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Time trends in childhood and adolescent obesity in England from 1995 to 2007 and projections of prevalence to 2015

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ABSTRACT

Objectives: To examine the 1995 to 2007 childhood and adolescent obesity trends and project prevalence to 2015 by age group and social class. **Design:** Repeated cross-sectional surveys. **Setting:** General population households in England **Participants:** Children aged 2-10 and adolescents aged 11-18. **Main Outcomes Measures:** Body mass index based on measured height and weight. Obesity was computed using the international standards. Prevalence projections to 2015 were based on extrapolation of linear and nonlinear (power or exponential) 1995 to 2007 trend. **Results:** Obesity prevalence increased from 1995 to 2007 from 3.1% to 6.9% among boys and from 5.2% to 7.4% among girls 2-10. There are signs of a levelling off trend past 2004/5. Assuming a linear trend, the 2015 projected obesity prevalence is 10.1% (95%CI: 7.5, 12.6) in male and 8.9% (5.8, 12.1) in female children and 8.0% (4.5, 11.5) in male and 9.7% (6.0, 13.3) in female adolescents. Projected prevalence in manual social classes is markedly higher than nonmanual [boys 2-10: 10.7% (6.6, 14.9) vs 7.9% (3.7, 12.1); girls 2-10: 11.2% (7.0, 15.3) vs 5.4% (1.3, 9.4) ; male adolescents: 10.0% (5.2, 14.8) vs 6.7% (3.4, 10.0); female adolescents: 10.4% (5.0, 15.8) vs 8.3% (4.3, 12.4)]. **Conclusion:** If the trends between 1995 and 2007 in young obesity continue, the percentage and numbers of obese young people in England will increase considerably by 2015 and the existing obesity gap between manual and nonmanual classes will widen further. This highlights the need for public health action to reverse recent trends and narrow social inequalities in health.

INTRODUCTION

Excess adiposity at a young age is linked to numerous immediate and long-term health risks, including increased risk for asthma¹ and type II diabetes,² persistence of the condition into adulthood^{3 4} and increased middle-age mortality and morbidity regardless of adult weight status.⁵ ^{6 7} Over the last few decades there have been signs of a worldwide increase in young obesity worldwide.^{8 9} In England, a consistently upward trend between 1974 and 2003 has been reported for school-age children (5-10 years) with signs that up to the early 2000s, prevalence may be increasing disproportionately in children from less advantaged socioeconomic backgrounds,¹⁰ contributing to widening socioeconomic inequalities in health. Recent forecasting efforts¹¹ have predicted that approximately 25% of young people under 20 in England will be obese by 2050 but the long forecasting interval (>40 years) renders such information not particularly useful for near and intermediate-term policy planning. Examining the recent prevalence trends and projecting the extent of the obesity problem within a realistic forecasting time frame can inform childhood and adolescent obesity prevention policies and interventions and will highlight the socioeconomic sub-groups that may need to be given priority by preventive policies. The present work is complementary to our recent study¹² that examined adults' temporal trends and projected obesity prevalence to 2012.

The aim of this study is to provide an update of the current state and time trends of childhood and adolescent obesity prevalence in England between 1995 and 2007 by narrow and broad age groups and by social class and to project obesity rates to year 2015 using the existing time trends for each sub-group as a guide. To achieve these aims, we used a number of large, nationally representative datasets of young people living in households in England, participants in the Health Survey for England.

METHODS

Study Population

The Health Survey for England (HSE)^{13 14} draws annually a nationally representative random sample of the free-living general population using multi-stage stratified probability sampling. Up to two individuals aged 2 to 15 were selected randomly from each household. In this study we used data from the 1995-2007 surveys. Response rates ranged between 85% in 1997 and 66% in 2004 and 2007. We define children as ages 2-10 and adolescents as 11-18 years.

Measurements

The weight and height measuring methodology has been described in detail elsewhere.^{10 13 14} Body Mass Index (BMI) is calculated as weight (kg) divided by squared height (m²). Obesity rates were computed using the age and sex-specific international classification BMI standards.¹⁵ The occupation of the head of the household was used to determine socioeconomic status. We used the Registrar-General's classification to classify the sample into manual and non-manual social classes.¹⁶

Statistical analysis

The prevalence of obesity for 1995-2007 was calculated for each year separately, by sex, age group (2-5, 6-10, 11-15, 16-18 years) and social class (manual/non manual); moving averages of prevalence were plotted for each group. **Moving averages were calculated as the average of each year and its two neighbours, e.g. the moving average for 2003 was the average of 2002, 2003, and 2004. The only exceptions were 1995 and 2007 whose moving averaged were calculated as the average of each year with its neighbour, i.e. 1996 and 2006, respectively.** A linear trend was fitted to the prevalence data (x_1, x_2, \dots, x_{11}), for the time period 1995-2007. The value of the series

was then projected p years ahead, where $p=8$ (corresponding to the year 2015) by extrapolating a linear trend. For all projected rates we have also calculated the 95% prediction intervals as follow:

$$y \pm (t_{n-2} * \text{standard error})$$

The standard error is given by:

$$\sqrt{\left[1 + \frac{1}{n} + \frac{(x_p - \bar{x})^2}{\sum_{i=1}^n (x_i - \bar{x})^2} \right]}$$

The assumption underlying the linear projections is that the time trends over the examined period will continue unchanged. An alternative set of projections was also made to allow for acceleration or slowing down in the rate of change in prevalence of obesity. For this set of projections, power (of form $x_t = \beta_0 t^{\beta_1}$ where $t = \text{year} - 1994$) and exponential curves (of form $x_t = \beta_0 e^{\beta_1 t}$) were fitted to the data. For presentation in the graphs, the best fitting curve between power and exponential was chosen based on the R^2 . In summary, the two scenarios are:

a) Scenario 1: projections are based on the linear trend observed in 1995 to 2007 and assume that the rate of increase will remain constant till 2015; b) Scenario 2: projections are based on the best fitting curve (exponential or power) to allow for acceleration or deceleration in obesity prevalence trends.

All analyses were run using SPSS statistical package, version 13.

Each year's survey was approved by the appropriate Research Ethics Committee.

RESULTS

Tables 1 and 2 present the obesity prevalence rates from 1995 to 2007 by sex and age-group.

Figure 1 presents moving averages of prevalence.

Prevalence Trends

Children aged 2-10

Overall, among male children the prevalence of obesity increased from 3.1% in 1995 to 6.9% in 2007 (Table 1). The overall prevalence of obesity among female children aged 2-10 increased from 5.2% in 1995 to 7.4% in 2007 (Table 2). Considering the moving averages of prevalence (Figure 1), there was an upward trend up to approximately 2004/05 in all age groups. Between 2004/05 and 2007 the trend tended to stabilise (boys) or decrease (girls 6-10 years).

In relation to social class, the annual obesity prevalence was on average 0.6% (boys aged 2-10) and 1.5% (girls aged 2-10yrs) higher in participants from manual than from non-manual households (Figure 2).

