesion and a lack of structure compared with mothers of non-overweight peers (Zeller et al. 2007: 133). Lastly, my findings suggest male youth with two or three siblings are more likely to be overweight or obese (refer to table 6.7). It is interesting to note that Christakis and Fowler (2007: 370) found the likelihood of an adult becoming obese increases by 40 per cent when their sibling becomes obese. While their study did not examine youth or associations with quantity of siblings, it does provide evidence that siblings can be associated with weight gain.

In the course of my research, it has become apparent that the socioeconomic status of a youth's family is yet another component of the overweight and obesity equation. Existing research, such as that by Wang (2001:1133), shows adolescent obesity and socioeconomic status are associated. In another study by Wang et al. (2002b: 200) income was specifically examined. Overweight and obesity among boys aged 7 to 15 years was found to be significantly less prevalent for those with highest household income than those with the lowest household income. While my study did not examine income, it did examine parental occupation and employment status. My results indicate that overweight in male youth is associated with families where the mother was not employed when they were 14 years old (refer to table 6.4). Furthermore, I found families in which the father was employed as a trades worker or labourer are associated with overweight and obesity in females and overweight in males (refer to table 6.5). If managerial employment is assumed to be among the higher paid occupations, the results of the study by Wang et al. (2002b) are somewhat at odds with my other finding that obesity in males is associated with having a managerial father.

All the education level and school sector variables analysed in this study were found to be associated with overweight and/or obesity, suggesting education is an important consideration in addressing this public health problem. Figures from the ABS (2008: 8), based on the 2004–2005 National Health Survey, show adults with a degree, diploma or higher qualification are less likely to be overweight or obese compared to adults with other or no non-school qualifications. My study found this to be particularly true of females, with higher rates of overweight experienced by those females who failed to complete school and higher rates of obesity experienced by those females not enrolled in post-school qualifications

(refer to tables 6.11 and 6.12). This is consistent with an existing body of research that shows education is a strong determinant of obesity in women (Lahti-Koski et al. 2000: 1669). For example, a longitudinal study by Gortmaker et al. (1993) found overweight adolescents aged 16 to 24 years, particularly females, had completed less years of education when they were interviewed 7 years later. Perhaps the associations found with not finishing secondary school and not enrolling in post-school qualifications are interlinked with social stigma surrounding obesity and psychological issues of self-esteem which Lobstein et al. (2004: 28–30) and Wilkins et al. (1998: 572) write about. For instance, a study by Falkner et al. (2001: 32) showed that obese school students are more likely to consider themselves poor students compared to their 'average weight' peers, and obese male school students are 2.18 times more likely to expect to quit school. Other research by Schwimmer et al. (2003: 1818) found impaired school function to be four times more prevalent among obese children and adolescents.

It is interesting to find that school culture could also be a part of the overweight and obesity equation. A study of 12 to 15 year old Australians by Olds et al. (2003: 313) found that both boys and girls at independent schools have higher physical fitness than students at Catholic and government sector schools. In part this supports my finding that obesity in males is associated with currently attending a Catholic or other non-government school (refer to table 6.9). Perhaps I did not find an association in females because I studied a different age group in my sample. Intriguingly, once a youth has left school, my results suggest that overweight and obesity in females becomes associated with previous attendance at a government school (refer to table 6.10). I was unable to source existing comparable research.

Finally in terms of education, it is worthwhile noting that there is an association between overweight and those youth who are no longer at school (refer to table 6.8). The association with obesity differs by gender: female obesity is associated with no longer being at school and conversely male obesity is associated with being at school. Assuming that age approximates school attendance, ABS (2009) figures from the 2007–2008 National Health Survey support the findings of my study: an increase in overweight rates from 19.2 per cent for 13 to 17 year olds, to 24.2 per cent for 18 to 24 year olds; an increase in female obesity rates from 5.7 per cent among 13 to 17 year olds, to 14.9 per cent among 18 to 24 year olds; a

marginal decrease in male obesity rates from 13.0 per cent among 13 to 17 year olds to 12.8 per cent among 18 to 24 year olds.

