

Segmentation and Insight into the Body Mass Index of the North West Population

Rebecca Harrison Caryl Beynon Clare Perkins Mark A Bellis

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Authors

Rebecca Harrison
Caryl Beynon
Clare Perkins
Mark A Bellis

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1. Key findings

This report uses data from the *Health and Lifestyles in the North West 2007* report and explores the relationship between body mass index (BMI) and a number of self-reported lifestyle characteristics and lifestyle-related illnesses. BMI is a measure of weight in relation to height and the categories included here are underweight, normal weight, overweight and obese. Being either underweight or overweight can have a significant impact upon health; in particular, obesity increases morbidity and mortality and places a significant burden on the health service. Consequently, encouraging people to maintain a healthy weight should continue to be a priority.

Throughout the report, geodemographic classification systems are used to illustrate any relationships between BMI categories and deprivation. Data on BMI were also explored in relation to gender and age. This section of the report summarises the key findings.

- 2.7% of respondents were underweight, 49.0% were normal weight, 34.1% were overweight and 14.2% were obese.
- Women were significantly more likely than men to be underweight or normal weight, and were significantly less likely than men to be overweight or obese.
- Generally, BMI increased as people aged but decreased as they reached their late 60s.
- There was no association between underweight and deprivation.
- For men, there was no association between normal weight and deprivation. For women, five of the six geodemographic classification systems showed a relationship between normal weight and deprivation, with increasing levels of deprivation being associated with a lower proportion of normal weight women.
- As deprivation increased, the proportion of obese people increased and this relationship was evident among both men and women.
- Maintaining a normal weight was significantly associated with participating in moderate or high levels of physical activity.
- In general, the more time a person spends being sedentary, the greater their weight.
- While a healthy diet is known to confer benefits, logistic regression analyses showed that the number of portions of fruit and vegetables eaten per day was not significantly associated with a person's weight.
- Smoking and alcohol consumption were both related to BMI.
- People who were normal weight were more likely than other respondents to rate their own health as very good.
- Having recently experienced a stroke, a heart attack or having angina were not significantly associated with BMI category.
- Having arthritis was more common among those who were obese.
- Nervous trouble or depression was associated with being underweight and being obese.
- Back problems were more likely among those who were overweight and obese.
- Diabetes was positively associated with being obese.
- High blood pressure was more common among those who were overweight and obese, with highest levels being among those who were obese.

2. Introduction

This report, produced by the North West Public Health Observatory (NWPHO), develops one of the seven key themes explored in the *Health and Lifestyles in the North West 2007*¹ report, body mass index, and the relationship that it may have with a number of lifestyle characteristics and lifestyle-related illnesses. The results of this report are aimed at health professionals and policy makers in the North West of England.

BMI is a measurement of body weight in relation to height – currently considered to be the most effective and reliable methodology available. It is calculated by taking an individual's weight in kilograms and dividing it by the square of their height in metres. The table below gives details of the BMI classification cut off points in adults.

Table 1: Body mass index classifications in adults.

Underweight	BMI below 18.5
Normal weight	BMI between 18.5 and 24.99
Overweight	BMI between 25 and 29.99
Obese	BMI between 30 and 39.99
Overweight and obese ⁱ	BMI between 25 and 39.99

There are a number of factors that can impact upon the distribution and trends of population BMI including: age, gender, lifestyle (for example, diet and physical activity), geography, social gradients or income levels and deprivation, and ethnicity. Being either underweight or overweight and/or obese can have significant impact upon health and wellbeing, and there have been a number of national and regional policy documents that detail the importance of maintaining a healthy weight. These include: *Healthy Weight*, *Healthy Lives: Cross-Government Strategy for England*;² *A North West Framework: To achieve healthy weight for children and families*;³ *Choosing Health: Making healthy choices easier*;⁴ *Saving Lives: Our Healthier Nation*⁵ as well as being given a high profile in the *2007 Comprehensive Spending Review*.⁶ Tackling obesity is a key theme throughout, as it places significant burden upon the NHS due to increased mortality and morbidity from a number of illnesses or diseases; as well as its wider impact upon society and the economy. It has also been suggested "...that obesity will soon overtake tobacco as the leading preventable cause of death".⁷ (p.3)

Background information, and policy and intelligence relating to BMI and other key lifestyle characteristics, can be found in the relevant sections of the *Health and Lifestyles in the North West* report¹ as well as the *Healthy Weight in the North West Population* synthesis report.⁸

3. Methodology

3.1 Health and Lifestyles in the North West

The initial regional survey – one of the largest ever of its kind – took place between June and December 2007 and was designed to collect information on the lifestyles of a representative sample of the North West population.ⁱⁱ

The survey was conducted over the telephone by specialist social research consultantsⁱⁱⁱ to a specified sample framework that was representative of the region. In total, 5,469 people completed the questionnaire. Respondents were asked, for example, about their general health; height and weight; smoking and drinking habits; what they eat; the physical activity they do; and about their caring responsibilities.

ⁱ The overweight and obese category has been created for the purpose of this report to show the BMI cut off points for this category.

ⁱⁱ Some primary care trusts (PCTs) bought additional 'boosts' to enable representative local level information for more effective local targeting of interventions, with standard regional comparisons from the regional survey.

ⁱⁱⁱ Vision Twentyone www.visiontwentyone.co.uk

The survey results highlighted how people in the North West rated their own general health and wellbeing and described aspects of their lifestyles that may affect their health. It provided an indication of the scale of lifestyle changes that are needed to address health inequalities by gender, age group and deprivation; thus pinpointing particular areas which may be in need of greater support to address lifestyle-related ill health. The full report can be found at: www.nwph.net/nwpho/publications/HealthandLifestylesNorthWest.pdf

3.2 Focus upon BMI

For the purpose of this report, data from the North West regional lifestyle survey (as detailed in Section 3.1) was combined with data from 'boost' lifestyle surveys (Table 2). Boost surveys employed the same methodology as the regional survey and increased the number of respondents for particular geographic areas.^{iv}

3.2.1 Sample size and weighting

The population sample for the purpose of this report brings together the total unweighted sample of 5,448 from the North West lifestyle survey and 39,016 from the boost surveys.

The initial survey sample was assessed to see if it was representative of the population (certain subgroups of the population were more difficult to survey than others) following which, appropriate adjustments were made through 'weighting' the data. Only surveys which contained age, gender and lower super output area (LSOA) were used. Therefore, a three-dimensional cross-tabulation of the survey sample (gender, age group, Index of Multiple Deprivation [IMD] 2007 quintile of residence) was compared with 2005 mid-year estimates^v of the whole population aged 16 years and over. Where a subset of the population was under-represented in the survey compared with the actual proportion of this subset in the total adult population, the particular cohort in question was given a weighting variable of greater than 1 (how far above the value of 1 was dependent on the degree of under-representation). Conversely, if a subset was over-represented in the survey compared with the actual proportion of the subset in the adult population, they were given a weighting variable of less than 1.

The weighting was then applied to the dataset before analysis was undertaken. Put simply, this means that responses from groups that are under-represented count more than groups that are over-represented, thus ensuring that the overall responses better represent the North West population. In order to weight the survey in this way, all three variables (gender, age group and deprivation quintile) must be present in the dataset. The final dataset contained 6,665 respondents from the North West lifestyle survey and an additional 37,799 (weighted) from the boost lifestyle surveys, thus providing an overall weighted sample of 44,464.

^{iv} The local boost lifestyle surveys added to this dataset included extra respondents from Cumbria, Liverpool, North Lancashire, Oldham, Sefton, and Wirral. It is possible to look at the boost surveys and analyse for stand-alone findings for these six areas, however, it is not possible to carry out such analysis for any of the other North West local authorities due to small numbers.

^v Single year of age population figures by LSOA were required for this process. 2005 mid-year estimates were the most recent year of population data of this nature available to NWPPO at the time of the weighting process.

Table 2: North West surveys that examine lifestyle and body mass index.

Survey	Number of respondents (weighted)	Data collection period	Geography	Age	Areas/topics investigated
North West Lifestyle Survey	5,448 (6,665)	June-Dec 2007	North West	16+	Lifestyle behaviours including: healthy weight; physical activity; alcohol consumption; fruit and vegetable intake; general health; chronic diseases; and smoking.
North West Lifestyle Survey local boosts	39,016 (37,799)	June-Dec 2007	Cumbria, Liverpool, North Lancashire, Oldham, Sefton, Wirral	16+	As above.

3.3 Analysis

Data were analysed using SPSS version 14. Where percentages have been discussed as being significantly different from the average, this is where the 95% confidence intervals (CIs) do not overlap.

Large confidence intervals are evident in a number of places. These indicate where sample sizes are small and therefore data in these instances should be interpreted with caution as they reduce the precision of the estimates. In most instances, these have been excluded from the commentary.

3.3.1 Socio-geodemographic analysis

Once the datasets were combined, geodemographic classifications were added based on LSOA, IMD 2007 quintile, IMD 2007 decile, P² People and Places^{vi}, Health ACORN,^{vii} ONS area classification^{viii} and Mosaic^{ix} (Table 3). All of the geodemographic classification charts shown within the report are ordered from least deprived to most deprived. Further details of these geodemographic classification systems can also be found in NWPHO's *Population Targeting: Tools for Social Marketing*⁹ report.

Data were analysed to reveal the relationship between each of the BMI groups (underweight, normal weight, overweight and obese), gender, age and deprivation. However, it is important to acknowledge when interpreting any of the area-based classifications that they are subject to 'ecological fallacy'¹⁰ whereby incorrect inferences may be made about the nature of specific individuals based upon aggregated statistics for the group to which these individuals belong. It is important to view each group across all associated categories, because looking at a group in one isolated category, where they may have limited representation, may lead to incorrect assumptions being made.

The analysis and commentary provided in this report should therefore be used alongside other knowledge about people living in specific areas and as a starting point from which to compare differences between geographical areas and gather insight.

^{vi} www.p2peopleandplaces.co.uk

^{vii} www.caci.co.uk/acorn/

^{viii} www.statistics.gov.uk/about/methodology_by_theme/area_classification/

^{ix} <http://cdu.mimas.ac.uk/experian/>

Table 3: Classification systems.

Classification system	Number of segments	Segmented according to...
Index of Multiple Deprivation (IMD, 2007) quintile	5	Multiple deprivation: income; employment; health and disability; education, skills and training; barriers to housing and services; crime and living environment.
Index of Multiple Deprivation (IMD, 2007) decile	10	Multiple deprivation: income; employment; health and disability; education, skills and training; barriers to housing and services; crime and living environment.
People and Places (P ²)	13*	Age; household composition; housing; employment; income; transport; leisure; spending patterns; general health; area stability.
Health ACORN	23*	Indicators of existing health; lifestyle indicators; property value; location.
Office for National Statistics (ONS) Area	20	Demographics; household composition; housing; socioeconomics.
Mosaic	11*	Demographics; socioeconomics and consumption; financial measures; property characteristics; property value; location.

*The 'Unclassified' segment in P² People and Places[®], Mosaic and Health ACORN has been excluded from commentary.

3.3.2 Other analysis

Additional analysis was carried out on the data to look for statistical significances present between each of the BMI categories (including an additional category of overweight and obese^x) with age and gender and also in relation to a number of lifestyle characteristics and lifestyle related conditions, namely:

- Alcohol consumption (non drinker, sensible, hazardous, harmful^{xi})
- Angina
- Arthritis
- Asthma
- Diabetes
- Fruit and vegetable intake (0 portions, 1-2 portions, 3-4 portions, 5 or more portions)
- General health (very good, good, fair, bad, very bad)
- Heart attack and stroke
- High blood pressure
- Nervous trouble and depression
- Physical activity (low, moderate, high)
- Sedentary behaviour (2 hours or less, more than 2 hours and up to and including 4 hours, more than 4 hours and up to and including 8 hours, more than 8 hours)
- Sciatica, lumbago or recurring backache
- Smoking habits (non-smoker, current smoker, ex-smoker)

Initially, the data were re-coded into five dichotomous outcome variables: underweight and not underweight; normal weight and not normal weight; overweight and not overweight; obese and not obese; and finally, overweight plus obese and not overweight or obese. For each of the five BMI categories separately, bivariate analyses (in the form of a Pearson's chi-square test) were used to test for associations between the outcome (i.e. underweight versus not underweight) and a number of categorical variables, namely: age, gender and the lifestyle characteristics or lifestyle conditions. This identified where significant relationships were evident.

From there, variables that were found to be significantly associated with the BMI outcome variable were entered into a logistic regression model^{xii} to identify which variables had a significant, independent relationship with the outcome variable once all the other risk factors

^x The overweight and obese BMI category (BMI greater than 25), was derived by combining findings for overweight (BMI of 25 to 29.99) and obese (BMI of 30+).

^{xi} Sensible: women should not exceed 2-3 units of alcohol per day on a regular basis, while men should not exceed 3-4 units of alcohol per day on a regular basis; Hazardous: consuming 15 to 35 units per week for women and 22 to 50 units for men; Harmful: drinking more than 35 units per week for women and more than 50 units for men.

^{xii} Logistic regression was used because the outcome variables being measured were dichotomous.

have been adjusted for. This meant it was possible to make further conclusions about the data – these are detailed in Section 4.5 and Appendix 2.

4. Findings

The commentary below relates to each of the BMI categories and patterns by age, gender and geodemographic classifications. Significant differences between geodemographic groups in comparison to the North West average have been calculated and can be found in Appendix 1.

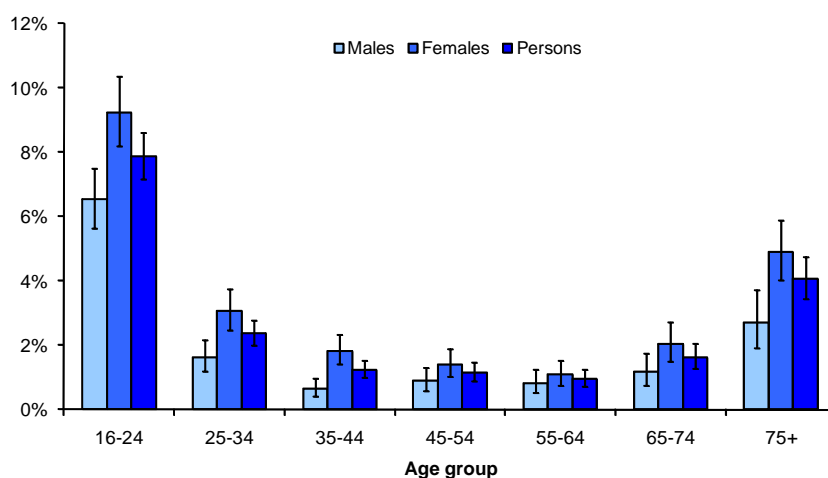
4.1 Underweight

Overall, 2.7% of adults were underweight, significantly more women (3.3%) than men (2.0%).

Generally, the prevalence of underweight people decreased with age to 64 years, after when levels increased (Figure 1). Those aged 16-24 years were significantly more likely than all other age groups to be underweight (7.9%), while those aged 55-64 years had the lowest proportion (1.0%), significantly lower than for those aged 25-34 years, 65-74 years and 75+ years.

Across all ages, women had a higher prevalence of underweight than men. This difference was significant when comparing those aged 16-24 years, 25-34 years, 35-44 years and 75+ years. The greatest difference between the genders was seen in those aged 35-44 years, where women (1.8%) were 2.6 times more likely to be underweight than men (0.7%). The highest prevalence of underweight was seen in men and women aged 16-24 years (men: 6.5%; women: 9.2%), while the lowest levels were found in those aged 55-64 years (1.1%) and 35-44 years (0.7%) for men and women respectively.

Figure 1: Percentage of adults who are underweight, by age and gender.



Males

There appeared to be a varied range of characteristics across the geodemographic classifications in terms of those areas where underweight in males was most or least likely to be observed (i.e. underweight in men did not generally appear to be attributed to a particular level of deprivation across the classification systems, Figure 2).

The proportion of underweight men according to classification for males ranged from 0.0% to 8.3%. The lowest proportions of underweight men were found in a number of the young people, student or professional groups: for example, P² Qualified Metropolitans, Health ACORN Students and Young Professionals, and ONS Area Mature City Professionals (all 0.0%). However, none of these groups were significantly different to the overall regional average (2.0%). The proportion of underweight men was significantly lower than the overall regional average

among Health ACORN Home Owning Older Couples (1.2%) and ONS Area Urban Commuter (1.2%).

In comparison, the highest levels of underweight men appeared to be found in some of the more deprived communities and those communities with higher concentrations of multiple ethnicities: Health ACORN Deprived Multi-ethnic Estates (3.4%), Mosaic Social Housing (3.5%) and ONS Area Multicultural Inner City (8.3%), which was significantly higher compared to the overall North West average. However, in this instance the confidence intervals were large and therefore interpretation should be viewed with caution.