Adolescents aged 11-18

Among male adolescents the prevalence increased from 2.7% in 1995 to 4.8% in 2007. Obesity rates for female adolescents aged 11-18 increased from 4.7% to 6.1%. There an upward trend between 1995 and 2004/05 in all age groups of male and female adolescents aged 11-18.

Similarly, the prevalence was higher in female than in male adolescents throughout the examined time period (Tables 1 and 2).

In relation to social class, the 1995-2007 annual obesity prevalence was on average 1.2% (boys 11-18yrs) and 2.1% (girls 11-18yrs) higher in participants from manual than from non-manual households (Figure 4). The prevalence of obesity in 1995 was 2.7% among males from non-manual classes compared with 2.9% for manual groups, increasing to 4.8% and 5.3% in 2007, respectively. For female adolescents in the non-manual social class, the prevalence of obesity was 2.8% in 1995 and increased to 5.3% in 2007, with a tendency to decline in the more recent years. For females from manual social classes the prevalence of obesity was 6.5% in 1995 increasing slightly to 6.7% in 2007, with a tendency to decline in the more recent years.

Projections to 2015

Table 3 shows the projections to 2015 and Figure 3 shows the linear and non-linear projection curves to 2015 for children and adolescents.

Children aged 2-10

With a linear trend, obesity rates in 2015 will be similar among pre-school boys aged 2-5 and boys 6-10 but the projected rate of obesity for all boys is 13.5% based on exponential scenario compared with 10.1% based on the linear one. For girls the exponential and linear trend-projected rates of obesity are comparable.

Overall, the estimated 2015 prevalence was higher than the 2007 levels for all boys and for girls in manual social classes, regardless of forecasting method. For children in the manual social class, the projected obesity prevalence in 2015 is 10.7% (95% CI: 6.6; 14.9) for boys and 11.2% (7.0; 15.3) for girls. For non-manual groups the projected obesity prevalence in 2015 is 7.9% (3.7; 12.1) for boys and 5.4% (1.3; 9.4) for girls. Assuming an exponential trend, obesity prevalence in 2015 for boys from manual social classes households will increase to 14.2%. In

the non-manual groups, prevalence will be considerably lower than in manual (boys:9.5%; girls: 5.3%). For girls from nonmanual households the projected prevalence of obesity will follow a downward trend but prevalence is projected to increase in girls from manual households.

Adolescents aged 11-18

The linear-projected rate of obesity for male adolescents is 8.0% ($R^2=0.41$), 9.5% in the exponential trend ($R^2=0.42$) and 6.9% in the power ($R^2=0.54$) scenarios. For females the three projected rates are comparable (R^2 was 0.37, 0.42 and 0.59 for the linear, exponential and power models, respectively).

Overall, the estimated 2015 prevalence was higher than the 2007 levels for all boys and girls in manual and non-manual social classes, regardless of forecasting method. For adolescents in the manual social class, the linear model projected rate is 10.0% (5.2; 14.8) for males and 10.4% (5.0; 15.8) for females. For non-manual social classes the projected obesity prevalence is 6.7% (3.4; 10.0) for boys and 8.3% (4.3; 12.4) for girls. If the trend is assumed to be power, obesity prevalence in 2015 for male and female adolescent from manual social classes households will increase to 8.2% and 9.1% respectively. In the non-manual groups projected prevalence will be considerably lower, at 5.6% for males and 7.9% for females.

DISCUSSION

Prevalence Trend

Our results show that there has been a marked increase in the prevalence of obesity between 1995 and 2004/2005 followed by a tendency to level off or decrease to 2007. Stabilising or

reversing recent trends in overweight or obesity prevalence in European countries have been reported for children in France (3-14¹⁷ and 7-9¹⁸ years), Switzerland, (6-13 years),¹⁹ and Sweden (girls 10-11 years).²⁰ In the USA, Ogden et al showed that there was no significant change in the prevalence of high BMI for age among children and adolescents between 2003/2004 and 2005/2006 or between 1999 and 2006.²¹ Thus, at least in the developed countries, the obesity epidemic may be slowing down. At the individual and family level the stabilisation of the trends may be related to the considerable media attention that issues around obesity have received in the recent years²² and the subsequent body weight awareness this may have generated. At the policy level, it could be partly the result of anti-obesity policies and strategic targets, such as the 2004 Public Service Agreement by the English government that set a target to halt the year-on-year increase of obesity in children under 11²³ and the French National Nutrition and Health Programme.²⁴

Projections to 2015

When interpreting our results it has to be taken into account that the method used to project future prevalence of obesity makes assumptions about future changes in obesity based only on past patterns (1995 to 2007). In boys and girls aged 2-10, the exponential curve provided a better fit to the data than the power curve, suggesting that rates of change in obesity prevalence has been accelerating. In contrast, the power curve provided a better fit in boys and girls aged 11-18, suggesting that the overall rate of change has been decelerating. This approach may be limited because it does not attempt to forecast and take into account changes in obesity determinants (e.g. ethnic composition, income distribution, or behaviour, such as physical activity or content and amount of food and drink consumed) over the forecasting period. Acknowledging that

factoring such parameters into our projections would have been extremely difficult, we chose a relatively short forecasting period.

The Foresight report,¹¹ which used HSE 1995 to 2004 data, estimated the projected 2050 obesity rate to be 26% for both males and females under 20 years. Intermediate projections were 10% by 2015 and 14% by 2025 but no age and sex-specific projections were specified. It is likely that these projections over-estimate forecast rates of obesity as they do not take into account the 2005-07 prevalence when there was a consistent tendency for stabilisation of the trend. Another obvious limitation of attempting to make long term predictions of a largely multifactor condition, such as obesity, is the breadth of societal, economic, demographic, technological, and lifestyle changes that are likely to occur over the forecasting period. For these reasons the Foresight forecasting exercise may be less useful for intermediate term policy and health services planning.

Social Class differences

The socio-economic gap in young obesity in favour of higher socioeconomic strata has been documented previously.^{10 25 26} We observed increases in obesity prevalence that are more pronounced in boys and girls from manual social class households. This trend differentiation is reflected by the projections to 2015. The 2015 projected rate for girls from nonmanual households is at 1995 levels (around 5%) in contrast to girls from manual where the projected rate is over twice as high (around 11%). The socio class gap is evident in boys too: the prevalence does not level off in those in manual classes, whose prevalence continued to rise year-on-year to 2007 (Figure 2). Our projections indicate that by 2015 there will be a considerable prevalence gap between boys from manual and non-manual classes (rates will be

higher in manual classes by approximately 35% (linear) to 50% (exponential)) and girls from manual and from non-manual classes (higher rates in manual by approximately 35% (linear) or 25% (exponential) scenario)). Among adolescents, the socioeconomic gap is pronounced among males but more subtle among females. The projected obesity prevalence for male adolescents from manual social classes is approximately 45% (power) to 50% (linear) higher than males from non-manual classes.