In summary, the evidence from my study suggests living arrangements, family structure, school attendance, education and parental socioeconomic status are all associated with overweight and obesity in youth. Specifically, higher rates of overweight were associated with living with one biological parent, not living with both parents for reasons other than divorce or separation, having two siblings, mothers not employed and fathers employed as trades workers and labourers. Higher overweight rates are also experienced by those youth no longer at school, previous attendance at a government school, and failure to complete school. Similarly, higher rates of obesity were associated with having two or three siblings, living with one biological parent and having a father employed as a trades worker, labourer or manager. The prevalence of obesity was also higher among those youth currently attending a private school, those no longer at school but previously having attended a government school, and those not enrolled in post-school qualifications. Curiously, obesity rates in males are higher for those still at school than those no longer at school, and for females the reverse is true. The existence and strength of the relationship between family background factors and overweight and/or obesity does differ by gender for much of this evidence, and thus it is best to refer to individual tables and relevant results discussion for full details.

Chapter 7: Conclusion and implications

7.1 Summary

Understanding the causes and consequences of overweight and obesity in our community is complex. It is acknowledged that many factors are at play including genetic, metabolic, psychological and environmental influences (Wilkins et al. 1998: 572) and more health, social and socioeconomic associations are being discovered all the time. Studies about the relationship with family background and social network factors appear to be growing along with many other fields of overweight and obesity research. My research has specifically focused on Australian youth and has drawn on social network and family background data collected in the latest HILDA survey. The results suggest there are potentially a number of social network and family background factors at play in the complicated equation for overweight and obesity. In general the findings support existing studies, sometimes they are contradictory and on other occasions they appear to enter new ground. It is important to reiterate that for some of the variables included in the analysis, the existence and strength of their relationship with overweight and/or obesity differs by gender.

It is not only the frequency of social contact that plays a role, but the perceived quantity of social support received. The evidence indicates that those youth with lower levels of social support are generally at increased risk of overweight and obesity, along with those who have very frequent or infrequent social contact. In addition, the type and quality of relationships a youth holds along with their family and household structure seem to be of significance. There is a greater prevalence of obesity among youth who have a partner or are living with someone in a relationship, and greater prevalence of overweight among those married. Those with a step parent, particularly those lacking satisfaction with their step parent relationship, are also at greater risk. Furthermore, the data indicates higher rates of overweight and obesity experienced by those youth with two or three siblings and those living with only one biological parent.

The socioeconomic status of a youth also appears to figure in determining their risk of overweight and obesity. The occupation of parents appears to be one such socioeconomic factor. The results suggest that higher rates of overweight are associated with having a mother who is not employed. Those youth with a father who is a trades worker, labourer or

manager are at increased risk of overweight and/or obesity. Education was the other socioeconomic factor explored in this study. Results indicate that failing to complete secondary school is associated with overweight and not enrolling in post-school qualifications is associated with obesity. An interesting relationship emerged between the type of school attended and overweight and obesity. The data analysed in this study suggests that among those still at school, those educated in the private sector are most at risk of obesity. However once they have left school it seems the opposite is true, with those who were educated in the government sector experiencing higher rates of overweight and obesity.

In summary, there is clear evidence in this study that social networks and family background are highly relevant to youth overweight and obesity in Australia.

7. 2 Social policy implications

Over the last two decades there has been a shift towards evidence-based health policy and preventative health policy (Gardner 2008: 42). In addition, the government views obesity as a National Health Priority Area (Access Economics 2008: 1) and regards young people as a target age group for health interventions (Gardner 2008: 42). In this context, any research into youth overweight and obesity should be welcomed, and could be incorporated into the activities of the $17.6 million National Preventative Health Agency which begins operation next year.

Given so many segments of the youth community are at risk of overweight and obesity, the federal government should consider a public health education campaign similar to those conducted for smoking, drink driving and skin cancer. In addition, local government policy could play an important role in fostering the development of social networks in the community through funding for recreational and sporting facilities as well as youth community events and services.

To address the findings on sole parent and step parent families, messages about healthy lifestyle and obesity avoidance need to reach families experiencing divorce, separation and other family structure changing events. Perhaps these messages could be distributed via services that such families might access such as counselling and community support groups

like The Smith Family. These messages also need to be directed at mothers who are not employed, a proportion of whom could be reached through Centrelink communications targeted at females with dependents. Furthermore, families in which the father is employed as a manager, trades worker or labourer could be targeted through relevant unions, super funds and professional membership associations.