Generally, across the classification systems there did not appear to be a relationship between underweight in men and deprivation, with only one out of the six systems (Mosaic) showing a significant relationship, whereby an increase in deprivation was associated with increased prevalence of underweight.

Females

As with men, there appeared to be varied range of characteristics across the geodemographic classifications in terms of those areas where underweight was most or least likely to be observed (i.e. underweight in women did not generally appear to be attributed to a particular level of deprivation across the classification systems).

The proportion of underweight women according to classification in females ranged from 0.0% to 8.4%, a similar range to that observed in males.^{xiii} The lowest proportions of underweight were found in a number of younger population groups such as: Health ACORN Students and Young Professionals (0.0%), ONS Area Educational Centres (1.9%) and Mosaic Younger Families and Educated Single Young People (both 2.5%). None of these groups were, however, significantly different to the overall regional average (3.3%). The highest levels of underweight appeared to be found in a number of the more deprived groups and those groups with higher clusters of ethnic populations, such as: P² Multicultural Centres (8.4%), Health ACORN Poor Single Parent Families (7.5%), and ONS Area groups Multicultural Urban (6.9%) and Multicultural Suburbia (6.3%). All of these groups (except Poor Single Parent Families) had a significantly higher proportion than the regional average.

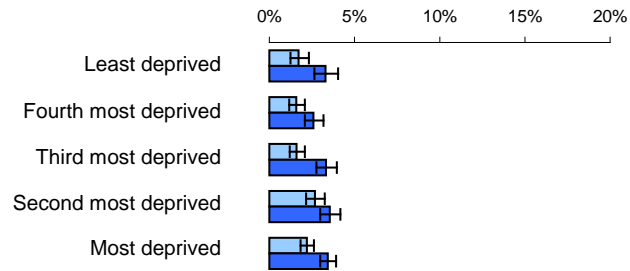
^{xiii} The highest prevalence was actually 37.5% among the Health ACORN mathematic group, but this classification category was excluded from the commentary due to large confidence intervals.

Figure 2: Proportion of participants classified as underweight by gender and geodemographic classification.

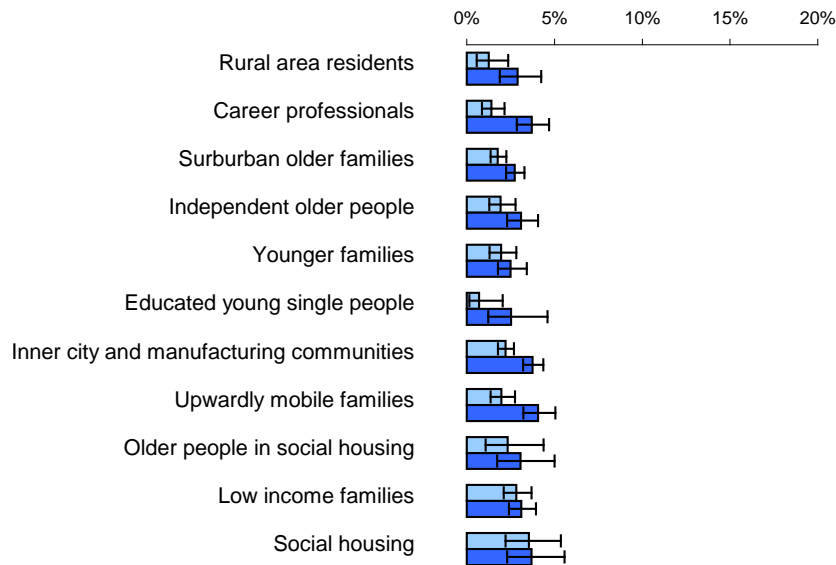
Values for the figures and significant differences are shown in Appendix 1. Error bars show 95% confidence intervals. Where the full confidence interval is not displayed, the confidence interval range was too large. Classifications are arranged from least to most deprived group.

■ Males
■ Females

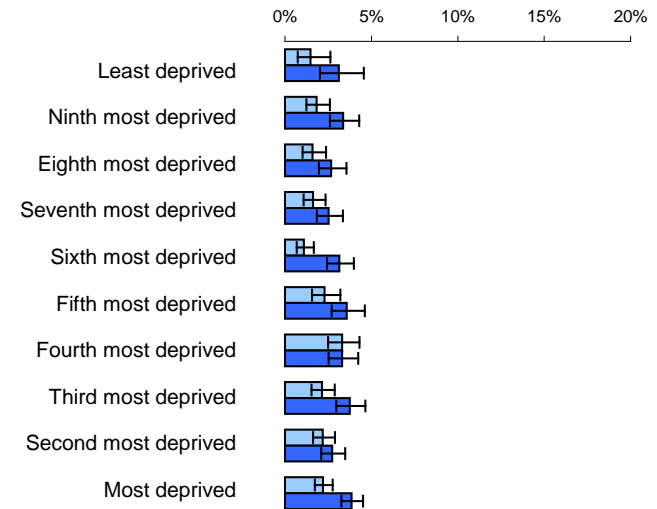
a) Index of Multiple Deprivation (IMD) 2007 quintiles



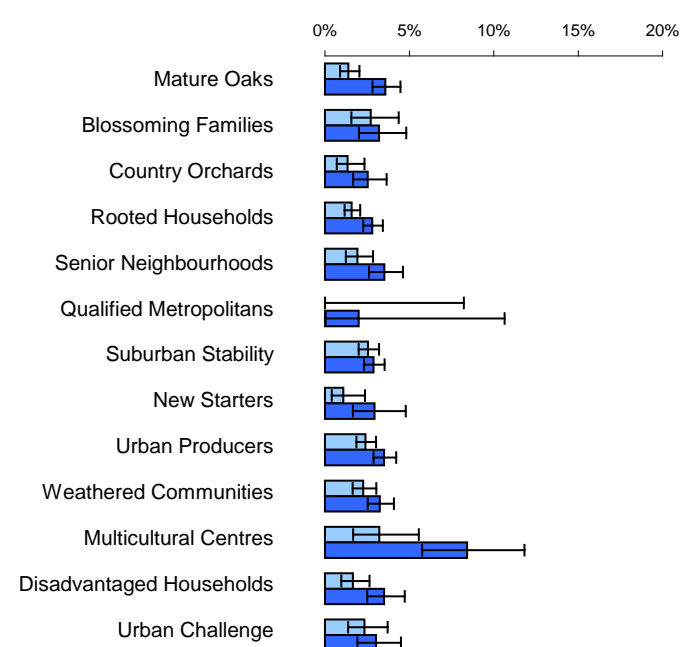
c) Mosaic classifications



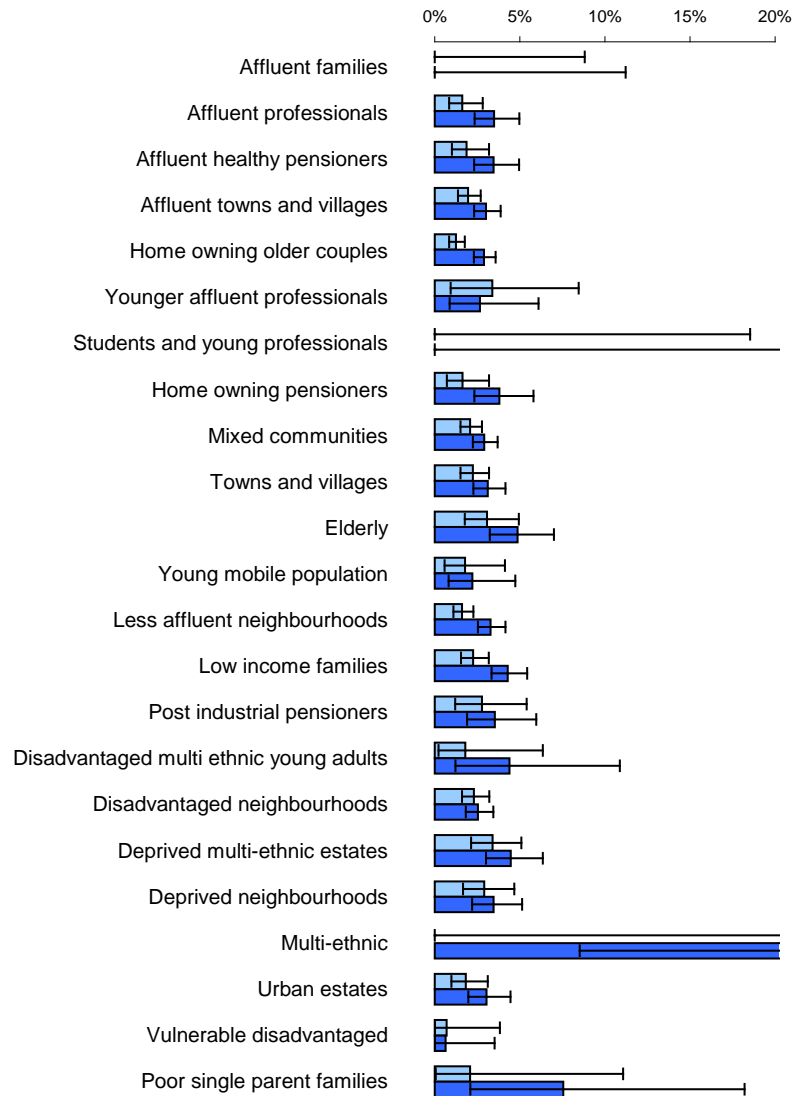
b) Index of Multiple Deprivation (IMD) 2007 deciles



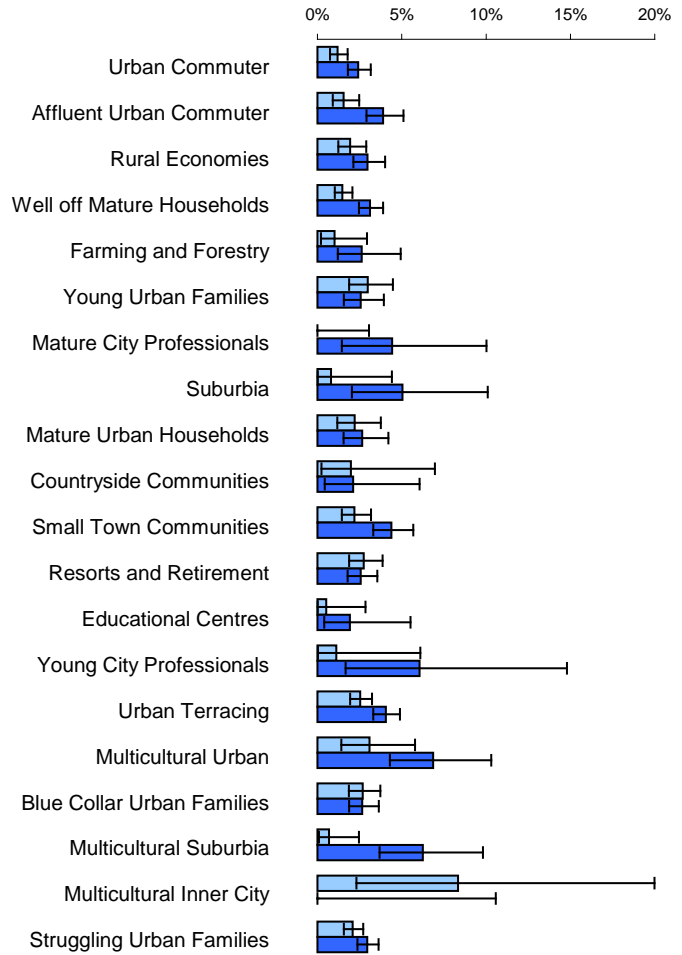
d) (P²) People and Places classifications



e) Health ACORN



f) ONS Area classification



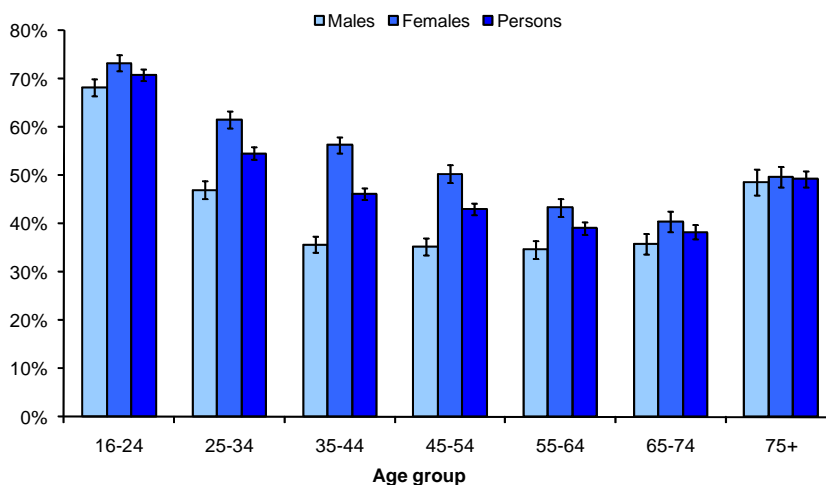
4.2 Normal weight

Nearly half of adults are normal weight (49.0%), significantly fewer men (43.4%) than women (54.2%).

The prevalence of normal weight generally decreased with age (up to 65-74 years, after when prevalence increased), with those aged 16-24 years (70.8%) significantly more likely to be normal weight than any other age group (Figure 3). There were also a number of other significant differences observed between the age groups. Those aged 65-74 years had significantly lower prevalence of normal weight than all other age groups (except 55-64 years); and those aged 75+ years had a significantly higher prevalence than those aged 35-74 years.

The significant difference seen overall between the two genders was also reflected across all age groups (with the exception of those aged 75+ years), with the proportion of men of normal weight being consistently lower than the proportion of women of normal weight. The greatest difference was seen between men and women aged 35-44 years, where women (56.4%) were 1.6 times more likely to be normal weight than men (35.7%).

Figure 3: Percentage of adults who are normal weight, by age and gender.



Males

The proportions of males who were normal weight across the different classification systems ranged from 33.6% (the lowest value was 25.0%, however, this group had a very high confidence interval range) to 72.2%. The lowest levels appeared to be in more disadvantaged areas such as: Health ACORN Vulnerable Disadvantaged (33.6%) and Deprived Neighbourhoods (38.3%) (both of which were significantly lower than the regional average 43.4%) and P² classification Urban Challenge (39.1%); as well as young family groups such as Mosaic Younger Families (40.3%) and ONS Area Young Urban Families (40.5%). The highest levels appeared in students and professional groups (both young and more established) such as: Health ACORN Students and Young Professionals (72.2%), and ONS Area Educational Centres (66.3%) and Young City Professionals (57.3%), all of which were significantly higher than the regional average (Figure 4).

None of the classification systems illustrated a significant relationship between deprivation and normal weight in males.

Females

The proportion of females who are normal weight ranged from 44.1% (the lowest value was 37.5%, but this group had a very high confidence interval range) to 90.0%. The lowest levels appeared to be in the more urban areas such as: ONS Area Struggling Urban Families (47.7%) and Urban Terracing (49.8%), Health ACORN Urban Estates (49.9%) and P² Urban Producers (50.5%); and more disadvantaged groups such as: P² classification Disadvantaged Households (44.1%), Mosaic Low Income Families (47.8%), and Health ACORN Deprived Neighbourhoods (44.1%) and Deprived Multi-ethnic Estates (48.3%). All of these groups had a significantly lower proportion of normal weight women than the North West average (54.2%). The highest levels appeared to be in student and professional groups (both young and mature) such as: Health ACORN groups Students and Young Professionals (90.0%) and Younger Affluent Professionals (63.8%) and Mosaic Educated Young Single People (66.7%) and Career Professionals (60.8%), all of which were significantly higher than the North West overall average. High levels were also found in some older, more affluent population groups such as: P² Mature Oaks (58.3%) and Senior Neighbourhoods (61.4%) and Health ACORN groups Affluent Healthy Pensioners (59.3%) and Home Owning Older Couples (58.0%), which again were significantly higher proportions than the regional average.

The prevalence of normal weight in females was significantly related to deprivation for five of the six classification systems, with more deprived segments typically showing lower levels of normal weight. ONS Area was the only classification system where there was no such relationship.

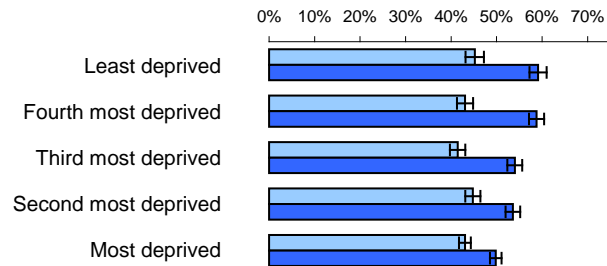
For both males and females, there were a number of other examples of classification groups that were significantly higher or lower than the North West average and these can be found in the tables in Appendix 1.