The widening socio-economic gap in children's and adolescents' obesity may be due partly due to difficulties to reach and communicate health messages to families from lower socioeconomic groups. Previous research shows higher socioeconomic status groups tend to follow recommendations for health behaviors²⁷ and respond more actively to health-related media messages²⁸ than do those of lower socioeconomic status. It is possible that the recent exponential increase in obesity and obesity-related (diet and physical activity) media messages²² have been received more positively by non-manual than by manual families. Since lower socioeconomic groups tend to be wary of measures and messages aimed at changing their lifestyle because they see these as “nanny-statism” that erodes their autonomy,²⁹ it is possible that policies targeting children's eating and physical activity habits have not have been perceived as favorably by manual classes. **Another possibility is that a stabilization in obesity prevalence among children from manual households is taking longer to occur than among children from non-manual households but it will eventually occur. However, our data cannot neither support nor reject such a prediction.**

Study Strengths and Limitations

Study strengths include the large, nationally representative samples covering 13 years, the objective measurement of weight and height, and that the sampling, recruitment, and data collection methods (including measurements) remained unchanged throughout the 13 years. A limitation of the present study is that we did not adjust the trend for changes in socio-demographic factors or lifestyle behaviours that affect obesity. Although HSE is designed to be nationally representative, we acknowledge that the decline in response rates in the recent years may have introduced respondent bias in the more recent years, for example if households refusing to take part in the survey (non-respondents) are more likely to be obese than respondents. This is possible as people from lower social classes are more likely to be both non-responders in survey research^{30 31} and obese.³² The decline in response rates may have resulted in under-estimating obesity prevalence in recent years and subsequently in our projected rates. It could be argued that it is a difficult task to provide an accurate forecast of future levels of obesity, given that levels can depend so much on short term influences. However, the purpose of our projections is not so much to provide an accurate forecast of future levels, but to predict what might happen if trends observed in recent years were to continue.

Conclusions

The prevalence of obesity in children and adolescents has been rising over the past decade and the inequalities in children's obesity documented before¹⁰ are widening. If trends continue as they have been between 1995 and 2007, in 2015 the number and prevalence of obese young people is projected to increase dramatically and these increases will affect lower social classes to a larger extent. Thus, it is essential to implement effective strategies for the management and prevention of young obesity and the reduction of social class inequalities in health.

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Competing Interests

None

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What is already known on this subject?

- Childhood and adolescent obesity **has increased at** fast rates in England over the last few decades.
- Children and adolescent from lower socioeconomic strata are at higher risk for obesity.

What does this study add?

- If the trends between 1995 and 2007 in young obesity continue, the percentage and numbers of obese young people in England will increase considerably by 2015.
- There are signs that the trend is leveling off , at least for young people from the nonmanual classes.
- The existing socioeconomic obesity gap in young people is expected to widen further by 2015.

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Figure Legends

Figure 1: Moving averages of obesity prevalence in children and adolescents living in England between 1995-2007.

Figure 2: Extrapolation of percentage obese children (aged 2-10 years) in England, by sex and social class

Figure 3: Extrapolation of percentage obese children and adolescents in England, by broad age group and sex

Figure 4: Extrapolation of percentage obese adolescents (aged 11 to 18 years) in England, by sex and social class

Table 1: Obesity prevalence rates^a in England from 1995 to 2007 and **average absolute change per annum** in boys, by age groups. **The Health Survey for England.**

	2-5 yrs	6-10 yrs	11-15 yrs	16-18 yrs	All 2-10	All 11-18
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI), [N]	% (95% CI), [N]
1995	2.9 (1.4, 4.3)	3.3 (1.8, 4.7)	2.5 (1.3, 3.8)	3.0 (0.9, 5.1)	3.1 (2.1, 4.1), [1113]	2.7 (1.6, 3.8), [847]
1996	4.3 (2.6, 6.1)	3.5 (2.1, 4.9)	3.7 (2.2, 5.2)	4.2 (2.0, 6.3)	3.9 (2.8, 5.0), [1234]	3.8 (2.6, 5.1), [977]
1997	3.6 (2.4, 4.8)	3.0 (2.0, 3.9)	4.5 (3.2, 5.7)	5.6 (2.0, 9.2)	3.2 (2.4, 4.0), [2159]	4.6 (3.4, 5.8), [1277]
1998	2.0 (0.8, 3.2)	4.0 (2.5, 5.5)	2.4 (1.1, 3.7)	3.9 (1.7, 6.1)	3.2 (2.2, 4.2), [1185]	2.9 (1.8, 4.0), [877]
1999	7.7 (4.2,11.2)	4.7 (2.4,7.1)	5.8 (3.1, 8.6)	3.2 (0.3, 6.0)	5.9 (3.9, 7.9), [563]	5.0 (2.9, 7.1), [446]
2000	4.1 (1.5, 6.7)	3.6 (1.6, 5.5)	6.1 (3.2, 9.0)	2.5 (0.1, 4.9)	3.8 (2.2, 5.4), [582]	5.0 (2.9, 7.1), [443]
2001	3.8 (1.9, 5.7)	6.1 (4.0, 8.2)	5.0 (3.2, 6.8)	5.9 (3.0, 8.7)	5.1 (3.6, 6.6), [913]	5.3 (3.8, 6.8), [850]
2002	5.8 (4.1, 7.5)	5.1 (3.8, 6.3)	6.4 (5.0, 7.8)	7.6 (5.4, 9.7)	5.3 (4.3, 6.3), [2036]	6.7 (5.6, 7.9), [1835]
2003	4.6 (2.3, 6.9)	6.9 (4.7, 9.1)	6.7 (4.5, 8.8)	6.1 (3.1, 9.0)	6.0 (4.4, 7.6), [864]	6.5 (4.7, 8.2), [816]
2004	7.7 (3.3,12.2)	7.5 (4.2,10.9)	5.0 (2.2, 7.9)	2.4 (-0.6, 5.3)	7.6(4.9, 10.3), [404]	4.0 (1.9, 6.1), [334]
2005	7.1 (4.1,10.2)	6.3 (3.9, 8.7)	6.7 (4.3, 9.1)	6.9 (2.6, 11.1)	6.7 (4.8, 8.6), [707]	6.8 (4.7, 8.8), [603]
2006	7.7 (5.8, 9.7)	5.4 (4.0, 6.8)	6.0 (4.6, 7.4)	5.9 (2.8, 8.9)	6.3 (5.2, 7.4), [1875]	5.9 (4.7, 7.2), [1396]
2007	6.4 (4.7, 8.2)	7.3 (5.7, 8.8)	4.9 (3.6, 6.1)	4.7 (0.8, 8.5)	6.9 (5.8, 8.1), [2006]	4.8 (3.7, 6.0), [1369]
AACA ^b (%)	0.30	0.33	0.19	0.14	0.32	0.18

^a Calculated using the international classification standards; ^b Average absolute change per annum 1995-2007 (%)

Table 2 Obesity prevalence rates^a in England from 1995 to 2007 and average absolute change per annum in girls, by age groups. The Health Survey for England.