Education policy could help address the associations found with youth not completing school or not enrolling in post-school qualifications. Healthy lifestyle teaching needs to be incorporated into the curriculum to prepare them for life beyond school including physical education classes and cooking and nutrition classes. Perhaps higher teacher-student ratios as well as access to tutors and welfare coordinators for those struggling will encourage students to complete their schooling and to develop the skills and confidence to enrol in post-school qualifications.

7.3 Limitations

BMI is central to this study and it is important to acknowledge its limitations. The height and weight measurements used to calculate BMI were self-reported, which can be problematic because people tend to understate their weight and overstate their height (ABS, 2008b: 3; Hayes et al., 2008: 542; Wang et al., 2002a: 473). Wang et al. (2002a: 473) specifically studied 15 to 19 year old Australians and found self-reported height was overstated and self-reported weight was understated, particularly among those classified as overweight and obese. This resulted in correct classification of overweight and obesity in only 70 per cent of girls and 69 per cent of boys (Wang et al. 2002a: 473). In addition, the BMI measure does not take into account ethnicity or, in the case of the adult BMI cut off points, age (Thirlaway and Upton, 2009: 54). Also, BMI is not sensitive to high body mass due to muscle rather than fat, nor does it measure fat distribution across the body which equates to different health risks (Thirlaway and Upton, 2009: 54). Lastly, Wang et al. (2002b: 204) suggests the validity of applying the international children and adolescent BMI score cut off points (Cole et al. 2000) to Australian youth still requires assessment.

There are other limitations to this study. Whilst the survey questions and response categories have been rigorously tested, self reported information is subject to acquiescence and social

desirability bias. The limitations of time, resources and an existing data set have meant only selected family background and social connection measures have been analysed in this study when in reality there is a multitude of factors associated with BMI. In addition, analysis methods only examined for association, not causation. Nuances in overweight and obesity rates may have gone undetected as a result of collapsing categories or declaring as missing those categories with very low counts, however this was necessary to use the chi-square statistic and to summarise data to a higher level of abstraction. Despite these aggregations there were still several instances when results were inconclusive because of small cell counts of ten or less cases. Lastly, the attrition rate is higher than that of a comparable longitudinal study, the British Household Panel Survey (MIAESR 2009a:14–15) and the application of a population weight has attempted to ensure results are representative of the population.

7.4 Future research

Future research could take a number of directions. Longitudinal quantitative research could be conducted using the existing seven waves of HILDA data in an attempt to determine the direction of the identified associations. A qualitative study could explore the attitudes and beliefs of youth surrounding the interaction between overweight and obesity and family background and social networks. Future research should avoid self-reported height and weight measures or alternatively employ correction equations similar to those developed by Hayes et al. (2008:545) for the 1995 National Nutrition Survey. Obesity rates in Australia are forecast to reach 18.3 per cent or 4.6 million people by 2025 (Access Economics 2008: iii), suggesting overweight and obesity will continue to be an important population health issue for the foreseeable future.

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Appendix 1: HILDA survey questions used in this research

Social network questions

Self Completion Questionnaire B7

Are you currently an active member of a sporting, hobby or community-based club or association? Cross one box.

Yes

No

Self Completion Questionnaire B22

The following statements have been used by many people to describe how much support they get from other people. How much do you agree or disagree with each? The more you agree, the higher the number of the box you should cross. The more you disagree, the lower the number of the box you should cross. Please cross one box for each statement *(on a rating scale 1 to 7, 1 being strongly disagree, 7 being strongly agree)*

b I often need help from other people but can't get it

d I don't have anyone that I can confide in

e I have no one to lean on in times of trouble

g I often feel very lonely

Self Completion Questionnaire B21

In general, about how often do you get together socially with friends or relatives not living with you? Cross one box.

Everyday

Several times a week

About once a week

2 or 3 times a month

About once a month

Once or twice every 3 months

Less often than once every 3 months.

Appendix 1: HILDA survey questions used in this research (continued)

Continuing Person Questionnaire H4 and New Person Questionnaire H1

Looking at SHOWCARD H4, which of these best describes your current marital status? And by 'married' we mean in a registered marriage.