Figure 4: Proportion of participants classified as normal weight by gender and geodemographic classification.

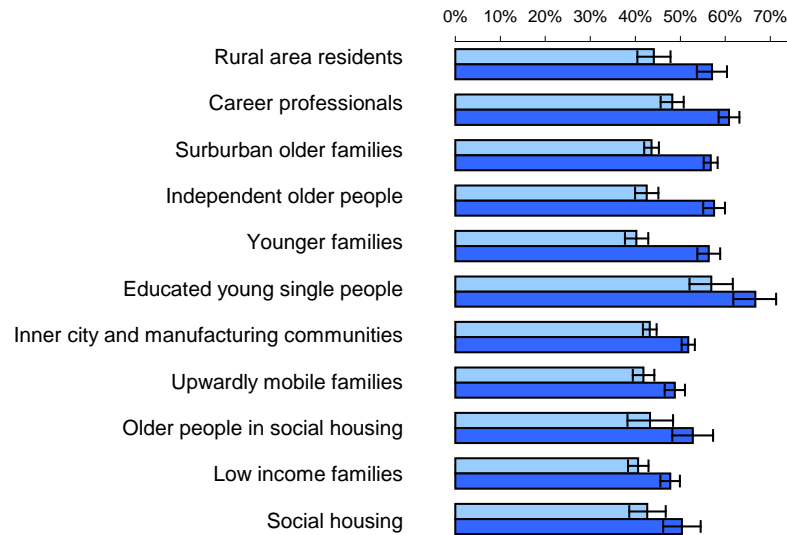
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■ Males
■ Females

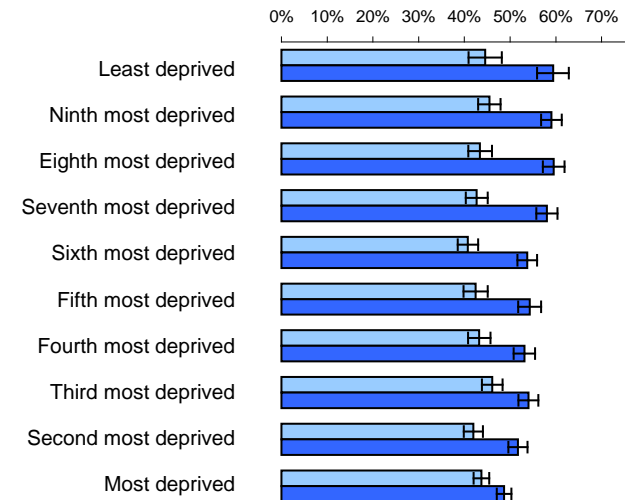
a) Index of Multiple Deprivation (IMD) 2007 quintiles



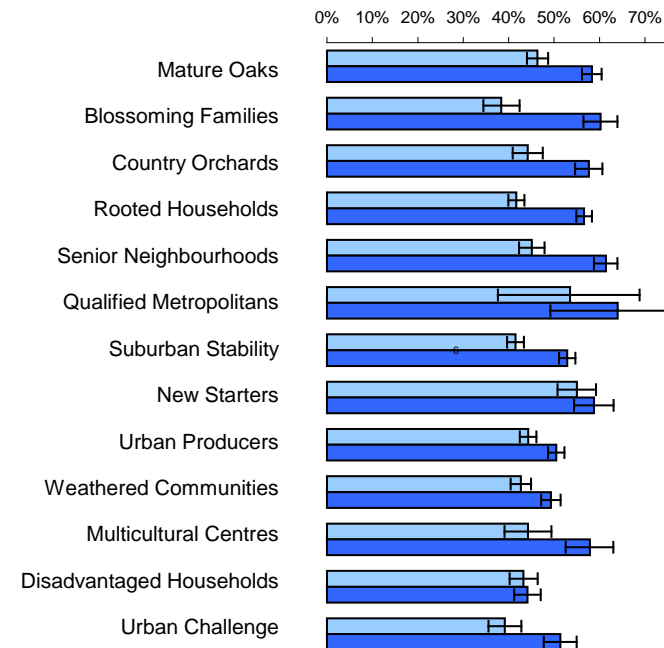
c) Mosaic classifications



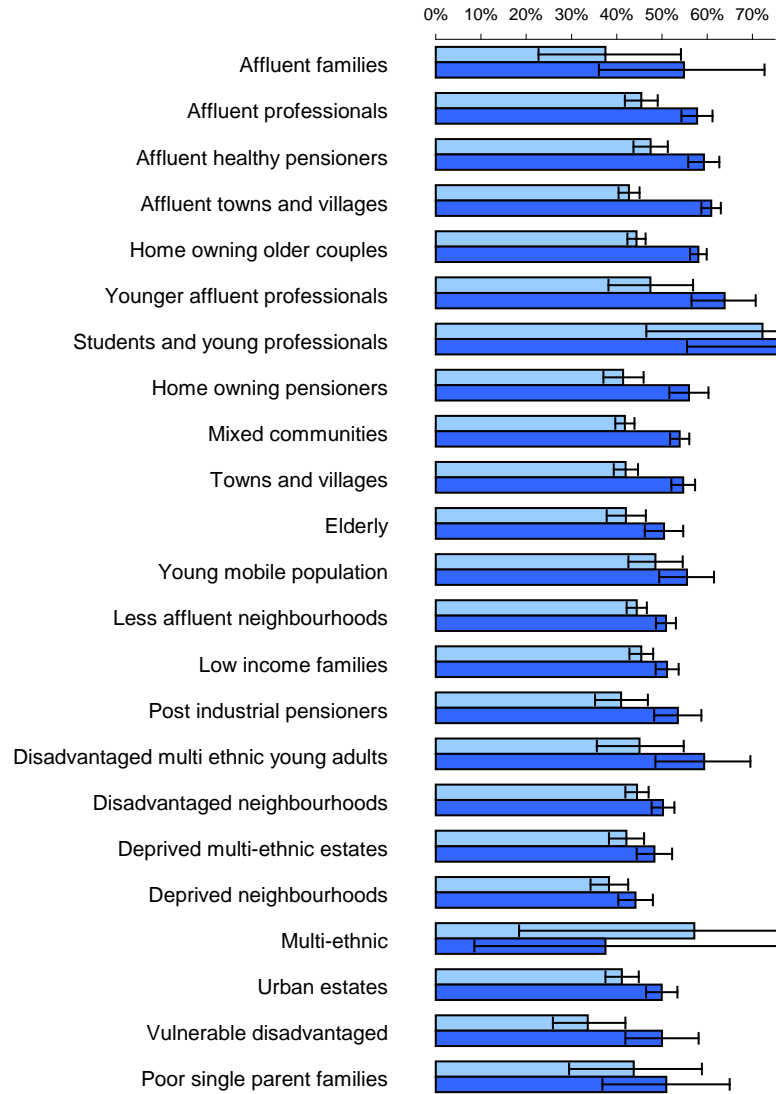
b) Index of Multiple Deprivation (IMD) 2007 deciles



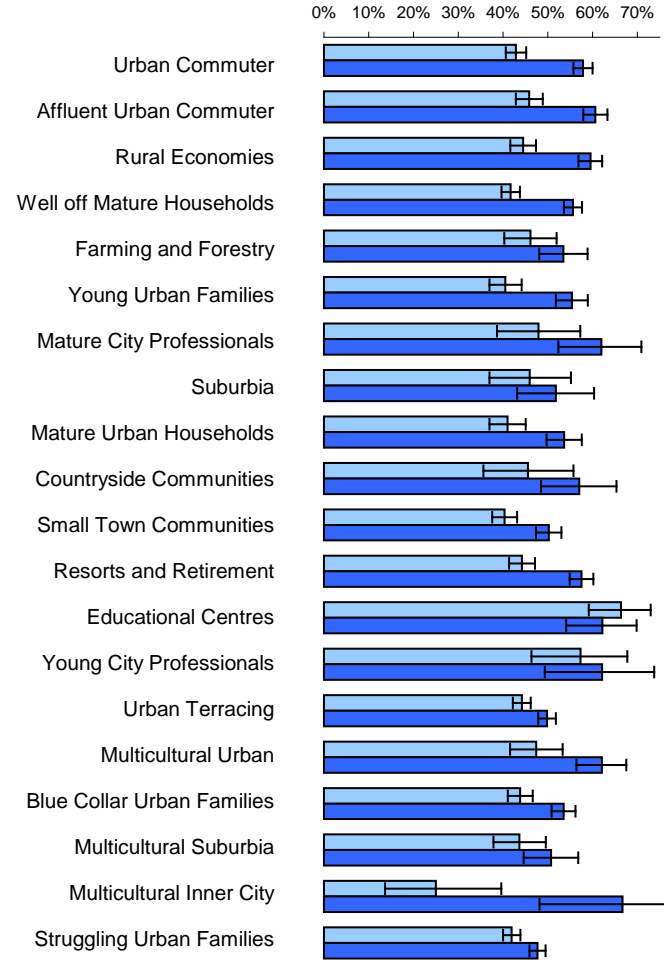
d) (P²) People and Places classifications



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f) ONS Area classification



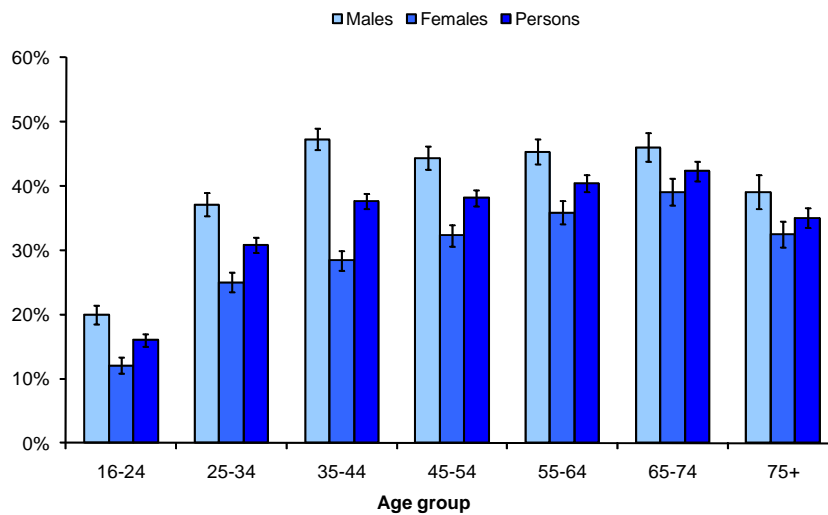
4.3 Overweight

Just over one in three adults were overweight (34.1%), significantly more men (39.9%) than women (28.9%).

The proportion of people who were overweight generally increased with age up to 65-74 years, with the highest prevalence found in those aged 65-74 years (42.3%, a proportion significantly higher than all other age groups except those aged 55-64 years). The lowest levels were seen in those aged 16-24 years (16.0%, significantly lower than for all other age groups) (Figure 5).

The significant difference seen overall between the two genders was also reflected across all age groups, with there being a consistently higher proportion of overweight men than women. Both men and women aged 16-24 years had the lowest levels of overweight (men: 19.9%; women: 12.0%), significantly lower than all other age groups. Men aged 35-44 years had the highest prevalence of overweight (47.3%), significantly higher than those aged 16-24, 25-34 and 75+ years. Women aged 65-74 years had a significantly higher proportion of overweight (39.1%) compared to all other age groups (except 55-64 years).

Figure 5: Percentage of adults who are overweight, by age and gender.



Males

The proportion of men who were overweight ranged from 20.7% to 57.5%. Lower levels of overweight men were seen in younger populations such as students and young career professionals: ONS Area groups Educational Centres (20.7%) and Young City Professionals (24.7%) and Mosaic Educated Young Single People (29.5%), and also more disadvantaged groups with high proportions of ethnic populations such as: ONS Area Multicultural Urban (30.9%) and P² classification Multicultural Centres (32.7%). All of these groups had significantly lower proportions than the overall regional average (39.9%). The highest levels of overweight were seen in more affluent groups such as: Health ACORN Affluent Families (57.5%), P² Blossoming Families (45.2%) and Rooted Households (43.0%) and ONS Area Urban Commuter (44.0%), all of which had significantly higher proportions than the North West average (Figure 6).

The prevalence of overweight in males was significantly related to deprivation for two of the six classification systems (IMD 2007 decile and P²), with more deprived segments typically showing higher levels of normal weight. IMD 2007 quintile, Mosaic, Health ACORN and ONS Area did not show any such relationship.

Females

The proportion of women who were overweight ranged from 10.0% to 34.5%. The lowest levels of overweight women were seen in student groups and young professionals such as: Health ACORN Students and Young Professionals (10.0%), ONS Area groups Young City Professionals (16.7%, significantly lower than the North West: 28.9%) and Educational Centres (24.4%) and Mosaic Educated Single Young People (20.7%, significantly lower than the regional average); and also areas with high concentrations of ethnic populations such as: ONS Area Multicultural Urban (18.0%, significantly lower than the North West), Multicultural Suburbia (23.2%), Multicultural Inner City (24.2%) and P² Multicultural Centres (20.5%, significantly lower than the regional average). The highest levels of overweight were generally seen in low income groups such as: Health ACORN Poor Single Parent Families (30.2%) and Low Income Families (30.3%); and also more deprived/disadvantaged groups such as: Health ACORN Deprived Neighbourhoods (32.3%) and Disadvantaged Neighbourhoods (30.4%), and P² Disadvantaged Households (32.1%). None of the classification measures were significantly higher than the North West overall.

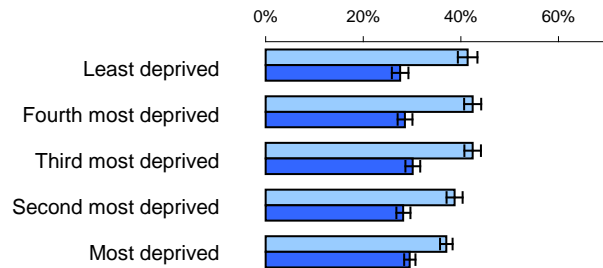
Across the six classification systems, there were no significant relationships found between deprivation and the proportion of overweight women.

Figure 6: Proportion of participants classified as overweight by gender and geodemographic classification.

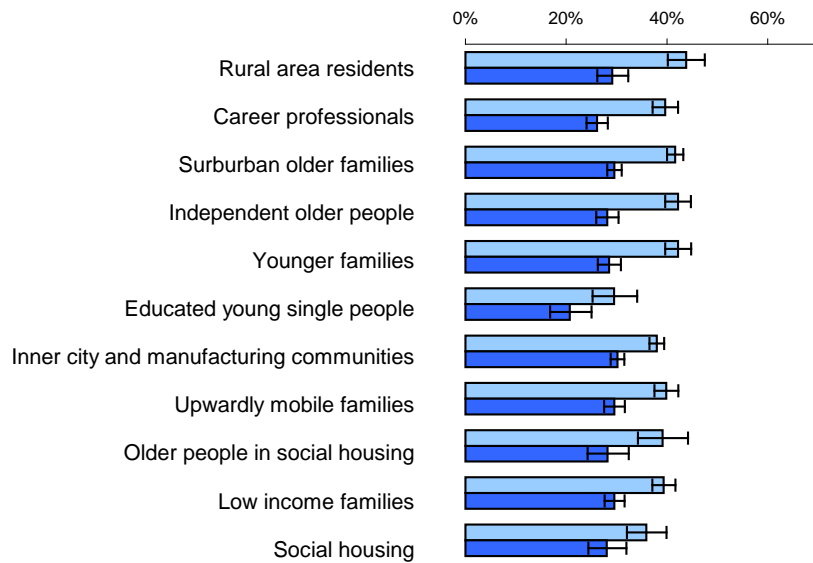
Values for the figures and significant differences are shown in Appendices 1. Error bars show 95% confidence intervals. Where the full confidence interval is not displayed, the confidence interval range was too large. Classifications are arranged from least to most deprived group.