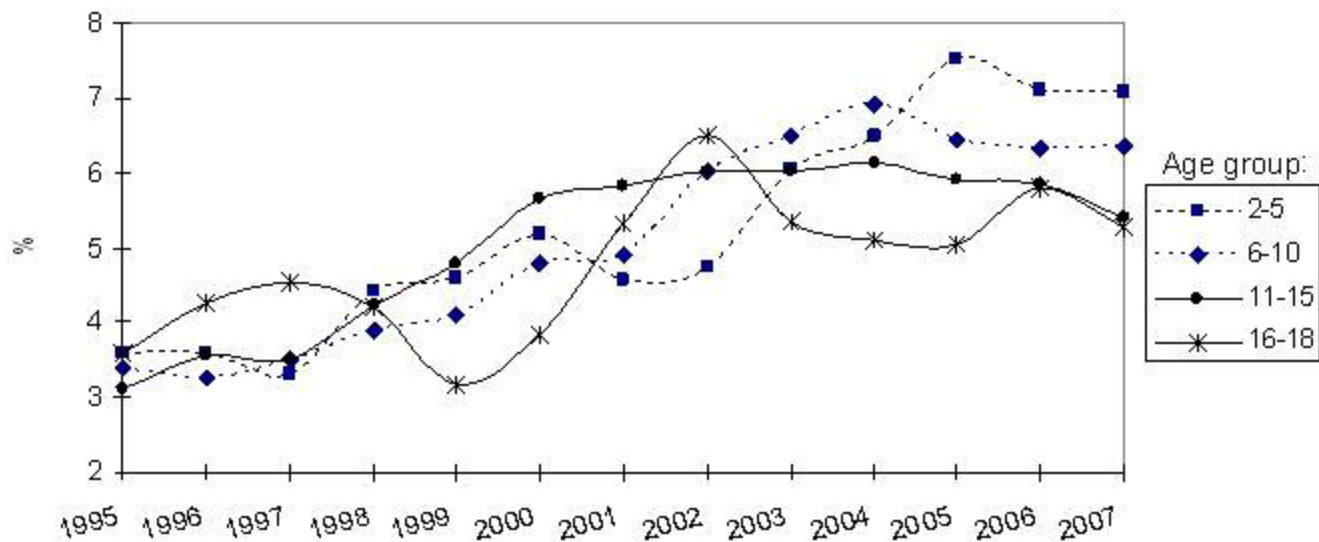
	2-5 yrs	6-10 yrs	11-15 yrs	16-18 yrs	All 2-10	All 11-18
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI), [N]	% (95% CI), [N]
1995	4.4 (2.6, 6.3)	5.8 (3.9, 7.7)	4.6 (2.8, 6.4)	4.8 (2.4, 7.2)	5.2(3.9, 6.5), [1114]	4.7 (3.2, 6.1), [872]
1996	5.7 (3.6, 7.8)	5.9 (4.1, 7.7)	5.6 (3.6, 7.5)	3.7 (1.7, 5.6)	5.8 (4.4, 7.2), [1178]	4.9 (3.5, 6.3), [935]
1997	5.7 (4.2, 7.3)	5.8 (4.5, 7.1)	4.9 (3.5, 6.2)	5.7 (2.2, 9.2)	5.8 (4.8, 6.8), [2222]	5.0 (3.7, 6.2), [1241]
1998	5.5 (3.4, 7.7)	4.7 (3.0, 6.4)	5.8 (3.8, 7.8)	7.4 (4.5, 10.4)	5.1 (3.8, 6.4), [1082]	6.3 (4.7, 8.0), [899]
1999	6.4 (3.3, 9.6)	7.3 (4.2, 10.4)	6.2 (3.1, 9.2)	8.7 (4.5, 12.9)	6.9 (4.7, 9.1), [535]	7.1 (4.7, 9.6), [443]
2000	4.1 (1.5, 6.8)	8.3 (5.1, 11.5)	7.2 (4.3, 10.2)	6.0 (1.9, 10.1)	6.6 (4.4, 8.8), [537]	6.8 (4.4, 9.2), [443]
2001	4.3 (2.3, 6.3)	6.3 (4.2, 8.3)	6.8 (4.6, 9.0)	8.4 (5.1,11.8)	5.4 (4.0, 6.8), [980]	7.3 (5.5, 9.1), [837]
2002	6.7 (4.9, 8.5)	8.9 (7.2,10.6)	7.6 (6.0, 9.2)	7.6 (5.5, 9.7)	8.0 (6.8, 9.2), [1948]	7.6 (6.3, 8.9), [1838]
2003	5.1 (2.7, 7.5)	7.2 (4.9, 9.4)	6.9 (4.7, 9.1)	7.5 (4.5,10.5)	6.4 (4.7, 8.1), [869]	7.1 (5.3, 8.9), [866]
2004	4.9 (1.2, 8.6)	7.1 (3.5, 10.7)	10.1 (6.1,14.1)	9.4 (4.0,14.9)	6.3 (3.6, 9.0), [338]	9.8 (6.6, 13.1), [360]
2005	8.2 (5.0,11.5)	9.8 (6.9,12.8)	7.7 (5.1, 10.2)	7.0 (2.4,11.6)	9.1(7.0, 11.3), [731]	7.5 (5.3, 9.7), [586]
2006	5.9 (4.1, 7.6)	6.3 (4.8, 7.8)	6.0 (4.5, 7.4)	8.9 (5.3,12.4)	6.1 (5.0, 7.2), [1845]	6.7 (5.3, 8.0), [1372]
2007	7.0 (5.1, 8.8)	7.6 (6.0, 9.3)	6.2 (3.9, 6.4)	5.2 (1.1, 9.2)	7.4 (6.2, 8.5), [2021]	6.1 (4.7, 7.4), [1290]
AACA ^b (%)	0.21	0.15	0.13	0.03	0.18	0.12

^aCalculated using the international classification standards; ^bAverage absolute change per annum 1995-2007