Married (in a registered marriage)

Separated, but not divorced

Divorced

Widowed

Never married but living with someone in a relationship

Never married and not living with someone in a relationship

Self Completion Questionnaire B18

Now some questions about family life. Please indicate, by crossing one box on each line, how satisfied or dissatisfied you currently are with each of the following relationships. The more satisfied you are, the higher the number of the box you should cross. The less satisfied you are, the lower the number of the box you should cross. If the questionnaire does not apply to you, cross the "Does not apply" category. How satisfied are you with *(on a rating scale 0 to 10, 0 being completely dissatisfied and 10 being completely satisfied):*

a your relationship with your partner?

f your relationship with your parents?

g your relationship with your step-parents?

Appendix 1: HILDA survey questions used in this research (continued)

Family background questions

New Person Questionnaire BB1
Responses combined with responses from continuing persons from their first interview.

This section is about your family background. Were you living with both your 'own' mother and father around the time you were 14 years old? (If asked, 'own' means natural or adopted as an infant.)

Both own mother and father

Father and stepmother

Mother and stepfather

Father only – no mother or stepmother

Mother only – no father or stepfather

Other (please specify)

New Person Questionnaire BB2
Responses combined with responses from continuing persons from their first interview.

Why were you not living with both your own parents?

Parents never married or lived together

One or both parents died

Parents separated or divorced

Other (please specify)

New Person Questionnaire BB16
Responses combined with responses from continuing persons from their first interview.

Thinking back to when you were 14 years old, did your father work in a job, business or farm? (Accept father substitutes).

Yes (→BB17a)

No (→BB17b)

Father was deceased (→BB17c)

Father not living with respondent so don't know

Don't know

Appendix 1: HILDA survey questions used in this research (continued)

New Person Questionnaire BB17a

What kind of work did he do? That is, what was his occupation called and what were the main tasks and duties he undertook in that job? Please describe fully.

New Person Questionnaire BB17b

What about any previous employment? That is, what was his occupation called and what were the main tasks and duties he undertook in that job? Please describe fully.

New Person Questionnaire BB17c

What kind of work did he do when he was alive? That is, in his last job what was his occupation called and what were the main tasks and duties he undertook in that job? Please describe fully.

Occupation title:

Main tasks/duties:

Never had a job

Don't know

New Person Questionnaire BB19
Responses combined with answers from continuing persons from their first interview.

And what about your mother? Was she in paid employment when you were 14? (Accept mother substitutes).

Yes(→BB20a)

No(→BB20b)

Mother was deceased(→BB20c)

No mother living with respondent so don't know

Don't know

New Person Questionnaire BB20a

What kind of work did she do? That is, what was her occupation called and what were the main tasks and duties she undertook in that job? Please describe fully.

Appendix 1: HILDA survey questions used in this research (continued)

New Person Questionnaire BB20b

What about any previous employment? That is, what was her occupation called and what were the main tasks and duties she undertook in that job? Please describe fully.

New Person Questionnaire BB20c

What kind of work did she do when she was alive? That is, in her last job what was her occupation called and what were the main tasks and duties she undertook in that job? Please describe fully.

Occupation title:

Main tasks/duties:

Never had a job

Don't know

New Person Questionnaire BB6
Responses combined with answers from continuing persons from their first interview. For continuing persons, updated if new sibling since last interview.

Now we have some questions about brothers and sisters. Have you ever had any brothers or sisters? Include half or adopted, but not step or foster.

Yes

No

Don't know

New Person Questionnaire BB7
Responses combined with answers from continuing persons from their first interview. For continuing persons who are still living at home and have a new sibling since the last interview, the number of new siblings is added to the number of siblings at last interview.

How many?

Enter number:

Appendix 1: HILDA survey questions used in this research (continued)

New Person Questionnaire A1
Responses combined with answers from continuing persons from their first interview. If continuing person was still at school at the time of their first interview and has left school since the date of that interview (refer to Continuing Person Questionnaire A3), age left school is calculated from month and year left school (refer to Continuing Person Questionnaire A4).

At what age did you leave school? (as a child/teenager; not as a mature age student and not tertiary study).

Enter age in whole years:

Never went to school

Still at school

Note: responses recoded to identify those still at school and those who have left school.

New Person Questionnaire A2
Responses combined with answers from continuing persons from their first interview. If respondent was still at school at the time of their first interview and has left school since then (refer to Continuing Person Questionnaire A3), the highest level of school they reported completing in a later interview is used (refer to Continuing Person Questionnaire A5).