■ Males
■ Females

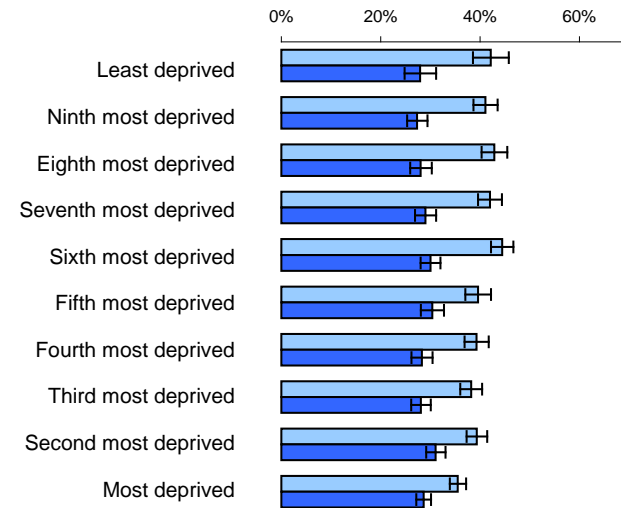
a) Index of Multiple Deprivation (IMD) 2007 quintiles



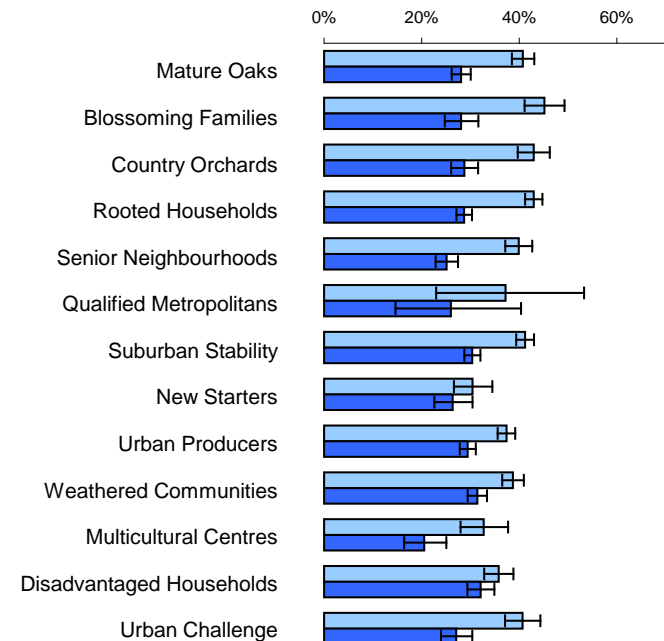
c) Mosaic classifications



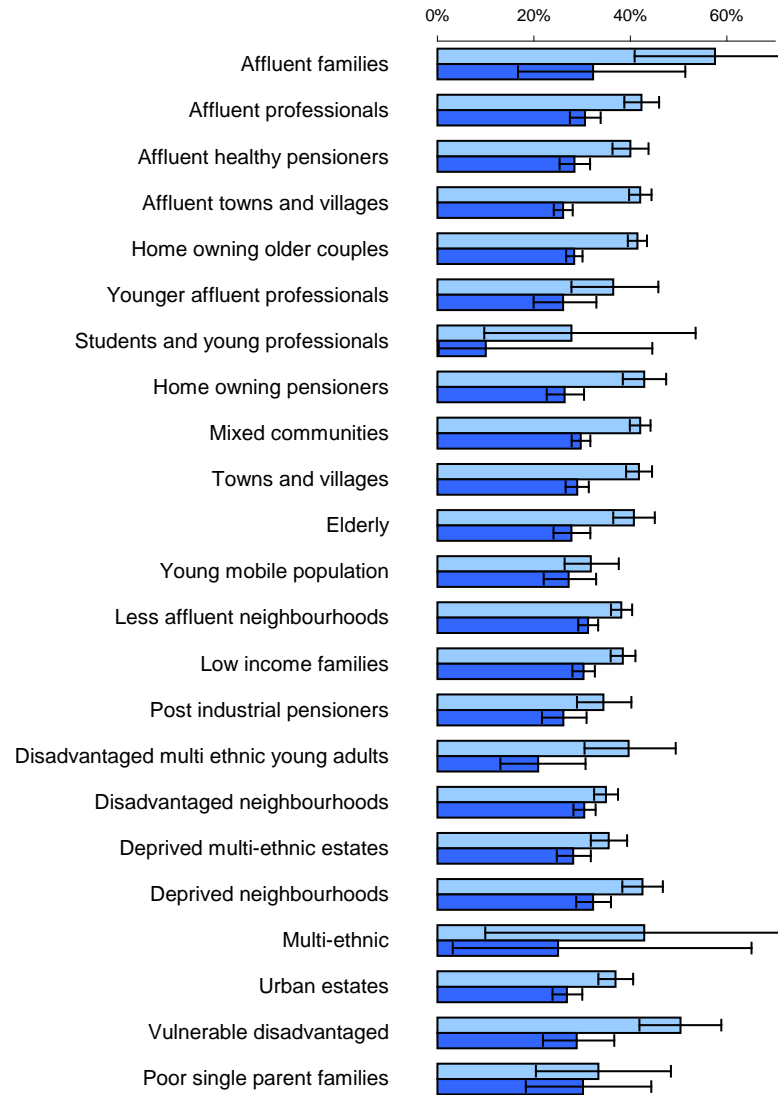
b) Index of Multiple Deprivation (IMD) 2007 deciles



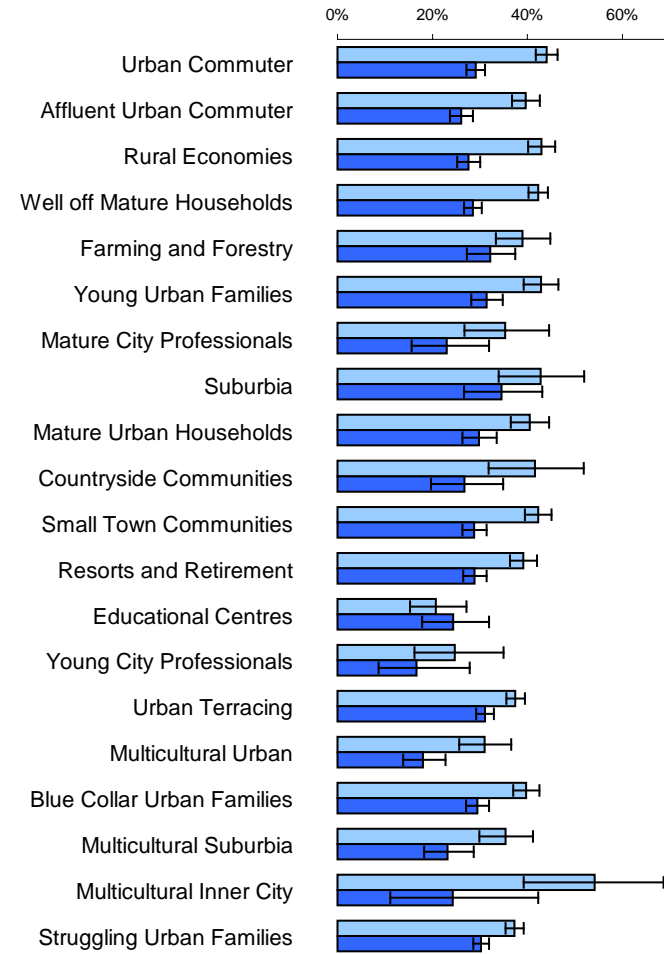
d) (P²) People and Places classifications



e) Health ACORN



f) ONS Area Classification



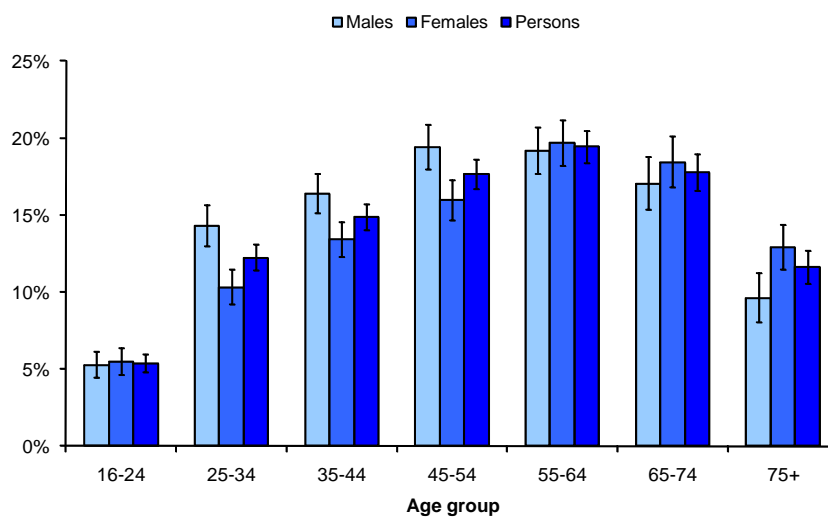
4.4 Obese

Overall, 14.2% of adults were obese, significantly more men (14.8%) than women (13.6%).

There was an increasing trend in obesity with age, with those aged 16-24 years having the lowest prevalence (5.4%), significantly lower than all other age groups; and those aged 55-64 years having the highest prevalence (19.4%, significantly higher than for all age groups except those aged 45-54 years and 65-74 years).

The significant difference seen overall between the two genders was also reflected across a number of the age groups. Men aged 25-34 years, 35-44 years and 45-54 years were significantly more likely to be obese than women in the same age groups. Interestingly, women aged 65-74 years and 75+ years had a higher prevalence of obesity than men, and in those aged 75+ years, this difference was significant (Figure 7).

Figure 7: Percentage of adults who are overweight, by age and gender.



Males

Across the classification systems, the prevalence of obesity in men ranged from 5.0% (the lowest prevalence was 0%, however, in this instance the confidence interval range was very large) to 21.9%. Lower levels of obesity were seen in more affluent groups such as: Health ACORN Affluent Families (5.0%), Affluent Professionals and Affluent Healthy Pensioners (both 10.7%), Mosaic Career Professionals (10.7%) and Rural Area Residents (10.8%) and P² Country Orchards and Mature Oaks (both 11.5%). All of these groups (with the exception of Affluent Families) were significantly lower than the North West overall (14.8%). The highest levels of obesity in men were seen in areas with high concentrations of ethnic populations: ONS Area Multicultural Suburbia (20.3%) and Multicultural Urban (18.6%), P² Multicultural Centres (19.8%) and Health ACORN Deprived Multi-ethnic Estates (19.0%). More deprived areas also had greater levels of male obesity such as: Health ACORN Post Industrial Pensioners (21.9%), Poor Single Parent Families (20.8%) and Urban Estates (20.1%), P² Disadvantaged Households (19.3%), and ONS Area Struggling Urban Families (18.7%). These groups (with the exception of Post Industrial Pensioners) had significantly higher proportions than the regional average overall (Figure 8).

All of the six classification systems found a significant relationship between the prevalence of obesity in men and level of deprivation, with increases in deprivation being associated with increases in the proportion of obese men.

Females

The proportion of obese females ranged from 7.4% (the lowest prevalence was 0%, however, in this instance the confidence interval range was very large) to 20.5%. Lower levels of obese females were seen in more affluent areas such as: Health ACORN Younger Affluent Professionals (7.4%), Affluent Professionals (8.2%) and Affluent Healthy Pensioners (8.9%), P² Qualified Metropolitans (8.0%) and Blossoming Families (8.4%) and ONS Area Affluent Urban Commuter (9.4%). All of these groups (with the exception of Qualified Metropolitans) were significantly lower than the overall regional average (13.6%). The highest levels of obesity were seen in the more deprived/disadvantaged groups such as: Health ACORN Vulnerable Disadvantaged (20.5%), Urban Estates (20.2%) and Deprived Neighbourhoods (20.1%), P² Disadvantaged Households (20.3%) and Mosaic Low Income Families (19.6%). These groups (except Vulnerable Disadvantaged and Urban Estates) had significantly higher proportions than the North West average. High levels were also seen in some areas where there were high concentrations of ethnic groups such as: ONS Area Multicultural Suburbia (19.9%) and Health ACORN Deprived Multi-ethnic Estates (19.1%), both significantly higher than the regional average overall.

There was a significant relationship between the proportion of obese females and level of deprivation, with five out of the six classification systems (IMD 2007 quintile, IMD 2007 decile, P² People and Places, Mosaic and Health ACORN) showing that as deprivation increased so did prevalence of obese in females.

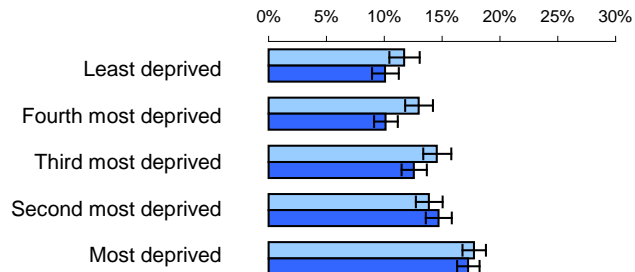
For both males and females, there were a number of other classification groups that were significantly higher or lower than the North West average and these can be seen in the tables in Appendix 1.

Figure 8: Proportion of participants classified as obese by gender and geodemographic classification.

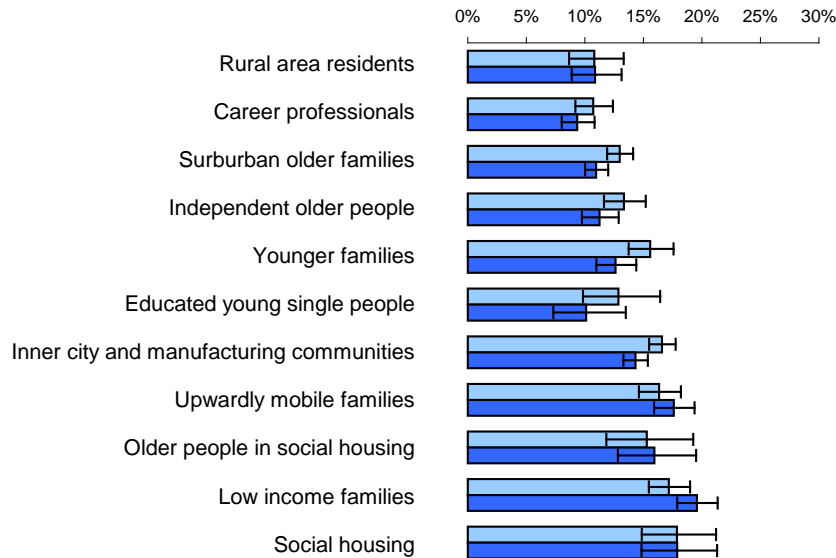
Values for the figures and significant difference are shown in Appendix 1. Error bars show 95% confidence intervals. Where the full confidence interval is not displayed, the confidence interval range was too large. Classifications are arranged from least to most deprived group.

■ Males
■ Females

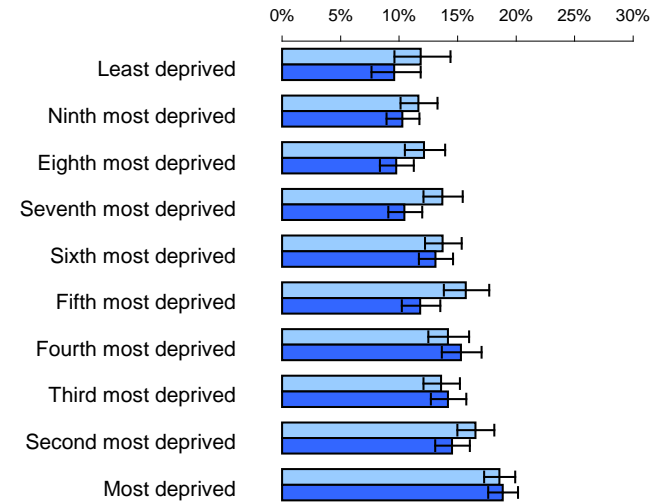
a) Index of Multiple Deprivation (IMD) 2007 quintiles