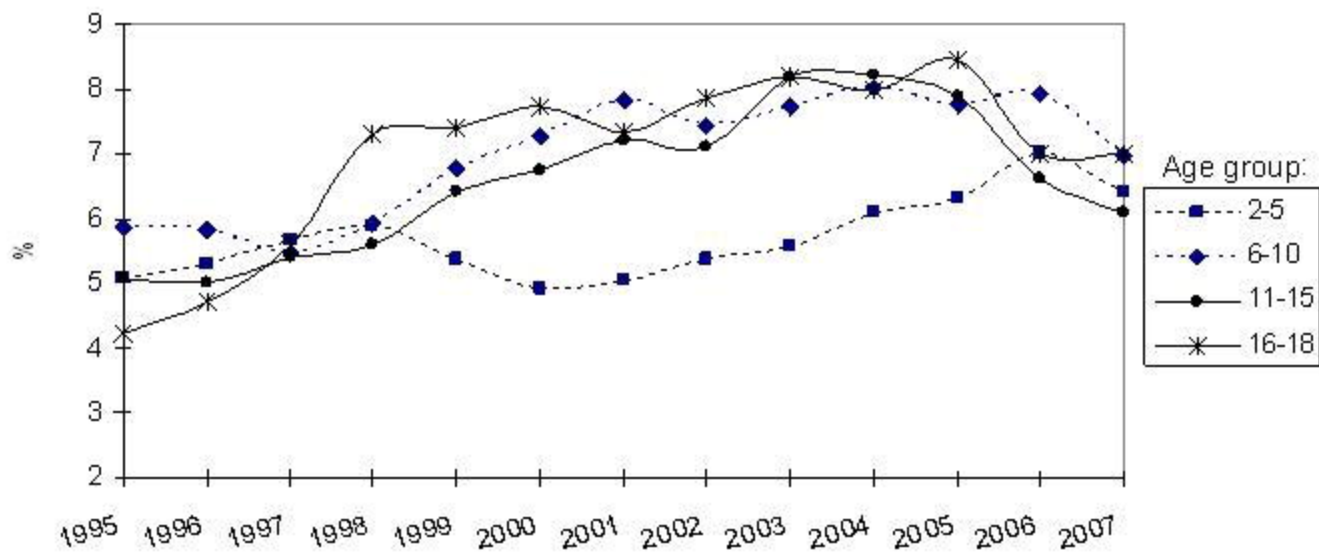
Table 3 Projected rates of obesity to 2015 (based on linear and non-linear trends) by age groups and sex

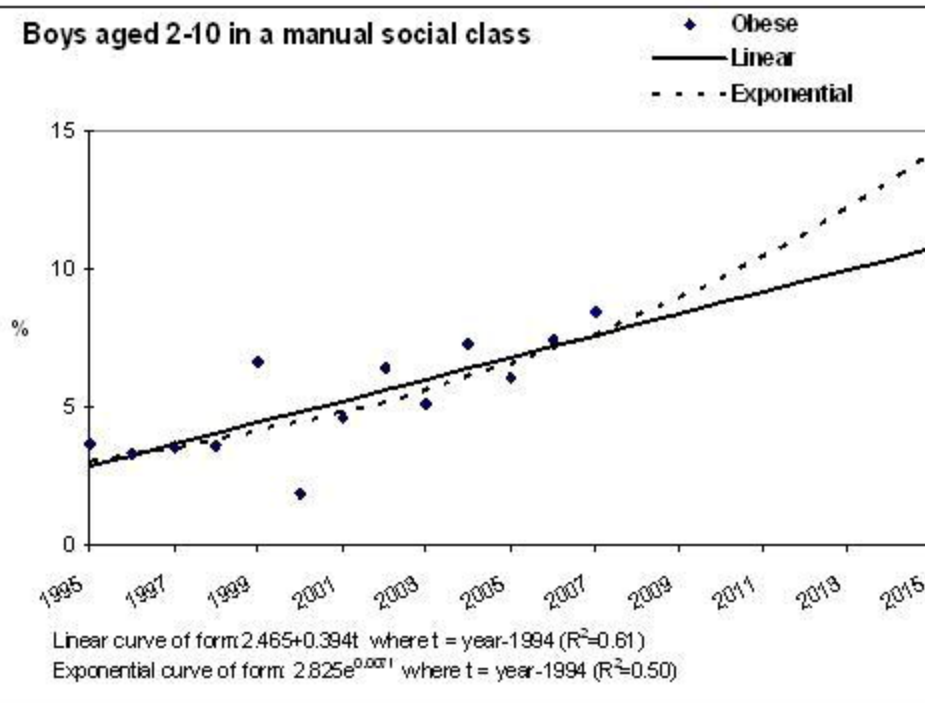
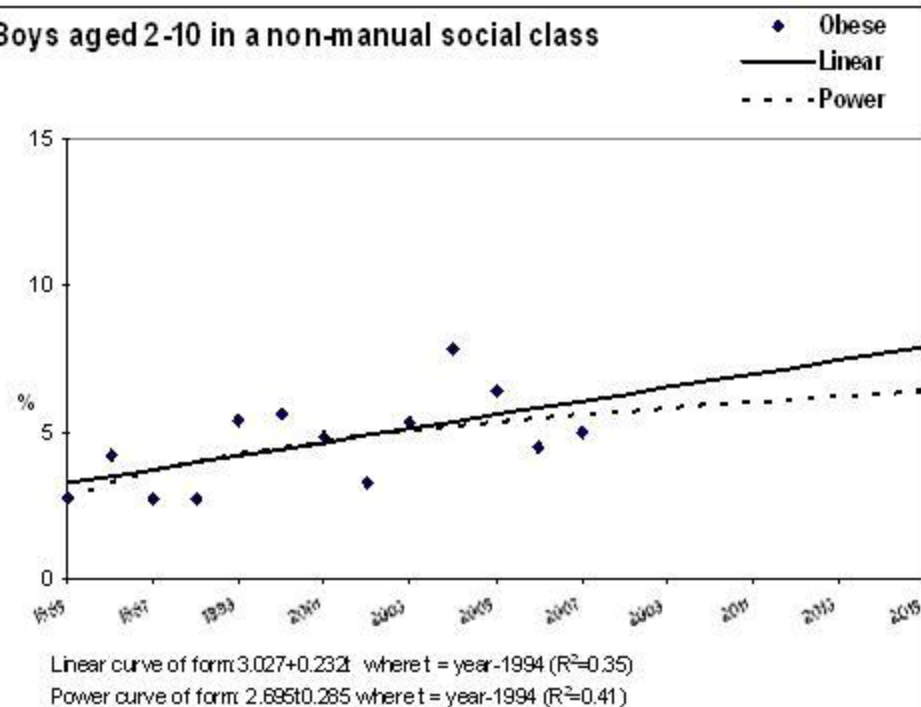
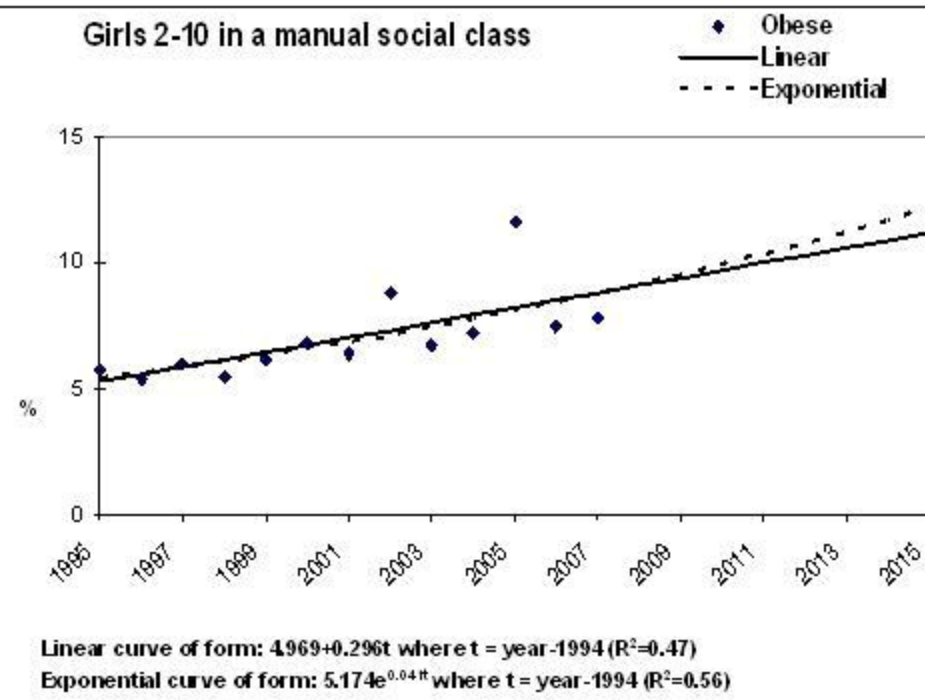
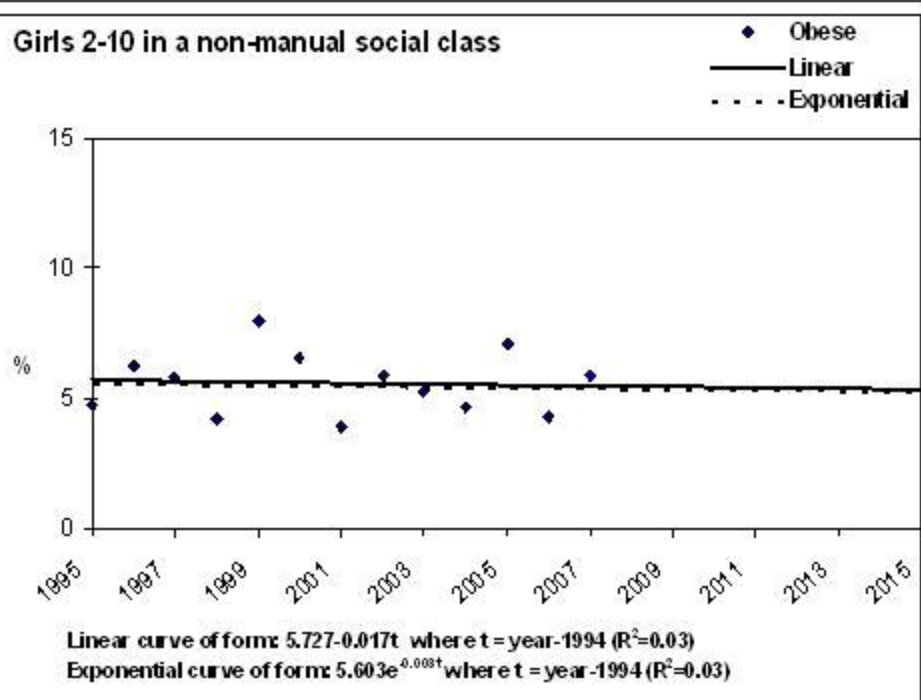
	2-5 yrs	6-10 yrs	11-15 yrs	16-18 yrs	All 2-10	All 11-18
	%	%	%	%	%	%
	(95% prediction intervals)	(95% prediction intervals)	(95% prediction intervals)	(95% prediction intervals)	(95% prediction intervals)	(95% prediction intervals)
Boys						
2015 Linear	10.2 (5.4, 14.9)	10.0 (7.2, 12.8)	8.5 (4.8, 12.2)	7.1 (1.8, 12.4)	10.1 (7.5, 12.6)	8.0 (4.5, 11.5)
R^2					0.761	0.406