Looking at SHOWCARD 1, what was the highest year of school you [completed/are currently attending]?

Year 12 or equivalent / Senior Secondary

Year 11 or equivalent

Year 10 or equivalent / Junior Secondary

Year 9 or equivalent

Year 8 or equivalent

Year 7 or equivalent (NSW, VIC, TAS, ACT only)

Did not attend secondary school but finished primary school

Attended primary school but did not finish

Appendix 1: HILDA survey questions used in this research (continued)

New person questionnaire A3
Responses combined with answers from continuing persons from their first interview. If respondent was still at school at the time of their first interview and has left school since the date of that interview (refer to Continuing Person Questionnaire A3), type of school attended is updated (refer to Continuing Person Questionnaire A6).

Looking at SHOWCARD 2, which of these categories best describes the type of school you [were attending in you last year / are currently attending]? If attended 2 schools in the last year, record for most recent school attended.

Government school

Catholic non-government school

Other non-government school

Other, not included above (please specify)

Don't know

New Person Questionnaire A11 and Continuing Person Questionnaire A9c
Note: the missing cases which were classified as 'not asked' were recoded as 'not studying a post-school qualification'

Are you studying this full-time or part-time?

Full-time student
Part-time student

New Person Questionnaire E9b and Continuing Person Questionnaire E9b

Since July 2006, how many different jobs (employers) have you had? And what period did you work in [each/that] job?

Time period for each job filled in on a calendar and variable derived

Appendix 2: Body Mass Index (BMI) cut off points for people aged 15 to 18 years

Below is a sub-section of the table from the study by Cole et al (2000).

Table A2.1: International cut off points for body mass index for overweight and obesity by sex between 15 and 18 years, defined to pass through body mass index of 25 and 30 kg/m2 at age 18, obtained by averaging data from Brazil, Great Britain, Hong Kong, Netherlands, Singapore and United States.

Age (years)	Body mass index 25 kg/m2 (overweight)		Body mass index 30kg/m2 (obese)	
	Males	Females	Males	Females
15	23.29	23.94	28.30	29.11
15.5	23.60	24.17	28.60	29.29
16	23.90	24.37	28.88	29.43
16.5	24.19	24.54	29.14	29.56
17	24.46	24.70	29.41	29.69
17.5	24.73	24.85	29.70	29.84
18	25	25	30	30

Source: Cole, T., Bellizzi, M., Flegal, K. and Dietz, W. (2000), "Establishing a standard definition for child overweight and obesity worldwide: International Survey", *British Medical Journal* 320, pp.1240–1246.

Appendix 3: Social network frequency tables

Table A3.1: Currently an active member of a sporting/hobby/community based association

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Yes	823	42.5	42.8	42.8
No	1101	56.9	57.2	100.0
Total	1925*	99.4	100.0	
Missing				
Refused/Not stated	11	0.6		
Total	1936	100.0		

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the values above when their decimal places are taken into account.

Table A3.2: Social support indicator

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Very high	370	19.1	19.1	19.1
High	353	18.2	18.2	37.3
Moderate	511	26.4	26.4	63.7
Low	445	23.0	23.0	86.7
Very low	257	13.3	13.3	100.0
Total	1936	100.0	100.0	

Table A3.3: How often get together socially with friends or relatives not living with you

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Everyday	315	16.3	16.5	16.5
Several times per week	752	38.8	39.4	55.8
About once a week	473	24.4	24.7	80.6
Between 1 and 3 times per month	280	14.4	14.6	95.2
Once or twice every 3 months or less	91	4.7	4.8	100.0
Total	1910*	98.7*	100.0	
Missing				
Refused/Not stated	26	1.3		
Total	1936	100.0		

*These total figures appears to be an incorrect sum of the values above. However they are the correct sum of the values above when their decimal places are taken into account.

Appendix 3: Social network frequency tables (continued)

Table A3.4: Marital status

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Married (in a registered marriage)	59	3.0	3.0	3.0
Not living with someone in a relationship (includes separated, divorced and never married)	1690	87.3	87.3	90.3
Never married but living with someone in a relationship	188	9.7	9.7	100.0
Total	1936*	100.0	100.0	

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the values above when their decimal places are taken into account.