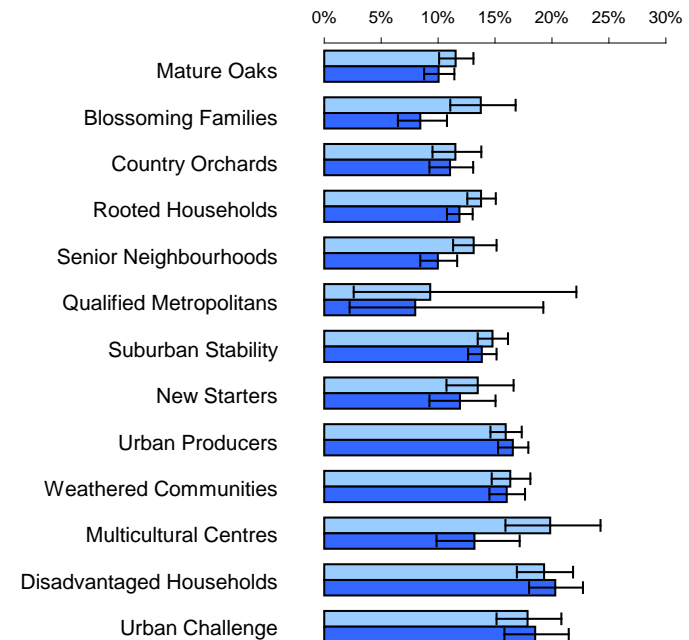
c) Mosaic classifications



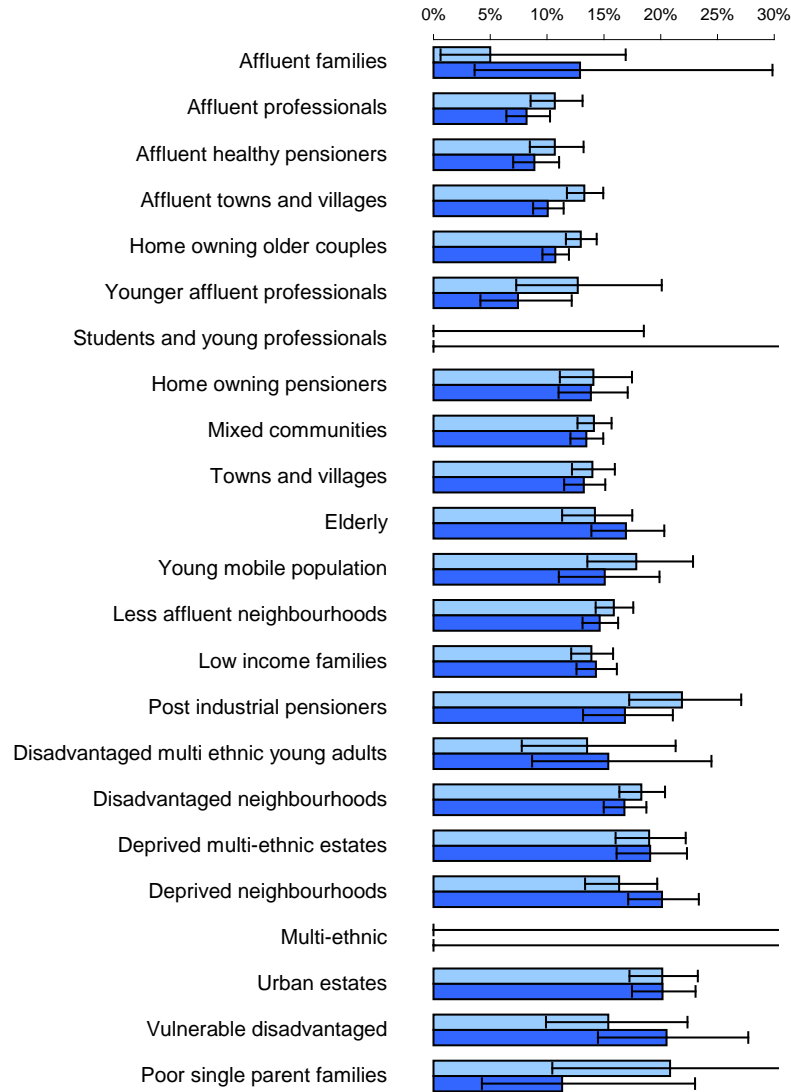
b) Index of Multiple Deprivation (IMD) 2007 deciles



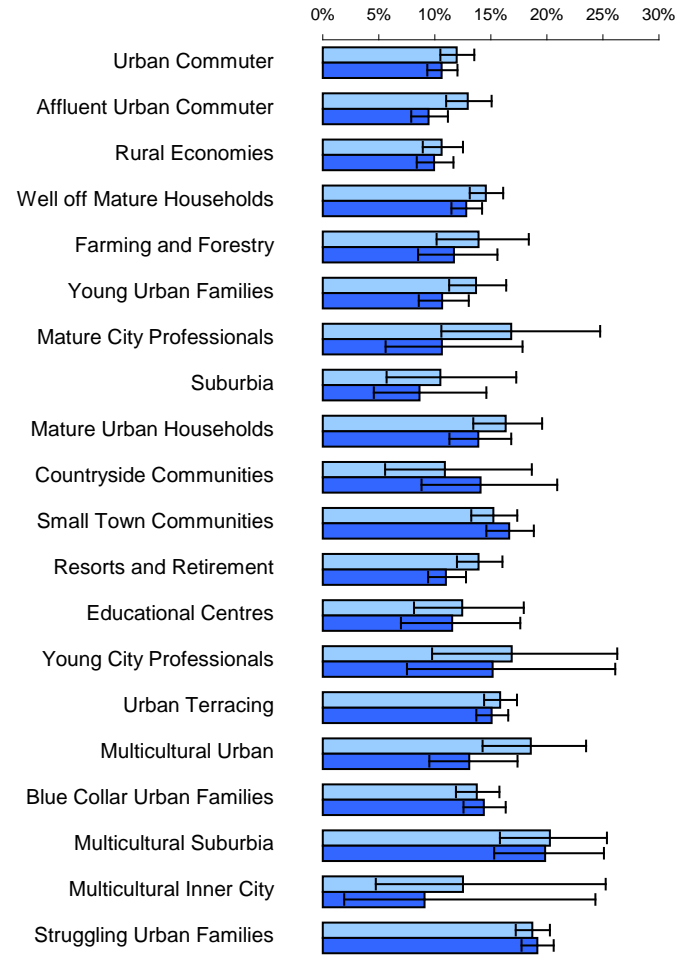
d) (P²) People and Places classifications



e) Health ACORN



f) ONS Area classification



4.5 Lifestyle and BMI: results from logistic regression modelling

Table 10 to Table 14 in Appendix 2 report the logistic regression model outputs for underweight, normal weight, overweight, obese, and overweight combined with obese in combination respectively (including Odds Ratio, 95% confidence intervals and P value significances). For each separate BMI category, chi-squared analyses were initially carried out to identify those lifestyle variables that were independently associated with that BMI category (data not shown). Variables that were significantly associated with the BMI category in the chi-squared analyses were entered into a logistic regression model (one model for each BMI category) in order to identify which lifestyle variables remained significantly associated with BMI following simultaneous adjustment for the other variables in the model.

The findings are commented upon below by lifestyle characteristic and are compared with evidence from existing literature.

4.5.1 Demographic characteristics: gender and age

Background

The Health Survey for England 2007¹¹ showed that for adults aged 16+ years:

- Underweight: 1.6% of the population were underweight (more women: 2.0% than men: 1.2%), and those who were underweight were most likely to be younger in age (16-34 years) or aged 75+ years.
- Normal: 37.7% of people in England were of normal weight (more women: 41.6% than men: 33.8%). Generally, the highest proportions of normal weight were seen in those aged 16-34 years, with proportions declining with age.
- Overweight: 36.7% of adults were overweight (more men: 41.4% than women: 32.0%), with proportions of overweight generally increasing with age.
- Obese: 24.0% of the adult population in England were obese (slightly more women: 24.4% than men: 23.6%), with the highest proportions of obese seen in those aged 45-74 years.

Findings

Following adjustment for the effects of other variables on BMI, being female was significantly associated with being underweight or normal weight. Similarly, the outputs from the remaining logistic regression models showed that women were less likely than men to be overweight or obese.

Those aged 16 to 24 years had significantly greater odds of being underweight or of normal weight than those in the older age categories. Therefore, those aged 16 to 24 years had significantly lower odds of being overweight or obese. However, those aged 75 years and over had significantly lower odds of being obese than those aged 16 to 24 years.

4.5.2 Activity levels: levels of physical activity and average sedentary time

Background

A significant proportion of the UK population are not meeting the Chief Medical Officer's recommended level of physical activity for adults of 30 minutes of moderate activity on at least five days a week.¹² Higher levels of physical activity have been associated with better self-rated health and lower BMI¹³ and coupled with improved diet will work towards tackling obesity.¹⁴ In addition, levels of physical activity are known to vary by socioeconomic classification, with higher rates experienced in professional classes compared to unskilled manual groups.^{15;16}

While the impact of physical activity upon health and health outcomes are very apparent, the influence of sedentary behaviour upon lifestyle is less so. For example, actively obese individuals have been found to experience lower morbidity and mortality than normal weight sedentary individuals.¹⁷ Physical inactivity has, however, been linked to poorer quality of life and puts

individuals at increased risk of obesity amongst other conditions.¹⁸ It has also been suggested that in turn, a sedentary lifestyle is more likely in those who are obese,¹⁸ thus increasing levels of morbidity.¹⁷ Reduced levels of activity may be influenced by reduced access to recreation and exercise.¹⁹

Findings

The chi-squared bivariate analyses showed that a person's level of physical activity was not significantly associated with being underweight or being overweight, so this variable was not entered into the logistic regression models for these two BMI categories. Having a normal BMI was significantly associated with undertaking moderate or high levels of physical activity compared with low levels of physical activity. Similarly, a low level of physical activity was associated with being obese. Combining the two BMI categories of overweight and obese showed that low levels of physical activity were significantly associated with this outcome.

Results for the association of weight and the average amount of time per day that people spend being sedentary were in line with those of physical activity, in that a larger amount of sedentary time is generally associated with greater weight. There was a weak association for underweight, with less than two hours of sedentary time per day being significantly associated with being underweight, though only compared with those who have between two and four and between four and eight hours of sedentary time. There was no significant association with being underweight when comparing those who engage in two hours or less per day and those who engage in more than eight hours per day. Being of normal weight was also significantly associated with having two hours or less sedentary time. There is no significant association between being overweight and the amount of sedentary time. However, being obese (and being overweight or obese) was significantly associated with the amount of sedentary time and the proportion of obese people increased as the amount of sedentary time increased.

4.5.3 Diet: portions of fruit and vegetables consumed per day

Background

The importance of having a healthy and balanced diet has been outlined in key policy documents such as *Choosing a Better Diet: a food and health action plan*.²⁰ Poor diet is known to impact upon levels of mortality and morbidity from a range of chronic diseases such as cancer, coronary heart disease, stroke and Type 2 diabetes.^{xiv:20}

There are differences in consumption of fruit and vegetables observed by:

- gender: women are more likely than men to consume the required daily amount;
- socioeconomic status: those in managerial and professional occupations are more likely to consume five portions of fruit and vegetables a day than those in routine and semi-routine groups;²¹ and
- age: the diet of older people has been found to be less healthy compared to younger age groups.²² One piece of research also concluded that factors strongly associated with healthy diet in early old age were being a non-smoker, being a home owner-occupier and taking anti-hypertensive medicine.²³ This report also showed that those who smoked and lived in rented accommodation were more likely to have a poor quality diet.

Findings

The amount of fruit and vegetables consumed per day was not significantly associated with any of the BMI categories in the multivariate analyses. This variable was weakly, but significantly, associated with underweight and normal weight and was more strongly associated with

^{xiv} Whilst also taking into account the impact of other factors affecting the risk of these diseases/illnesses such as smoking, alcohol consumption and levels of exercise.

overweight in the bivariate analyses, but these associations failed to reach significance when entered into the logistic regression model.

4.5.4 Substance use: smoking and alcohol consumption

Background

Weight gain is a common phenomenon in those who have given up smoking as nicotine is a metabolic stimulant and therefore heavy smokers have greater energy expenditure than non-smokers.^{24;25} Nicotine is also an appetite suppressant and therefore stopping smoking may lead to increased appetite, which would in turn lead to weight gain.^{26;27} Quitting smoking is associated with general improvement in a number of lifestyle factors such as increased physical activity and healthier diet.²⁸

There is an acknowledged lack of studies looking at the metabolic effects of body weight upon alcohol consumption. However, anecdotal evidence suggests that increasing levels of alcohol consumption may be contributing to the rise in overweight and obesity due to the high calorific value of alcoholic drinks; and also that women are more likely than men to gain weight from alcohol. In addition there is also an acknowledged relationship between alcohol and underweight with heavy drinking linked to increased risk of malnutrition and underweight.²⁹ A recent report *Alcohol and Food, Making the Public Health Connections* published by the Centre for Public Health, Liverpool John Moores University, reviewed literature considering the relationship between alcohol and food. The report can be found at: www.cph.org.uk/showPublication.aspx?pubid=613

Findings

A very definite picture is evident for the association between weight and smoking. Compared with non-smokers, smoking is significantly associated with being of lower weight, whereas being an ex-smoker was significantly associated with being of greater weight.

Compared with those who do not drink alcohol at all, people who drink at sensible or hazardous levels were significantly less likely to be underweight, but more likely to be normal weight. There was no difference in the proportion of underweight people who were harmful drinkers versus non-drinkers and the same was true for normal weight. Interestingly, being a hazardous or a harmful drinker was significantly associated with being overweight (compared with non-drinkers), whereas the reverse was true for those that were obese (and consequently these effects cancel themselves out for overweight and obese combined). Hazardous or harmful drinkers were, therefore, more likely to be overweight but less likely to be obese compared with people who did not drink alcohol. Sensible drinkers were significantly less likely to be obese than non-drinkers, but no association was evident between sensible drinking and being overweight.

4.5.5 Health: Self-perceived general health and previous health diagnoses

4.5.5.1 General health

Background

Research suggests that there is a link between obesity and health-related quality of life: both physical and emotional/mental.^{30;31} Doll et al (2000) suggested that the more overweight the individual, the more physical well-being is likely to deteriorate, and for those with a chronic condition already present, both physical and emotional well-being was compromised.³⁰ Vasilijevic et al (2008) stated that increased BMI has a greater impact upon physical health compared to mental health and that this is particularly pronounced in obese individuals.³¹

Findings

Underweight people were more likely to rate their general health as bad or very bad compared to very good, while there was no difference in the proportion of underweight people who rated their health as good or fair compared to very good. Being of normal weight was significantly associated with rating one's general health as being very good. A greater proportion of people who were overweight rated their general health as good or fair as opposed to very good, but there was no significant difference between the proportions of overweight people who rated their health as bad or very bad compared to the proportion who rated it as very good. A greater proportion of obese people (and overweight and obese in combination) rated their health as good, fair, bad and very bad compared with the proportion of obese (and overweight and obese in combination) people who rated it as very good.

4.5.5.2 Heart attack, stroke and angina

Background

There are similar risk factors that can impact upon the likelihood of an individual having a heart attack or stroke. These include: age (stroke mainly affects those over the age of 65 years, although it can occur at any time); gender – the Health Survey for England 2006 showed that more men than women had been diagnosed as 'ever having had a heart attack', while the same survey showed similar levels of stroke prevalence in men and women;³² diet; lack of exercise; smoking; heavy drinking; body mass index (BMI): having a body mass index between 30 and 40¹; the risk of coronary heart disease increases 3.6 times for every unit increase in BMI;³³ underweight also impacts upon cardiovascular health and can cause cardiovascular disease;^{34;35;36} and having a medical condition such as high blood pressure or high cholesterol. There is also a clear divide in prevalence between the social classes.⁵ The importance of tackling obesity has been highlighted in the National Service Framework delivery strategy for coronary heart disease.³⁷

Findings

The bivariate chi-squared analyses suggested that having a stroke or having a heart attack was significantly associated with BMI. However, when adjusted for the effects of other variables, having had a stroke or having had a heart attack was not found to be significantly associated with any of the BMI groups. Similarly, the logistic regression analyses showed that suffering from angina in the 12 months before completing the questionnaire was not significantly associated with any of the BMI categories.

4.5.5.3 Arthritis

Background

The risk of arthritis increases with age for both men and women, however, the prevalence of arthritis and rheumatism is higher among women than men.³⁸ Risk factors that are associated with, for example, rheumatoid arthritis include increased risk of cardiovascular disease if the condition is not treated correctly (www.rheumatoid.org.uk). It has been suggested that obesity may be one possible factor that contributes to the development of osteoarthritis as it puts added strain on joints (www.nhs.uk/Conditions/Arthritis/Pages/Introduction.aspx). Weight control may therefore be seen as one way in which arthritis may be managed as it helps to ease joint pressure as well as stress, or injury to joints, thus reducing the severity of osteoarthritis.

Findings

People who had experienced arthritis were less likely to be underweight, were less likely to be normal weight, but were more likely to be obese. There was no significant association between the presence of arthritis and being overweight. When overweight and obese were combined,

there was a significant association with a greater proportion of people who had arthritis being overweight or obese.

4.5.5.4 Nervous trouble or depression

Background

Mental illness can be affected by lifestyle factors such as diet and exercise, which are both known to directly impact upon weight.^{39;40} There is an apparent relationship between BMI (particularly obesity) and mental illness, as being obese has been found to increase the risk of mood and anxiety disorders.^{41;42} McLaren et al (2007) investigated the relationship between BMI (both overweight/obese and underweight) and mental health in a population aged 18-64 years, and found that this relationship varied depending upon the type of mental illness as well as by gender and age.⁴³ For example, there was an increased reporting of anxiety disorders in men who were underweight compared with normal weight men and women; mood disorders were more likely in obese compared to normal weight women; while substance misuse disorders were more prevalent in obese men at a younger, rather than older age. Bruffaerts et al (2008) also found a moderate association of obesity with mental disorders, with obese individuals more likely to have a mood disorder or more than one mental disorder compared with those who were considered normal weight.⁴⁴ From this study it was not possible, however, to assess whether it was the mental disorder that caused the individuals to be overweight or underweight, or vice versa.