2015 Power	7.7 (3.3, 18.0)	7.7 (4.8, 12.4)	7.5 (4.1, 13.7)	5.6 (2.2, 14.6)	7.8 (4.9, 12.4)	6.9 (4.0, 11.7)
R^2					0.699	0.540
2015 Exponential	13.9 (5.0, 38.6)	13.2 (7.7, 22.8)	10.9 (4.5, 26.2)	7.2 (2.1, 24.4)	13.5 (7.9, 23.0)	9.5 (4.4, 20.2)
R^2					0.760	0.423
Girls						
2015 Linear	7.6 (4.0, 11.1)	9.8 (5.8, 13.8)	9.5 (5.5, 13.4)	9.9 (4.7, 15.1)	8.9 (5.8, 12.1)	9.7 (6.0, 13.3)
R^2					0.349	0.367
2015 Power	6.4 (3.9, 10.5)	8.4 (5.4, 12.9)	8.3 (5.6, 12.2)	9.0 (5.1, 16.0)	7.6 (5.3, 10.9)	8.6 (6.1, 12.1)
R^2					0.368	0.589
2015 Exponential	7.6 (4.1, 14.2)	10.4 (5.9, 18.1)	10.1 (5.9, 17.6)	11.0 (4.8, 24.7)	9.3 (5.9, 14.6)	10.6 (6.2, 17.9)
R^2					0.372	0.418