Table A3.5: Partner status

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Has a partner	737	38.1	38.7	38.7
No partner	1170	60.5	61.3	100.0
Total	1908*	98.5*	100.0	
Missing				
Refused/Not stated	28	1.5		
Total	1936	100.0		

*These total figures appears to be an incorrect sum of the values above. However they are the correct sum of the values above when their decimal places are taken into account.

Table A3.6: Satisfaction with relationship with partner

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Not satisfied	72	3.7	9.8	9.8
Satisfied	665	34.4	90.2	100.0
Total	737	38.1	100.0	
Missing				
Refused/Not stated	28	1.5		
Not applicable	1170	60.5		
Total	1199*	61.9*		
Total	1936	100.0		

*These total figures appears to be an incorrect sum of the values above. However they are the correct sum of the values above when their decimal places are taken into account.

Appendix 3: Social network frequency tables (continued)

Table A3.7: Satisfaction with relationship with parents

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Not satisfied	227	11.7	12.5	12.5
Satisfied	1595	82.4	87.5	100.0
Total	1823*	94.1	100.0	
Missing				
Multiple response SCQ	3	0.1		
Refused/Not stated	30	1.5		
Not applicable	81	4.2		
Total	113*	5.9*		
Total	1936	100.0		

*These total figures appears to be an incorrect sum of the values above. However they are the correct sum of the values above when their decimal places are taken into account.

Table A3.8: Step parent status

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Has step parent	400	20.7	21.1	21.1
Does not have step parent	1501	77.5	78.9	100.0
Total	1901	98.2	100.0	
Missing				
Multiple response SCQ	2	0.1		
Refused/Not stated	34	1.7		
Total	35*	1.8		
Total	1936	100.0		

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the above values when their decimal places are taken into account.

Appendix 3: Social network frequency tables (continued)

Table A3.9: Satisfaction with relationship with step parent(s)

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Not satisfied	124	6.4	30.9	30.9
Satisfied	276	14.3	69.1	100.0
Total	400	20.7	100.0	
Missing				
Multiple response SCQ	2	0.1		
Refused/Not stated	34	1.7		
Not applicable	1501	77.5		
Total	1536*	79.3		
Total	1936	100.0		

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the above values when their decimal places are taken into account.

Appendix 4: Family background frequency tables

Table A4.1: Were you living with both your own mother and father around the time you were 14 years old?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Living with both your own mother and father at age 14	1367	70.6	71.8	71.8
Living with one biological parent and one step parent	170	8.8	9.0	80.8
Living with one biological parent and no step parent	365	18.9	19.2	100.0
Total	1903*	98.3	100.0	
Missing				
Other	31	1.6		
Don't know	1	0.1		
Total	32	1.7		
Total	1936	100.0		

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the above values when their decimal places are taken into account.

Table A4.2: Why were you not living with both your parents at age 14?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Parents separated or divorced	466	24.1	82.1	82.1
Other#	101	5.2	17.9	100.0
Total	567	29.3	100.0	
Missing				
Not asked	1368	70.7		
Total	1936*	100.0		

Other includes one parent setting up for family to move to a new country, parent/s living overseas, did not get on with parents, fostered/adopted out, parent/s were ill (mentally/physically).

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the above values when their decimal places are taken into account.

Appendix 4: Family background frequency tables (continued)

Table A4.3: Number of siblings

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
No siblings	125	6.5	6.6	6.6
1 sibling	615	31.8	32.6	39.3
2 siblings	590	30.5	31.3	70.6
3 siblings	306	15.8	16.2	86.8
4 or more siblings	248	12.8	13.2	100.0
Total	1884	97.4	100.0	
Missing	51	2.7		
Total	1936*	100.0*		

*These total figures appears to be an incorrect sum of the values above. However they are the correct sum of the values above when their decimal places are taken into account.

Table A4.4: Father's occupation when youth was 14 years old

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Managers	324	16.8	19.1	19.1
Professionals	365	18.8	21.5	40.6
Technicians and trades workers	415	21.4	24.4	65.1
Community and personal service, clerical and administrative, and sales workers	275	14.2	16.2	81.3
Machinery drivers and operators, and labourers	318	16.4	18.7	100.0
Total	1697	87.7*	100.0*	
Missing				
Not able to be determined	76	3.9		
Refused/not stated	14	0.7		
Don't know	11	0.6		
Not applicable – never worked	6	0.3		
Not asked	132	6.8		
Total	239	12.3		
Total	1936	100.0		

*These total figures appears to be an incorrect sum of the values above. However they are the correct sum of the values above when their decimal places are taken into account.