The health of underweight individuals includes an increased predisposition to mental illness such as anxiety and depression.^{34;35;45} Controlled weight loss has, however, been associated with a decreased risk of depression.³⁶ In turn, there is an association with those who are depressed having greater difficulty in losing weight.⁴⁶

Findings

A greater proportion of people who are underweight reported having suffered from nervous trouble or depression in the 12 months before the questionnaire was administered than the proportion who were not underweight, though this association was relatively weak. There was no association between having nervous trouble or depression and being of normal weight versus not being of normal weight. There was a significant association between nervous trouble or depression and being overweight with those who were overweight being less likely to suffer this condition. The opposite was true for people who were obese, with a greater proportion of obese people having nervous trouble or depression than the proportion of people who were not obese.

4.5.5.5 Back problems

Background

Back pain is the single largest cause of sickness absence in the UK and has an economic impact both upon back pain sufferers and the economy. It has been found to increase with increasing age and men report consistently higher prevalence of back pain than women.⁴⁷ Back problems may be attributed to being obese⁴⁸ and the likelihood of having back pain has also been found to increase with increasing levels of deprivation.⁴⁹

Findings

People who had backache were less likely to be underweight and less likely to be normal weight than people who did not, although the association for underweight was relatively weak. Similarly, a greater proportion of people who were overweight or obese reported having had backache than people who were not overweight or obese.

4.5.5.6 Diabetes

Background

The National Service Framework delivery strategy for diabetes emphasises the importance of tackling obesity.⁵⁰ Being overweight increases the risk of Type 2 diabetes: the risk is 20 times greater in individuals with a BMI over 35 compared to a BMI within the normal range of 18-25.⁵¹ By 2010 it is estimated that there will be 2.5 million people in the UK with diabetes – nine per cent of which may be directly attributed to an increase in obesity.⁵⁰ Other risk factors for diabetes include: deprivation; being over the age of 40; having high blood pressure; and having recently suffered from a heart attack or stroke.

Findings

Diabetes was less likely among those who were underweight but this association was relatively weak. Having diabetes was also less likely among those who were of normal weight compared with those who were not of normal weight. A greater proportion of obese people reported having diabetes than non obese people and this difference was relatively large. Conversely, there was no significant association between being overweight and having diabetes. When people who were overweight or obese were grouped together, the association with diabetes remained significant, with those who were overweight or obese having greater odds of obesity than those who were normal weight or underweight.

4.5.5.7 High blood pressure

Background

There are a number of factors which contribute to hypertension (high blood pressure) including being overweight, with approximately 85% of people with high blood pressure having a BMI greater than 25.³³ Weight loss or maintaining a 'healthy' weight may therefore be one way in which to reduce/prevent high blood pressure (www.bpassoc.org.uk/BloodPressureandyou/Yourlifestyle/Healthyweight).

Findings

The proportion of people with high blood pressure was significantly lower among those who were underweight than those who were not underweight; and the proportion with high blood pressure was also significantly lower among those who were normal weight than those who were not normal weight. Being overweight or obese was significantly associated with having high blood pressure. The odds of having high blood pressure were greater among those who were obese (versus not obese) than the odds of having high blood pressure among those who were overweight (versus not overweight).

5. Conclusions

This report is based upon data from one of the largest ever lifestyle surveys in the North West, providing an insight into the population's weight. These findings build upon the body of evidence for associations between weight and lifestyle and lifestyle-related illnesses and should be used in conjunction with other regional and national intelligence about body weight.

The findings show that approximately half of the population of the North West are not of normal weight, with 34.1% recorded as overweight and a further 14.2% being obese. The remaining 2.7% were underweight. People who were normal weight were more likely to rate their own health as very good, while being overweight or obese was significantly related to diabetes, high blood pressure, arthritis and backache. Nervous trouble or depression was associated with both underweight and obese. Lifestyle factors like physical activity, alcohol use and smoking impact upon a person's weight, while weight is also shown to be a function of gender, age, ethnicity and levels of deprivation. In light of the suggestion, "...that obesity will soon overtake tobacco as the leading preventable cause of death"^{7 (p.3)} strategies which focus on encouraging people to maintain a healthy weight should continue to be a priority for the region.

6. Appendices

6.1 Appendix 1

The following tables show the percentages of individuals who were reported to be underweight, normal weight, overweight and obese. The percentages are displayed with their 95% lower and upper confidence intervals (LCI and UCI respectively). Where cells are highlighted, this indicates that the associated figure is significantly different from the North West regional average for that gender and that variable. Cells shaded in light blue are significantly lower than the average, while cells shaded dark blue are significantly higher than the average. Figures are rounded to two decimal places. The tables are divided into gender and by classification system. In each table, the categories are ordered from least to most deprived.

The Pearson's Rho (P) calculation identifies where there is a correlation between deprivation and BMI category for each of the geodemographic classifications against age. Where the P value is positive, this indicates a positive relationship, for example, as deprivation increases so does the likelihood of obesity in males and females. A negative P value indicates a negative relationship; for example, as deprivation decreases the likelihood of normal weight in females increases. A perfect correlation of 1 or -1 indicates that the exact value of one variable can be determined by knowing the value of the other variable. Where a significance has been calculated, it has been highlighted in purple.

KEY

	Significantly lower than the North West
	Significantly higher than the North West
	Statistically significant Pearson's Rho value

Table 4: Weight category by Index of Multiple Deprivation (IMD) 2007 quintile and gender.

Classification	Underweight			Normal weight			Overweight			Obese		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
MALES												
Least deprived	1.72%	1.24%	2.33%	45.20%	43.18%	47.22%	41.38%	39.39%	43.38%	11.71%	10.44%	13.07%
Fourth most deprived	1.58%	1.17%	2.08%	43.06%	41.31%	44.82%	42.38%	40.64%	44.14%	12.98%	11.82%	14.21%
Third most deprived	1.59%	1.20%	2.08%	41.45%	39.77%	43.14%	42.41%	40.72%	44.11%	14.55%	13.37%	15.79%
Second most deprived	2.67%	2.16%	3.26%	44.79%	43.14%	46.45%	38.69%	37.08%	40.32%	13.85%	12.73%	15.04%
Most deprived	2.20%	1.83%	2.62%	43.05%	41.74%	44.36%	37.00%	35.72%	38.28%	17.76%	16.76%	18.79%
North West overall	2.01%	1.81%	2.22%	43.38%	42.66%	44.11%	39.86%	39.14%	40.58%	14.75%	14.24%	15.28%
Pearson's Rho (P)	-0.312 (P=0.609)			-0.269 (P=0.662)			-0.814 (P=0.094)			0.904 (P=<0.05)		
FEMALES												
Least deprived	3.29%	2.64%	4.04%	59.13%	57.23%	61.01%	27.52%	25.83%	29.27%	10.06%	8.94%	11.27%
Fourth most deprived	2.59%	2.09%	3.18%	58.78%	57.13%	60.43%	28.51%	27.02%	30.05%	10.11%	9.13%	11.16%
Third most deprived	3.32%	2.76%	3.96%	54.01%	52.37%	55.64%	30.12%	28.63%	31.64%	12.55%	11.49%	13.67%
Second most deprived	3.54%	2.98%	4.17%	53.58%	51.99%	55.16%	28.19%	26.77%	29.63%	14.69%	13.59%	15.84%
Most deprived	3.43%	2.98%	3.92%	49.82%	48.54%	51.09%	29.51%	28.36%	30.69%	17.24%	16.29%	18.23%
North West overall	3.26%	3.02%	3.52%	54.19%	53.49%	54.89%	28.92%	28.29%	29.56%	13.63%	13.15%	14.11%
Pearson's Rho (P)	0.521 (P=0.368)			-0.963 (P<0.01)			0.556 (P=0.331)			0.972 (P<0.01)		

Table 5: Weight category by Index of Multiple Deprivation (IMD) 2007 decile and gender.

Classification	Underweight			Normal weight			Overweight			Obese		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
MALES												
Least deprived	1.48%	0.74%	2.63%	44.55%	40.94%	48.21%	42.13%	38.55%	45.77%	11.84%	9.61%	14.39%
Ninth most deprived	1.83%	1.24%	2.60%	45.46%	43.03%	47.91%	41.07%	38.68%	43.50%	11.64%	10.13%	13.29%
Eighth most deprived	1.60%	1.01%	2.38%	43.41%	40.83%	46.02%	42.86%	40.29%	45.46%	12.14%	10.49%	13.93%
Seventh most deprived	1.62%	1.07%	2.35%	42.70%	40.31%	45.12%	41.98%	39.60%	44.39%	13.69%	12.08%	15.44%
Sixth most deprived	1.09%	0.68%	1.66%	40.75%	38.54%	42.98%	44.44%	42.20%	46.69%	13.72%	12.21%	15.34%
Fifth most deprived	2.28%	1.57%	3.21%	42.44%	39.83%	45.08%	39.59%	37.01%	42.20%	15.69%	13.83%	17.70%
Fourth most deprived	3.31%	2.49%	4.31%	43.22%	40.78%	45.69%	39.29%	36.89%	41.73%	14.18%	12.51%	15.98%
Third most deprived	2.13%	1.54%	2.88%	46.10%	43.85%	48.36%	38.19%	36.01%	40.40%	13.58%	12.08%	15.19%
Second most deprived	2.19%	1.62%	2.89%	41.97%	39.89%	44.07%	39.32%	37.27%	41.41%	16.51%	14.98%	18.14%
Most deprived	2.20%	1.73%	2.76%	43.72%	42.03%	45.42%	35.51%	33.89%	37.15%	18.57%	17.27%	19.93%
North West overall	2.01%	1.81%	2.22%	43.38%	42.66%	44.11%	39.86%	39.14%	40.58%	14.75%	14.24%	15.28%
Pearson's Rho (P)	0.542 (P=0.106)			-0.173 (P=0.633)			-0.767 (P<0.01)			0.875 (P=0.001)		
FEMALES												
Least deprived	3.11%	2.02%	4.56%	59.40%	55.91%	62.82%	27.90%	24.82%	31.14%	9.59%	7.64%	11.84%
Ninth most deprived	3.37%	2.59%	4.30%	59.04%	56.76%	61.30%	27.32%	25.30%	29.42%	10.27%	8.92%	11.74%
Eighth most deprived	2.67%	1.96%	3.56%	59.54%	57.15%	61.89%	28.05%	25.91%	30.26%	9.74%	8.37%	11.26%
Seventh most deprived	2.52%	1.84%	3.35%	58.05%	55.73%	60.35%	28.97%	26.88%	31.13%	10.46%	9.08%	11.97%
Sixth most deprived	3.14%	2.44%	3.98%	53.76%	51.60%	55.91%	30.00%	28.05%	32.01%	13.10%	11.68%	14.61%
Fifth most deprived	3.57%	2.70%	4.62%	54.28%	51.76%	56.79%	30.35%	28.06%	32.71%	11.80%	10.23%	13.52%
Fourth most deprived	3.30%	2.52%	4.24%	53.14%	50.79%	55.47%	28.28%	26.20%	30.43%	15.29%	13.65%	17.04%
Third most deprived	3.75%	2.97%	4.66%	54.01%	51.84%	56.17%	28.06%	26.14%	30.05%	14.18%	12.70%	15.75%
Second most deprived	2.73%	2.09%	3.49%	51.70%	49.60%	53.79%	31.05%	29.14%	33.02%	14.52%	13.09%	16.05%
Most deprived	3.85%	3.26%	4.52%	48.68%	47.06%	50.30%	28.61%	27.16%	30.09%	18.86%	17.61%	20.15%
North West overall	3.26%	3.02%	3.52%	54.19%	53.49%	54.89%	28.92%	28.29%	29.56%	13.63%	13.15%	14.11%
Pearson's Rho (P)	0.416 (P=0.232)			-0.943 (P<0.001)			0.465 (P=0.176)			0.912 (P<0.001)		

Table 6: Weight category by P² People & Places and gender.

Classification	Underweight			Normal weight			Overweight			Obese		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
MALES												
Mature Oaks	1.39%	0.90%	2.04%	46.34%	44.02%	48.67%	40.74%	38.46%	43.05%	11.53%	10.09%	13.09%
Blossoming Families	2.72%	1.56%	4.37%	38.37%	34.42%	42.43%	45.16%	41.09%	49.28%	13.75%	11.07%	16.80%
Country Orchards	1.34%	0.70%	2.33%	44.18%	40.90%	47.51%	42.95%	39.68%	46.27%	11.52%	9.50%	13.80%
Rooted Households	1.58%	1.17%	2.09%	41.67%	39.91%	43.45%	42.96%	41.19%	44.75%	13.78%	12.57%	15.06%
Senior Neighbourhoods	1.92%	1.23%	2.85%	45.08%	42.29%	47.88%	39.87%	37.14%	42.65%	13.13%	11.31%	15.13%
Qualified Metropolitans	0.00%	0.00%	8.22%	53.49%	37.65%	68.82%	37.21%	22.98%	53.27%	9.30%	2.59%	22.14%
Suburban Stability	2.55%	2.00%	3.20%	41.50%	39.67%	43.34%	41.18%	39.35%	43.02%	14.78%	13.49%	16.14%
New Starters	1.09%	0.40%	2.36%	55.01%	50.74%	59.22%	30.42%	26.59%	34.46%	13.48%	10.73%	16.62%
Urban Producers	2.40%	1.87%	3.03%	44.29%	42.45%	46.14%	37.38%	35.59%	39.19%	15.94%	14.61%	17.34%
Weathered Communities	2.27%	1.65%	3.04%	42.67%	40.43%	44.93%	38.71%	36.51%	40.95%	16.35%	14.71%	18.09%
Multicultural Centres	3.22%	1.67%	5.55%	44.24%	39.12%	49.44%	32.71%	27.97%	37.73%	19.84%	15.91%	24.25%
Disadvantaged Households	1.66%	0.97%	2.64%	43.27%	40.22%	46.37%	35.77%	32.83%	38.79%	19.30%	16.93%	21.85%
Urban Challenge	2.34%	1.37%	3.71%	39.15%	35.58%	42.80%	40.67%	37.07%	44.33%	17.86%	15.14%	20.84%
North West overall	2.01%	1.81%	2.22%	43.38%	42.66%	44.11%	39.86%	39.14%	40.58%	14.75%	14.24%	15.28%
Pearson's Rho (P)	0.308 (P=0.306)			-0.399 (P=0.177)			-0.672 (P<0.05)			0.799 (P=0.001)		
FEMALES												
Mature Oaks	3.57%	2.81%	4.47%	58.33%	56.15%	60.47%	28.06%	26.12%	30.06%	10.04%	8.77%	11.43%
Blossoming Families	3.20%	2.02%	4.81%	60.26%	56.49%	63.94%	28.09%	24.76%	31.62%	8.44%	6.47%	10.78%
Country Orchards	2.53%	1.67%	3.66%	57.68%	54.65%	60.66%	28.75%	26.05%	31.56%	11.05%	9.23%	13.08%
Rooted Households	2.80%	2.26%	3.43%	56.62%	54.89%	58.33%	28.71%	27.16%	30.30%	11.88%	10.78%	13.04%
Senior Neighbourhoods	3.52%	2.61%	4.62%	61.41%	58.79%	63.97%	25.11%	22.85%	27.47%	9.97%	8.45%	11.67%
Qualified Metropolitans	2.00%	0.05%	10.65%	64.00%	49.19%	77.08%	26.00%	14.63%	40.34%	8.00%	2.22%	19.23%
Suburban Stability	2.88%	2.31%	3.53%	52.91%	51.11%	54.70%	30.37%	28.73%	32.04%	13.85%	12.63%	15.13%
New Starters	2.93%	1.65%	4.79%	58.79%	54.39%	63.09%	26.37%	22.60%	30.41%	11.91%	9.24%	15.04%
Urban Producers	3.50%	2.88%	4.22%	50.51%	48.72%	52.30%	29.43%	27.82%	31.08%	16.56%	15.26%	17.93%
Weathered Communities	3.24%	2.54%	4.08%	49.33%	47.20%	51.46%	31.40%	29.45%	33.41%	16.03%	14.50%	17.64%
Multicultural Centres	8.43%	5.76%	11.81%	57.87%	52.55%	63.05%	20.51%	16.43%	25.08%	13.20%	9.86%	17.17%
Disadvantaged Households	3.50%	2.51%	4.73%	44.14%	41.24%	47.08%	32.08%	29.38%	34.87%	20.28%	17.98%	22.73%
Urban Challenge	3.02%	1.93%	4.50%	51.38%	47.76%	54.99%	27.07%	23.94%	30.38%	18.53%	15.83%	21.47%
North West overall	3.26%	3.02%	3.52%	54.19%	53.49%	54.89%	28.92%	28.29%	29.56%	13.63%	13.15%	14.11%
Pearson's Rho (P)	0.330 (P=0.271)			-0.652 (P<0.05)			-0.013 (P=0.966)			0.828 (P<0.001)		

Table 7: Weight category by Mosaic classification and gender.