Boys

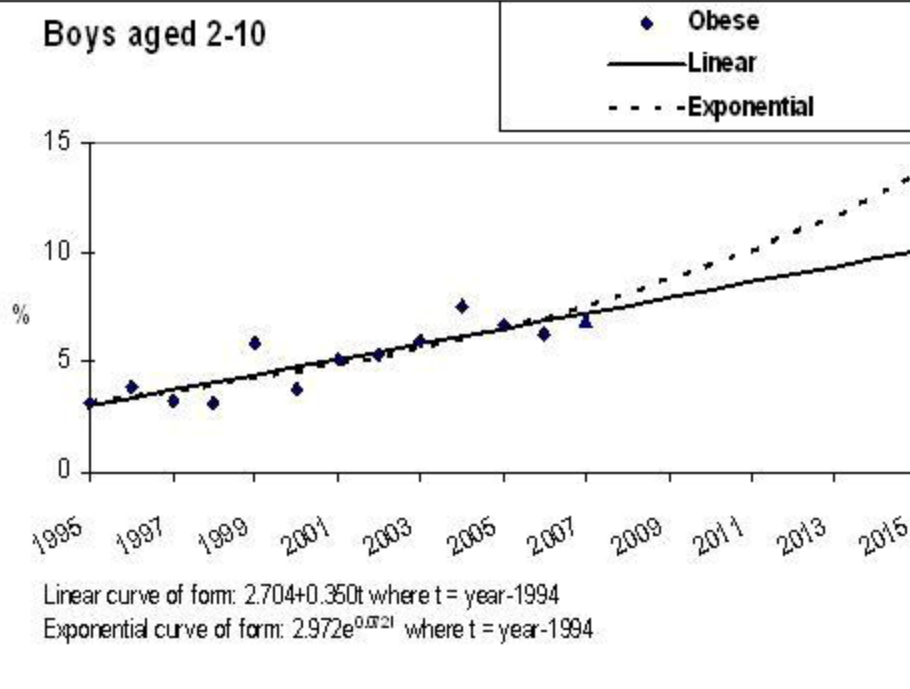


Girls

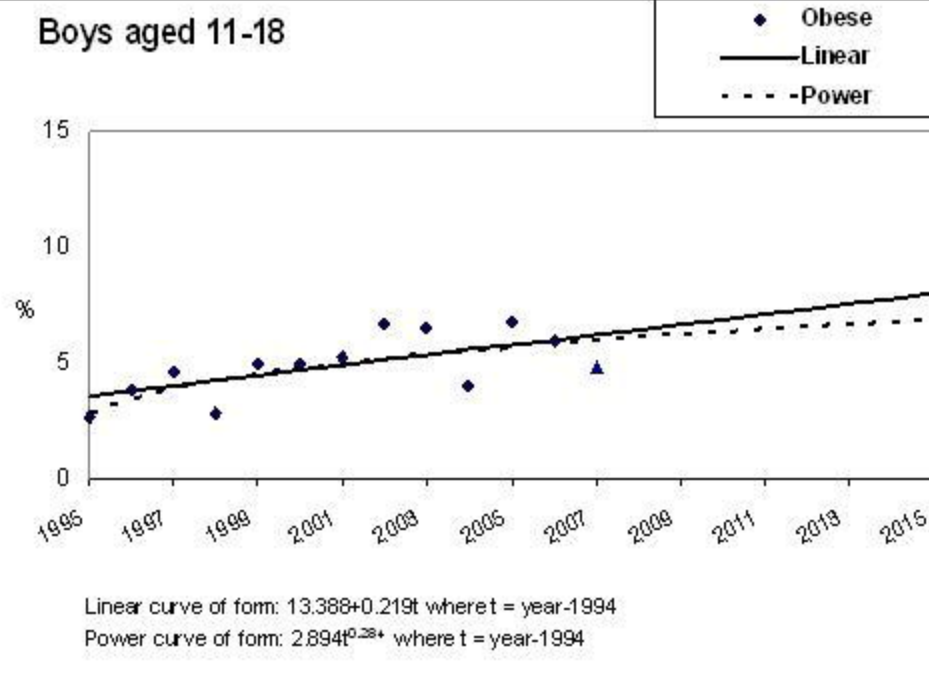


Boys aged 2-10 in a manual social class**Boys aged 2-10 in a non-manual social class****Girls 2-10 in a manual social class****Girls 2-10 in a non-manual social class**