Appendix 4: Family background frequency tables (continued)

Table A4.5: Mother's occupation when youth was 14 years old

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Managers	109	5.6	6.9	6.9
Professionals	466	24.1	29.4	36.3
Technicians and trades workers	71	3.7	4.5	40.8
Community and personal service, clerical and administrative, and sales workers	753	38.9	47.5	88.3
Machinery drivers and operators, and labourers	186	9.6	11.7	100.0
Total	1586*	81.9	100.0	
Missing				
Not able to be determined	100	5.1		
Refused/Not stated	27	1.4		
Don't know	30	1.6		
Not applicable – never worked	102	5.3		
Not asked	91	4.7		
Total	350	18.1		
Total	1936	100.0		

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the above values when their decimal places are taken into account.

Table A4.6: Was your father in paid employment when you were 14 years old?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Employed	1611	83.2	93.6	93.6
Not employed	109	5.6	6.4	100.0
Total	1720	88.9*	100.0	
Missing				
Not able to be determined	38	2.0		
Refused/Not stated	38	1.9		
Don't know	26	1.3		
Father was deceased	23	1.2		
Father not living with respondent so don't know	91	4.7		
Total	216	11.1		
Total	1936	100.0		

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the above values when their decimal places are taken into account.

Appendix 4: Family background frequency tables (continued)

Table A4.7: Was your mother in paid employment when you were 14 years old?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Employed	1277	66.0	71.3	71.3
Not employed	514	26.6	28.7	100.0
Total	1792*	92.5	100.0	
Missing				
Mother was deceased	17	0.9		
Mother not living with respondent so don't know	7	0.3		
Not able to be determined	82	4.3		
Refused/Not stated	17	0.9		
Don't know	21	1.1		
Total	144	7.5		
Total	1936	100.0		

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the above values when their decimal places are taken into account.

Table A4.8: Still at school or not at school status

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Not at school	1369	70.7	70.7	70.7
Still at school	567	29.3	29.3	100.0
Total	1936	100.0	100.0	

Table A4.9: Type of school attending (those still at school)

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Government school	360	63.4	64.0	64.0
Catholic or other non-government school	202	35.6	36.0	100.0
Total	562	99.1*	100.0	
Missing				
Other, not included above	5	0.9		
Total	567	100.0		

*The total figure appears to be an incorrect sum of the values above. However it is the correct sum of the above values when their decimal places are taken into account.

Appendix 4: Family background frequency tables (continued)

Table A4.10: Type of school attended (those not at school)

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Government school	935	68.3	68.9	68.9
Catholic or other non-government school	422	30.8	31.1	100.0
Total	1357	99.1	100.0	
Missing				
Don't know	2	0.2		
Other, not included above	10	0.7		
Total	12	0.9		
Total	1369	100.0		

Table A4.11: Highest year of school completed (those not at school)

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Year 12 or equivalent / senior secondary	947	69.2	69.2	69.2
Year 11 or equivalent, or less	422	30.8	30.8	100.0
Total	1369	100.0	100.0	

Table A4.12: Enrolled/not enrolled in a post-school qualification

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Currently enrolled in post-school qualification	558	40.8	40.8	40.8
Not currently enrolled in a post-school qualification	811	59.2	59.2	100.0
Total	1369	100.0	100.0	

Appendix 4: Family background frequency tables (continued)

Table A4.13: Time spent in employment in the last financial year (those not at school)

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Did not spend any time in jobs in last financial year (ie not employed)	169	12.4	12.4	12.4
Spent between 1% and 100% of time in jobs last financial year (ie employed)	1200	87.6	87.6	100.0
Total	1369	100.0	100.0	

Table A4.14: Post-school qualification study status of those employed

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
Currently enrolled in post-school qualification	481	40.1	40.1	40.1
Not currently enrolled in a post-school qualification	719	59.9	59.9	100.0
Total	1200	100.0	100.0	