Classification	Underweight			Normal weight			Overweight			Obese		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
MALES												
Rural area residents	1.25%	0.57%	2.36%	44.11%	40.44%	47.82%	43.83%	40.17%	47.54%	10.82%	8.65%	13.32%
Career professionals	1.41%	0.87%	2.14%	48.19%	45.63%	50.76%	39.68%	37.18%	42.21%	10.72%	9.20%	12.41%
Suburban older families	1.77%	1.36%	2.25%	43.62%	42.00%	45.26%	41.63%	40.02%	43.26%	12.98%	11.90%	14.11%
Independent older people	1.93%	1.28%	2.77%	42.53%	39.97%	45.12%	42.19%	39.63%	44.78%	13.35%	11.64%	15.21%
Younger families	1.96%	1.30%	2.82%	40.25%	37.70%	42.85%	42.21%	39.63%	44.82%	15.58%	13.74%	17.57%
Educated young single people	0.70%	0.15%	2.04%	56.91%	52.06%	61.66%	29.51%	25.22%	34.08%	12.88%	9.85%	16.43%
Inner city and manufacturing communities	2.20%	1.78%	2.69%	43.21%	41.72%	44.71%	37.98%	36.52%	39.46%	16.60%	15.49%	17.75%
Upwardly mobile families	1.97%	1.36%	2.75%	41.83%	39.45%	44.23%	39.86%	37.50%	42.25%	16.35%	14.61%	18.21%
Older people in social housing	2.33%	1.07%	4.38%	43.26%	38.26%	48.37%	39.12%	34.22%	44.19%	15.28%	11.84%	19.27%
Low income families	2.82%	2.10%	3.69%	40.64%	38.37%	42.94%	39.37%	37.11%	41.66%	17.17%	15.46%	18.99%
Social housing	3.54%	2.21%	5.36%	42.66%	38.64%	46.76%	35.92%	32.05%	39.93%	17.88%	14.87%	21.20%
North West overall	2.01%	1.81%	2.22%	43.38%	42.66%	44.11%	39.86%	39.14%	40.58%	14.75%	14.24%	15.28%
Pearson's Rho (P)	0.752 (P=<0.01)			-0.238 (P=0.480)			-0.442 (P=0.173)			0.906 (P=<0.001)		
FEMALES												
Rural area residents	2.89%	1.88%	4.24%	57.06%	53.68%	60.39%	29.17%	26.15%	32.32%	10.88%	8.88%	13.15%
Career professionals	3.70%	2.86%	4.70%	60.83%	58.49%	63.14%	26.11%	24.06%	28.25%	9.36%	8.03%	10.83%
Suburban older families	2.73%	2.24%	3.29%	56.75%	55.19%	58.30%	29.55%	28.13%	31.00%	10.97%	10.01%	11.99%
Independent older people	3.09%	2.30%	4.06%	57.51%	55.06%	59.94%	28.14%	25.96%	30.40%	11.26%	9.76%	12.90%
Younger families	2.50%	1.77%	3.41%	56.34%	53.81%	58.86%	28.53%	26.27%	30.88%	12.62%	10.99%	14.40%
Educated young single people	2.53%	1.22%	4.59%	66.67%	61.79%	71.30%	20.71%	16.82%	25.04%	10.10%	7.31%	13.50%
Inner city and manufacturing communities	3.75%	3.21%	4.36%	51.76%	50.27%	53.25%	30.17%	28.81%	31.55%	14.32%	13.30%	15.39%
Upwardly mobile families	4.06%	3.22%	5.04%	48.78%	46.52%	51.04%	29.57%	27.53%	31.66%	17.60%	15.92%	19.37%
Older people in social housing	3.07%	1.73%	5.01%	52.76%	48.23%	57.26%	28.22%	24.27%	32.44%	15.95%	12.82%	19.50%
Low income families	3.10%	2.40%	3.94%	47.76%	45.60%	49.92%	29.56%	27.61%	31.57%	19.58%	17.90%	21.35%
Social housing	3.68%	2.29%	5.58%	50.35%	46.17%	54.53%	28.07%	24.42%	31.95%	17.89%	14.83%	21.29%
North West overall	3.26%	3.02%	3.52%	54.19%	53.49%	54.89%	28.92%	28.29%	29.56%	13.63%	13.15%	14.11%
Pearson's Rho (P)	0.327 (P=0.326)			-0.645 (P<0.05)			0.100 (P=0.770)			0.890 (P<0.001)		

Table 8: Weight category by Health ACORN classification and gender.

Classification	Underweight			Normal weight			Overweight			Obese		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
MALES												
Affluent families	0.00%	0.00%	8.81%	37.50%	22.73%	54.20%	57.50%	40.89%	72.96%	5.00%	0.61%	16.92%
Affluent professionals	1.62%	0.84%	2.82%	45.41%	41.78%	49.07%	42.30%	38.71%	45.95%	10.68%	8.54%	13.13%
Affluent healthy pensioners	1.88%	1.00%	3.19%	47.47%	43.70%	51.27%	39.97%	36.30%	43.73%	10.68%	8.48%	13.22%
Affluent towns and villages	1.95%	1.36%	2.71%	42.71%	40.41%	45.04%	42.04%	39.74%	44.37%	13.29%	11.75%	14.95%
Home owning older couples	1.24%	0.84%	1.77%	44.37%	42.37%	46.37%	41.43%	39.45%	43.42%	12.97%	11.65%	14.37%
Younger affluent professionals	3.39%	0.93%	8.45%	47.46%	38.19%	56.85%	36.44%	27.78%	45.80%	12.71%	7.29%	20.10%
Students and young professionals	0.00%	0.00%	18.53%	72.22%	46.52%	90.31%	27.78%	9.69%	53.48%	0.00%	0.00%	18.53%
Home owning pensioners	1.63%	0.71%	3.19%	41.43%	37.03%	45.93%	42.86%	38.43%	47.37%	14.08%	11.12%	17.48%
Mixed communities	2.08%	1.51%	2.78%	41.78%	39.66%	43.91%	42.01%	39.90%	44.15%	14.13%	12.67%	15.69%
Towns and villages	2.25%	1.52%	3.19%	41.99%	39.33%	44.69%	41.77%	39.11%	44.46%	14.00%	12.18%	15.97%
Elderly	3.07%	1.77%	4.94%	42.03%	37.76%	46.40%	40.69%	36.44%	45.05%	14.20%	11.32%	17.50%
Young mobile population	1.79%	0.58%	4.12%	48.57%	42.58%	54.59%	31.79%	26.37%	37.59%	17.86%	13.55%	22.86%
Less affluent neighbourhoods	1.61%	1.10%	2.27%	44.40%	42.16%	46.65%	38.12%	35.95%	40.33%	15.87%	14.27%	17.58%
Low income families	2.26%	1.55%	3.17%	45.42%	42.80%	48.05%	38.43%	35.89%	41.02%	13.89%	12.13%	15.80%
Post industrial pensioners	2.78%	1.21%	5.40%	40.97%	35.24%	46.89%	34.38%	28.90%	40.17%	21.88%	17.24%	27.10%
Disadvantaged multi ethnic young adults	1.80%	0.22%	6.36%	45.05%	35.59%	54.78%	39.64%	30.48%	49.37%	13.51%	7.77%	21.31%
Disadvantaged neighbourhoods	2.31%	1.60%	3.21%	44.47%	41.92%	47.05%	34.92%	32.48%	37.41%	18.31%	16.36%	20.37%
Deprived multi-ethnic estates	3.40%	2.14%	5.10%	42.13%	38.29%	46.04%	35.49%	31.81%	39.31%	18.98%	16.03%	22.22%
Deprived neighbourhoods	2.90%	1.67%	4.67%	38.29%	34.22%	42.50%	42.47%	38.30%	46.72%	16.33%	13.34%	19.69%
Multi-ethnic	0.00%	0.00%	40.96%	57.14%	18.41%	90.10%	42.86%	9.90%	81.59%	0.00%	0.00%	40.96%
Urban estates	1.83%	0.98%	3.11%	41.13%	37.48%	44.85%	36.90%	33.34%	40.57%	20.14%	17.25%	23.28%
Vulnerable disadvantaged	0.70%	0.02%	3.83%	33.57%	25.89%	41.94%	50.35%	41.87%	58.81%	15.38%	9.90%	22.36%
Poor single parent families	2.08%	0.05%	11.07%	43.75%	29.48%	58.82%	33.33%	20.40%	48.41%	20.83%	10.47%	34.99%
North West overall	2.01%	1.81%	2.22%	43.38%	42.66%	44.11%	39.86%	39.14%	40.58%	14.75%	14.24%	15.28%
Pearson's Rho (P)	0.152 (P=0.488)			-0.164 (P=0.454)			-0.235 (P=0.280)			0.442 (P<0.05)		

Table 8 continued...

Classification	Underweight			Normal weight			Overweight			Obese		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
FEMALES												
Affluent families	0.00%	0.00%	11.22%	54.84%	36.03%	72.68%	32.26%	16.68%	51.37%	12.90%	3.63%	29.83%
Affluent professionals	3.49%	2.35%	4.97%	57.76%	54.32%	61.15%	30.57%	27.45%	33.82%	8.18%	6.41%	10.26%
Affluent healthy pensioners	3.46%	2.31%	4.96%	59.26%	55.79%	62.67%	28.40%	25.31%	31.64%	8.89%	7.02%	11.06%
Affluent towns and villages	3.02%	2.31%	3.87%	60.87%	58.68%	63.02%	26.06%	24.14%	28.05%	10.06%	8.77%	11.47%
Home owning older couples	2.89%	2.30%	3.58%	58.04%	56.18%	59.87%	28.36%	26.69%	30.07%	10.71%	9.59%	11.92%
Younger affluent professionals	2.66%	0.87%	6.10%	63.83%	56.52%	70.70%	26.06%	19.95%	32.95%	7.45%	4.13%	12.18%
Students and young professionals	0.00%	0.00%	30.85%	90.00%	55.50%	99.75%	10.00%	0.25%	44.50%	0.00%	0.00%	30.85%
Home owning pensioners	3.80%	2.33%	5.80%	55.98%	51.62%	60.27%	26.38%	22.66%	30.36%	13.85%	11.02%	17.10%
Mixed communities	2.91%	2.25%	3.70%	53.91%	51.80%	56.01%	29.73%	27.82%	31.69%	13.45%	12.06%	14.95%
Towns and villages	3.11%	2.27%	4.16%	54.71%	52.07%	57.33%	28.95%	26.59%	31.39%	13.23%	11.51%	15.11%
Elderly	4.86%	3.23%	7.00%	50.45%	46.21%	54.69%	27.75%	24.06%	31.67%	16.94%	13.91%	20.32%
Young mobile population	2.21%	0.81%	4.74%	55.51%	49.39%	61.52%	27.21%	22.01%	32.91%	15.07%	11.04%	19.89%
Less affluent neighbourhoods	3.28%	2.54%	4.15%	50.87%	48.66%	53.07%	31.22%	29.20%	33.29%	14.64%	13.12%	16.26%
Low income families	4.29%	3.33%	5.42%	51.14%	48.61%	53.66%	30.28%	27.99%	32.64%	14.29%	12.58%	16.14%
Post industrial pensioners	3.53%	1.89%	5.97%	53.53%	48.29%	58.72%	26.09%	21.67%	30.89%	16.85%	13.17%	21.07%
Disadvantaged multi ethnic young adults	4.40%	1.21%	10.87%	59.34%	48.53%	69.52%	20.88%	13.06%	30.67%	15.38%	8.67%	24.46%
Disadvantaged neighbourhoods	2.54%	1.82%	3.44%	50.22%	47.72%	52.72%	30.44%	28.17%	32.78%	16.80%	14.99%	18.74%
Deprived multi-ethnic estates	4.46%	3.01%	6.34%	48.31%	44.40%	52.23%	28.15%	24.73%	31.78%	19.08%	16.13%	22.31%
Deprived neighbourhoods	3.45%	2.20%	5.14%	44.14%	40.33%	48.01%	32.28%	28.74%	35.98%	20.12%	17.14%	23.37%
Multi-ethnic	37.50%	8.52%	75.51%	37.50%	8.52%	75.51%	25.00%	3.19%	65.09%	0.00%	0.00%	36.94%
Urban estates	3.04%	1.98%	4.45%	49.94%	46.47%	53.41%	26.85%	23.85%	30.02%	20.17%	17.48%	23.08%
Vulnerable disadvantaged	0.64%	0.02%	3.52%	50.00%	41.90%	58.10%	28.85%	21.88%	36.63%	20.51%	14.47%	27.71%
Poor single parent families	7.55%	2.09%	18.21%	50.94%	36.84%	64.94%	30.19%	18.34%	44.34%	11.32%	4.27%	23.03%
North West overall	3.26%	3.02%	3.52%	54.19%	53.49%	54.89%	28.92%	28.29%	29.56%	13.63%	13.15%	14.11%
Pearson's Rho (P)	0.328 (P=0.126)			-0.544 (P<0.01)			0.078 (P=0.725)			0.437 (P<0.05)		

Table 9: Weight category by Office for National Statistics (ONS) Area classification and gender.

Classification	Underweight			Normal weight			Overweight			Obese		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
MALES												
Urban Commuter	1.19%	0.75%	1.79%	42.86%	40.60%	45.16%	44.00%	41.72%	46.30%	11.95%	10.50%	13.51%
Affluent Urban Commuter	1.55%	0.91%	2.47%	45.85%	42.87%	48.85%	39.65%	36.74%	42.62%	12.94%	11.01%	15.08%
Rural Economies	1.94%	1.23%	2.89%	44.48%	41.63%	47.36%	42.97%	40.13%	45.84%	10.61%	8.92%	12.51%
Well off Mature Households	1.48%	1.02%	2.08%	41.71%	39.65%	43.79%	42.25%	40.18%	44.33%	14.56%	13.12%	16.10%
Farming and Forestry	1.02%	0.21%	2.94%	46.10%	40.31%	51.97%	38.98%	33.38%	44.81%	13.90%	10.16%	18.38%
Young Urban Families	2.98%	1.88%	4.48%	40.51%	36.95%	44.16%	42.82%	39.22%	46.48%	13.69%	11.29%	16.38%
Mature City Professionals	0.00%	0.00%	3.05%	47.90%	38.66%	57.25%	35.29%	26.76%	44.58%	16.81%	10.58%	24.76%
Suburbia	0.81%	0.02%	4.41%	45.97%	36.99%	55.15%	42.74%	33.90%	51.94%	10.48%	5.70%	17.26%
Mature Urban Households	2.21%	1.18%	3.75%	40.99%	36.98%	45.08%	40.48%	36.48%	44.57%	16.33%	13.43%	19.57%
Countryside Communities	1.98%	0.24%	6.97%	45.54%	35.60%	55.76%	41.58%	31.86%	51.82%	10.89%	5.56%	18.65%
Small Town Communities	2.20%	1.45%	3.18%	40.36%	37.60%	43.16%	42.23%	39.45%	45.05%	15.22%	13.25%	17.35%
Resorts and Retirement	2.75%	1.89%	3.86%	44.21%	41.33%	47.11%	39.14%	36.33%	42.01%	13.91%	11.97%	16.03%
Educational Centres	0.52%	0.01%	2.85%	66.32%	59.18%	72.95%	20.73%	15.24%	27.13%	12.44%	8.13%	17.94%
Young City Professionals	1.12%	0.03%	6.10%	57.30%	46.37%	67.74%	24.72%	16.19%	35.00%	16.85%	9.75%	26.27%
Urban Terracing	2.53%	1.94%	3.24%	44.19%	42.19%	46.20%	37.46%	35.52%	39.43%	15.82%	14.39%	17.34%
Multicultural Urban	3.09%	1.42%	5.79%	47.42%	41.57%	53.33%	30.93%	25.66%	36.59%	18.56%	14.26%	23.51%
Blue Collar Urban Families	2.69%	1.87%	3.73%	43.84%	41.08%	46.62%	39.73%	37.02%	42.49%	13.74%	11.89%	15.76%
Multicultural Suburbia	0.69%	0.08%	2.46%	43.64%	37.86%	49.55%	35.40%	29.90%	41.19%	20.27%	15.81%	25.36%
Multicultural Inner City	8.33%	2.32%	19.98%	25.00%	13.64%	39.60%	54.17%	39.17%	68.63%	12.50%	4.73%	25.25%
Struggling Urban Families	2.09%	1.57%	2.71%	41.92%	40.01%	43.85%	37.29%	35.42%	39.18%	18.70%	17.22%	20.26%
North West overall	2.01%	1.81%	2.22%	43.38%	42.66%	44.11%	39.86%	39.14%	40.58%	14.75%	14.24%	15.28%
Pearson's Rho (P)	0.406 (P=0.076)			-0.080 (P=0.737)			-0.219 (P=0.353)			0.531 (P<0.05)		

Table 9 continued...