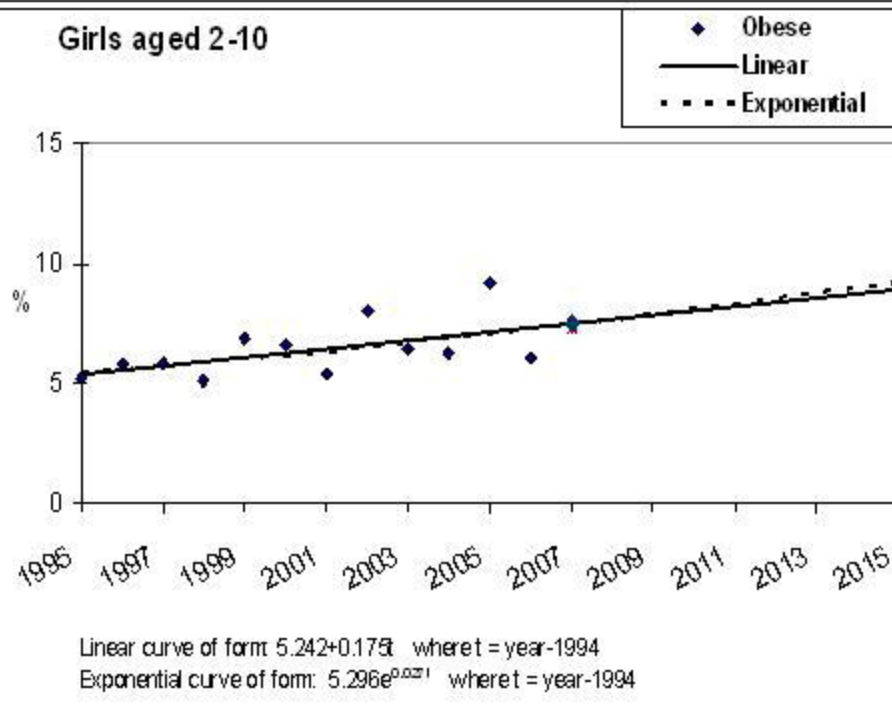
Boys aged 2-10



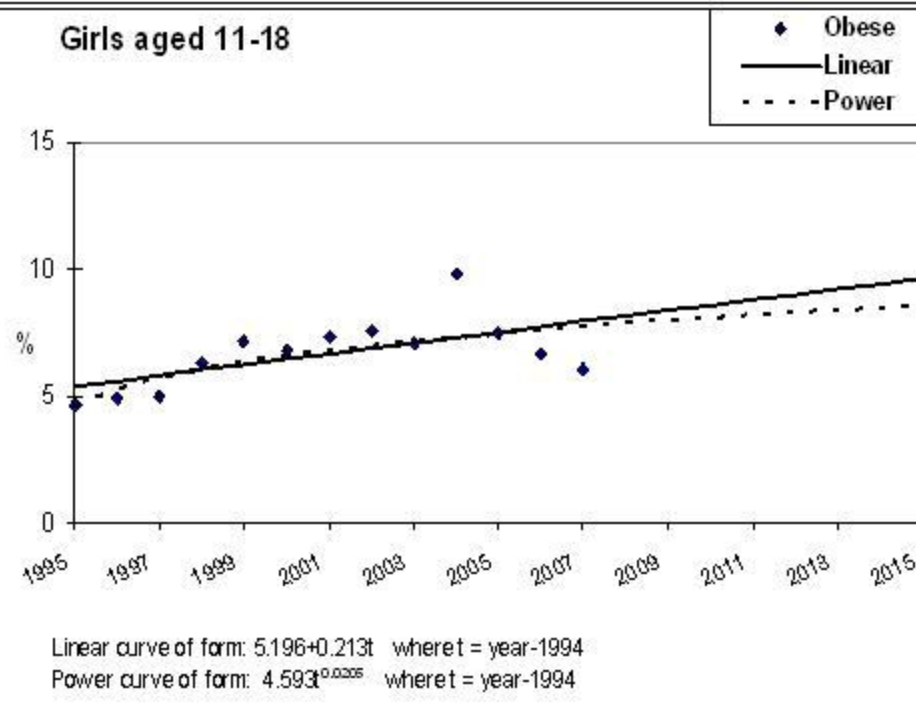
Boys aged 11-18



Girls aged 2-10

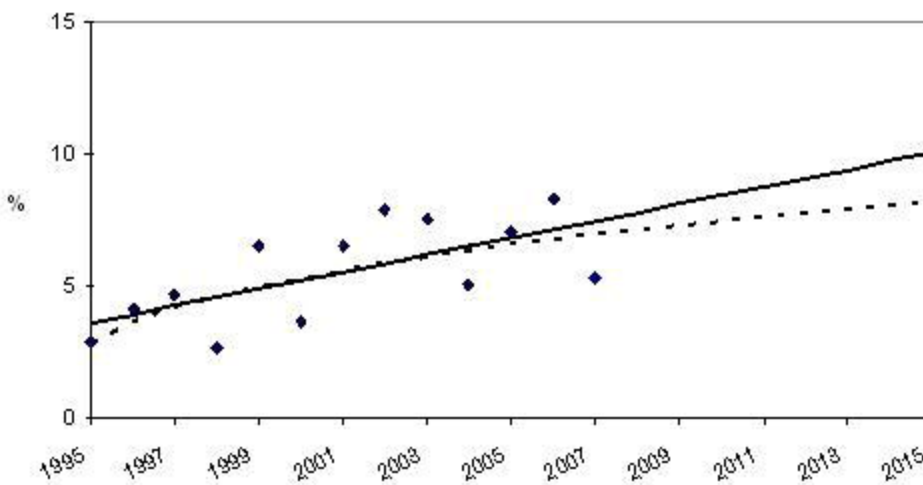


Girls aged 11-18



Boys aged 11-18 in a manual social class

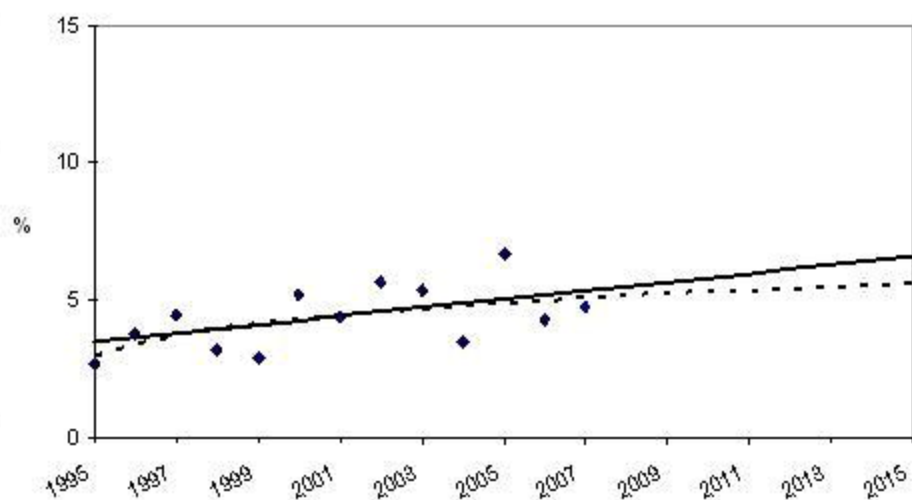
◆ Obese
 — Linear
 - - - Power



Linear curve of form: $3.315 + 0.321t$ where $t = \text{year} - 1994$ ($R^2 = 0.44$)
 Power curve of form: $2.878t^{0.345}$ where $t = \text{year} - 1994$ ($R^2 = 0.50$)

Boys aged 11-18 in a non-manual social class

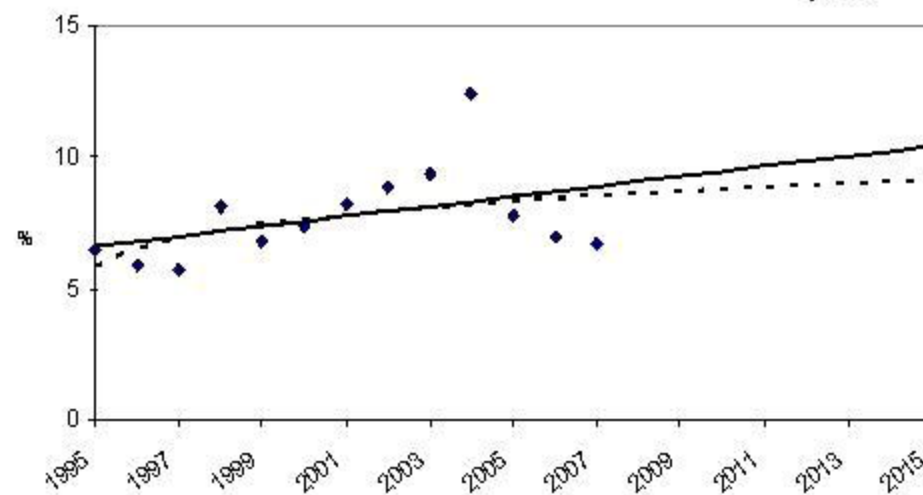
◆ Obese
 — Linear
 - - - Power



Linear curve of form: $3.338 + 0.155t$ where $t = \text{year} - 1994$ ($R^2 = 0.26$)
 Power curve of form: $2.972t^{0.210}$ where $t = \text{year} - 1994$ ($R^2 = 0.34$)

Girls aged 11-18 in a manual social class

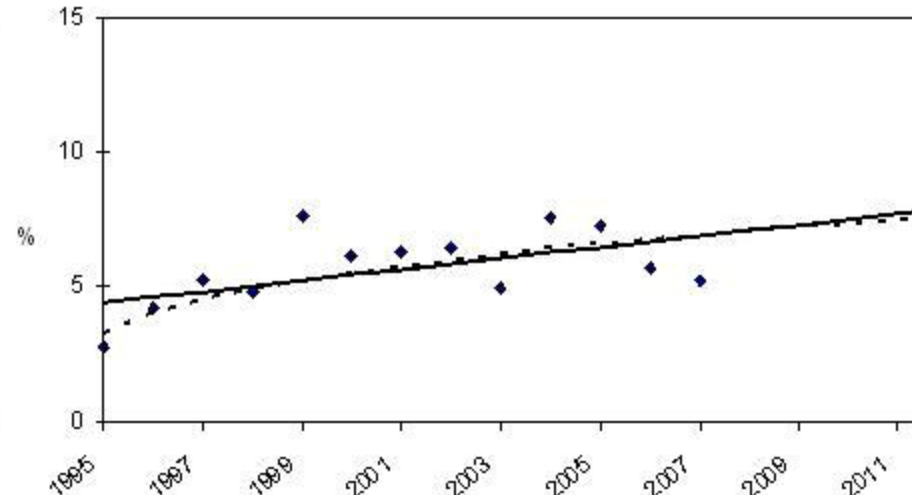
◆ Obese
 — Linear
 - - - Power



Linear curve of form: $6.419 + 0.191t$ where $t = \text{year} - 1994$ ($R^2 = 0.18$)
 Power curve of form: $5.921t^{0.143}$ where $t = \text{year} - 1994$ ($R^2 = 0.20$)

Girls 11-18 in a non-manual social class

◆ Obese
 — Linear
 - - - Power



Linear curve of form: $4.212 + 0.206t$ where $t = \text{year} - 1994$ ($R^2 = 0.31$)
 Power curve of form: $4.026e^{0.04t}$ where $t = \text{year} - 1994$ ($R^2 = 0.60$)