Classification	Underweight			Normal weight			Overweight			Obese		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
FEMALES												
Urban Commuter	2.42%	1.80%	3.17%	57.87%	55.73%	59.99%	29.10%	27.17%	31.09%	10.62%	9.33%	12.01%
Affluent Urban Commuter	3.90%	2.91%	5.11%	60.64%	57.90%	63.32%	26.03%	23.65%	28.53%	9.43%	7.89%	11.16%
Rural Economies	2.97%	2.13%	4.02%	59.53%	56.85%	62.16%	27.58%	25.21%	30.04%	9.93%	8.39%	11.65%
Well off Mature Households	3.12%	2.46%	3.90%	55.60%	53.58%	57.61%	28.48%	26.67%	30.34%	12.81%	11.49%	14.22%
Farming and Forestry	2.63%	1.21%	4.94%	53.51%	48.07%	58.89%	32.16%	27.24%	37.40%	11.70%	8.49%	15.58%
Young Urban Families	2.56%	1.57%	3.93%	55.38%	51.82%	58.91%	31.41%	28.16%	34.80%	10.64%	8.56%	13.02%
Mature City Professionals	4.42%	1.45%	10.02%	61.95%	52.33%	70.92%	23.01%	15.61%	31.87%	10.62%	5.61%	17.82%
Suburbia	5.04%	2.05%	10.10%	51.80%	43.17%	60.35%	34.53%	26.68%	43.06%	8.63%	4.54%	14.59%
Mature Urban Households	2.65%	1.55%	4.21%	53.67%	49.72%	57.58%	29.80%	26.28%	33.50%	13.88%	11.30%	16.81%
Countryside Communities	2.11%	0.44%	6.05%	57.04%	48.47%	65.31%	26.76%	19.68%	34.83%	14.08%	8.82%	20.91%
Small Town Communities	4.38%	3.31%	5.68%	50.20%	47.37%	53.03%	28.79%	26.28%	31.41%	16.63%	14.59%	18.82%
Resorts and Retirement	2.57%	1.79%	3.55%	57.55%	54.88%	60.19%	28.89%	26.49%	31.37%	11.00%	9.39%	12.78%
Educational Centres	1.92%	0.40%	5.52%	62.18%	54.08%	69.81%	24.36%	17.85%	31.87%	11.54%	6.98%	17.62%
Young City Professionals	6.06%	1.68%	14.80%	62.12%	49.34%	73.78%	16.67%	8.62%	27.87%	15.15%	7.51%	26.10%
Urban Terracing	4.05%	3.31%	4.90%	49.84%	47.86%	51.82%	31.03%	29.22%	32.89%	15.08%	13.69%	16.54%
Multicultural Urban	6.86%	4.30%	10.30%	62.09%	56.40%	67.55%	17.97%	13.84%	22.74%	13.07%	9.51%	17.37%
Blue Collar Urban Families	2.66%	1.88%	3.65%	53.52%	50.86%	56.17%	29.45%	27.07%	31.93%	14.37%	12.57%	16.32%
Multicultural Suburbia	6.25%	3.68%	9.82%	50.74%	44.63%	56.82%	23.16%	18.28%	28.64%	19.85%	15.28%	25.10%
Multicultural Inner City	0.00%	0.00%	10.58%	66.67%	48.17%	82.04%	24.24%	11.09%	42.26%	9.09%	1.92%	24.33%
Struggling Urban Families	2.96%	2.38%	3.63%	47.68%	45.88%	49.50%	30.22%	28.58%	31.91%	19.14%	17.74%	20.60%
North West overall	3.26%	3.02%	3.52%	54.19%	53.49%	54.89%	28.92%	28.29%	29.56%	13.63%	13.15%	14.11%
Pearson's Rho (P)	0.121 (P=0.612)			-0.128 (P=0.592)			-0.312 (P=0.180)			0.135 (P=0.570)		

6.2 Appendix 2

Table 10: Factors significantly associated with underweight.

Variable		Odds Ratio	95% CI	P value
Gender	Male	Reference		
	Female	1.57	1.37-1.80	P<0.001
Age category	16-24	Reference		
	25-34	0.28	0.23-0.34	P<0.001
	35-44	0.15	0.12-0.19	P<0.001
	45-54	0.15	0.12-0.20	P<0.001
	55-64	0.15	0.11-0.20	P<0.001
	65-74	0.27	0.21-0.36	P<0.001
	75 and over	0.64	0.51-0.81	P<0.001
Average sedentary time per day	2 hours or less	Reference		
	> 2 hrs and ≤ 4 hrs	0.78	0.66-0.92	P<0.05
	> 4 hrs and ≤ 8 hrs	0.84	0.71-1.00	P<0.05
	More than 8 hours	0.87	0.68-1.12	NS
General health	Very good	Reference		
	Good	0.92	0.79-1.07	NS
	Fair	1.20	0.97-1.48	NS
	Bad	1.70	1.24-2.34	P<0.001
	Very bad	2.72	1.68-4.40	P<0.001
Alcohol consumption	Non drinker	Reference		
	Sensible	0.57	0.50-0.66	P<0.001
	Hazardous	0.38	0.29-0.49	P<0.001
	Harmful	0.30	0.18-0.49	NS
Smoking status	Non smoker	Reference		
	Current smoker	1.43	1.22-1.68	P<0.001
	Ex smoker	0.76	0.62-0.93	P<0.01
Arthritis in previous 12 months	No	Reference		
	Yes	0.62	0.49-0.80	P<0.001
Nervous depression in previous 12 months	No	Reference		
	Yes	1.37	1.10-1.71	P<0.05
Backache in previous 12 months	No	Reference		
	Yes	0.79	0.65-0.97	P<0.05
Diabetes in previous 12 months	No	Reference		
	Yes	0.52	0.33-0.81	P<0.05
High blood pressure in previous 12 months	No	Reference		
	Yes	0.54	0.42-0.69	P<0.001

Variables not entered into the logistic regression model because chi-squared tests showed a level of significance of $P>0.05$ were: level of physical activity, ever experienced a heart attack, ever experienced a stroke, and angina in the previous 12 months. The variables that were significantly associated with being underweight in the chi-squared analysis but failed to reach significance in the logistic regression model were: the number of portions of fruit and vegetables consumed per day and asthma in the previous 12 months. NS=not significant.

Table 11: Factors significantly associated with normal weight.

Variable		Odds Ratio	95% CI	P value
Gender	Male	Reference		
	Female	1.61	1.54-1.68	<0.001
Age category	16-24	Reference		
	25-34	0.51	0.47-0.55	<0.001
	35-44	0.38	0.35-0.41	<0.001
	45-54	0.38	0.35-0.41	<0.001
	55-64	0.38	0.35-0.41	<0.001
	65-74	0.42	0.39-0.47	<0.001
	75 and over	0.75	0.68-0.82	<0.001
Level of physical activity	Low	Reference		
	Moderate	1.16	1.10-1.23	<0.001
	High	1.14	1.08-1.21	<0.001
Average sedentary time per day	2 hours or less	Reference		
	> 2 hrs and ≤ 4 hrs	0.91	0.86-0.97	<0.01
	> 4 hrs and ≤ 8 hrs	0.85	0.80-0.90	<0.001
	More than 8 hours	0.73	0.67-0.79	<0.001
General health	Very good	Reference		
	Good	0.74	0.70-0.78	<0.001
	Fair	0.63	0.59-0.68	<0.001
	Bad	0.74	0.65-0.82	<0.001
	Very bad	0.70	0.56-0.86	<0.001
Alcohol consumption	Non drinker	Reference		
	Sensible	1.16	1.10-1.22	<0.001
	Hazardous	1.19	1.11-1.29	<0.001
	Harmful	1.07	0.94-1.22	NS
Smoking status	Non smoker	Reference		
	Current smoker	1.24	1.17-1.31	<0.001
	Ex smoker	0.83	0.79-0.88	<0.001
Arthritis in previous 12 months	No	Reference		
	Yes	0.79	0.73-0.84	<0.001
Backache in previous 12 months	No	Reference		
	Yes	0.84	0.79-0.90	<0.001
Diabetes in previous 12 months	No	Reference		
	Yes	0.54	0.48-0.60	<0.001
High blood pressure in previous 12 months	No	Reference		
	Yes	0.60	0.56-0.64	<0.001

The chi-squared analyses showed that every lifestyle variable tested was significantly associated with normal weight and so all were entered into the logistic regression model. The variables that were significantly associated with being of normal weight in the chi-squared analysis but failed to reach significance in the logistic regression model were: the number of portions of fruit and vegetables consumed per day, ever experienced a heart attack, ever experienced a stroke, asthma in the previous 12 months, angina in the previous 12 months and nervous depression in the previous 12 months. NS=not significant.

Table 12: Factors significantly associated with overweight.

Variable		Odds Ratio	95% CI	P value
Gender	Male	Reference		
	Female	0.61	0.58-0.64	P<0.001
Age category	16-24	Reference		
	25-34	2.36	2.15-2.59	P<0.001
	35-44	3.17	2.90-3.46	P<0.001
	45-54	3.17	2.89-3.47	P<0.001
	55-64	3.40	3.10-3.73	P<0.001
	65-74	3.63	3.28-4.01	P<0.001
	75 and over	2.78	2.50-3.10	P<0.001
General health	Very good	Reference		
	Good	1.19	1.13-1.26	P<0.001
	Fair	1.09	1.02-1.17	P<0.05
	Bad	0.99	0.88-1.11	NS
	Very bad	0.96	0.78-1.19	NS
Alcohol consumption	Non drinker	Reference		
	Sensible	1.05	0.99-1.10	NS
	Hazardous	1.13	1.04-1.22	P<0.01
	Harmful	1.28	1.12-1.45	P<0.001
Smoking status	Non smoker	Reference		
	Current smoker	0.86	0.81-0.92	P<0.001
	Ex smoker	1.10	1.04-1.16	P<0.001
Asthma in previous 12 months	No	Reference		
	Yes	0.90	0.82-0.97	P<0.05
Nervous depression in previous 12 months	No	Reference		
	Yes	0.84	0.77-0.91	P<0.001
Backache in previous 12 months	No	Reference		
	Yes	1.10	1.04-1.17	P<0.001
High blood pressure in previous 12 months	No	Reference		
	Yes	1.13	1.06-1.20	P<0.001

The chi-squared analyses showed that every lifestyle variable tested was significantly associated with being overweight and so all were entered into the logistic regression model. The variables that were significantly associated with being overweight in the chi-squared analysis but failed to reach significance in the logistic regression model were: level of physical activity, average sedentary time per day, the number of portions of fruit and vegetables consumed per day, ever experienced a heart attack, ever experienced a stroke, angina in the previous 12 months, arthritis in the previous 12 months, and diabetes in the previous 12 months. NS=not significant.

Table 13: Factors significantly associated with obese.

Variable		Odds Ratio	95% CI	P value
Gender	Male	Reference		
	Female	0.91	0.86-0.97	P<0.05
Age category	16-24	Reference		
	25-34	2.29	1.99-2.65	P<0.001
	35-44	2.68	2.33-3.07	P<0.001
	45-54	2.61	2.27-3.00	P<0.001
	55-64	2.20	1.91-2.54	P<0.001
	65-74	1.55	1.33-1.81	P<0.001
	75 and over	0.76	0.64-0.91	P<0.01
Level of physical activity	Low	Reference		
	Moderate	0.81	0.75-0.88	P<0.001
	High	0.79	0.74-0.86	P<0.001
Average sedentary time per day	2 hours or less	Reference		
	> 2 hrs and ≤ 4 hrs	1.22	1.12-1.33	P<0.001
	> 4 hrs and ≤ 8 hrs	1.41	1.29-1.54	P<0.001
	More than 8 hours	1.73	1.55-1.94	P<0.001
General health	Very good	Reference		
	Good	1.50	1.38-1.62	P<0.001
	Fair	2.07	1.88-2.28	P<0.001
	Bad	1.69	1.46-1.95	P<0.001
	Very bad	1.64	1.28-2.08	P<0.001
Alcohol consumption	Non drinker	Reference		
	Sensible	0.81	0.76-0.87	P<0.001
	Hazardous	0.69	0.62-0.77	P<0.001
	Harmful	0.72	0.60-0.88	P<0.001
Smoking status	Non smoker	Reference		
	Current smoker	0.77	0.71-0.84	P<0.001
	Ex smoker	1.19	1.10-1.28	P<0.001
Asthma in previous 12 months	No	Reference		
	Yes	1.20	1.09-1.33	P<0.001
Arthritis in previous 12 months	No	Reference		
	Yes	1.48	1.36-1.61	P<0.001
Nervous depression in previous 12 months	No	Reference		
	Yes	1.30	1.18-1.44	P<0.001
Backache in previous 12 months	No	Reference		
	Yes	1.19	1.10-1.28	P<0.001
Diabetes in previous 12 months	No	Reference		
	Yes	2.25	2.01-2.51	P<0.001
High blood pressure in previous 12 months	No	Reference		
	Yes	1.89	1.75-2.04	P<0.001

The chi-squared analyses showed that every lifestyle variable tested was significantly associated with being obese and so all were entered into the logistic regression model. The variables that were significantly associated with being obese in the chi-squared analysis but failed to reach significance in the logistic regression model were: ever experienced a heart attack, ever experienced a stroke and angina in the previous 12 months. NS=not significant.

Table 14: Factors significantly associated with overweight or obese.

Variable		Odds Ratio	95% CI	P value
Gender	Male	Reference		
	Female	0.59	0.56-0.62	P<0.001
Age category	16-24	Reference		
	25-34	2.72	2.50-2.96	P<0.001
	35-44	3.84	3.54-4.17	P<0.001
	45-54	3.81	3.50-4.15	P<0.001
	55-64	3.76	3.44-4.11	P<0.001
	65-74	3.24	2.94-3.58	P<0.001
	75 and over	1.68	1.51-1.86	P<0.001
Level of physical activity	Low	Reference		
	Moderate	0.87	0.82-0.92	P<0.001
	High	0.88	0.83-0.93	P<0.001
Average sedentary time per day	2 hours or less	Reference		
	> 2 hrs and ≤ 4 hrs	1.13	1.07-1.19	P<0.001
	> 4 hrs and ≤ 8 hrs	1.20	1.13-1.28	P<0.001
	More than 8 hours	1.39	1.28-1.52	P<0.001
General health	Very good	Reference		
	Good	1.38	1.31-1.45	P<0.001
	Fair	1.57	1.46-1.69	P<0.001
	Bad	1.29	1.15-1.45	P<0.001
	Very bad	1.26	1.02-1.55	P<0.05
Smoking status	Non smoker	Reference		
	Current smoker	0.77	0.73-0.81	P<0.001
	Ex smoker	1.21	1.15-1.28	P<0.001
Angina in previous 12 months	No	Reference		
	Yes	1.17	1.02-1.33	P<0.05
Arthritis in previous 12 months	No	Reference		
	Yes	1.33	1.25-1.43	P<0.001
Backache in previous 12 months	No	Reference		
	Yes	1.22	1.15-1.29	P<0.001
Diabetes in previous 12 months	No	Reference		
	Yes	1.96	1.75-2.19	P<0.001
High blood pressure in previous 12 months	No	Reference	1.63-1.86	
	Yes	1.74		P<0.001

Variables not entered into the logistic regression model because chi-squared tests showed a level of significance of $P>0.05$ were: the number of portions of fruit and vegetables consumed per day, alcohol consumption levels and asthma in the previous 12 months. The variables that were significantly associated with being overweight in the chi-squared analysis but failed to reach significance in the logistic regression model were: ever experienced a heart attack, ever experienced a stroke and nervous depression in the previous 12 months. NS=not significant.

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Segmentation and Insight into the Body Mass Index of the North West Population

Rebecca Harrison Caryl Beynon Clare Perkins Mark A Bellis

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North West Public Health Observatory

Centre for Public Health

Research Directorate

Faculty of Health and Applied Social Sciences

Liverpool John Moores University

3rd Floor Henry Cotton Campus

15-21 Webster Street

Liverpool

L3 2ET

t: +44(0)151 231 4535

f: +44(0)151 231 4552

e: nwpho-contact@ljmu.ac.uk

www.nwpho.org.uk

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