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1. Summary of key findings

	Reception		Year 6	
	Boys	Girls	Boys	Girls
<p>Changes in prevalence of obesity</p> <p>Page 6</p>	<p>Significant decrease since 2010/11 and evidence of a downward trend over the period covered by the NCMP.</p>	<p>Significant increase since 2010/11, but over the period covered by the NCMP there is no statistically significant trend.</p>	<p>No change since 2010/11, but a significant upwards trend between 2007/08 and 2011/12.</p>	<p>Significant increase since 2010/11 and significant upwards trend between 2007/08 and 2011/12.</p>
<p>Changes in health inequalities</p> <p>Page 8</p>	<p>Socioeconomic inequalities appear to be widening. Obesity prevalence is decreasing in the least deprived areas but remaining constant in the most deprived areas. The decreases are statistically significant for boys living in the least deprived 50% of areas, and girls in the least deprived 10%.</p>		<p>Socioeconomic inequalities appear to be widening. Obesity prevalence is increasing in the most deprived areas, whilst remaining relatively stable in the least deprived areas. The increases are statistically significant for boys and girls living in the most deprived 50% of areas.</p>	
<p>Changes in obesity prevalence by ethnic group</p> <p>Page 15</p>	<p>Since 2010/11 no ethnic group has seen a significant change in obesity prevalence. White British boys have seen a significant decrease between 2007/08 and 2011/12.</p>	<p>Since 2010/11 obesity prevalence has increased for White British and Black African girls. There is no robust evidence for a significant change since 2007/08 in any ethnic group.</p>	<p>Since 2010/11 obesity prevalence has increased in boys classed as Other Black ethnicity. Since 2007/08 the trend among boys from White British and Black African ethnic groups shows a significant increase.</p>	<p>Since 2010/11 obesity prevalence increased in White British girls. Since 2007/08 the trend among girls from White British, Bangladeshi, Pakistani, and Other Asian ethnic groups shows a significant increase.</p>
<p>Changes in mean BMI for age</p> <p>Page 22</p>	<p>Significant decrease since 2010/11, but no significant trend over the period covered by the NCMP.</p>	<p>Significant increase since 2010/11, but no significant trend over the period covered by the NCMP.</p>	<p>Significant increase since 2010/11, the trend between 2007/08 and 2011/12 also shows a significant increase.</p>	
<p>Changes in BMI distribution</p> <p>Page 23</p>	<p>The decrease in mean BMI since 2010/11 is spread evenly across the population. Since 2006/07 BMI has increased in boys with a low BMI but fallen among the most obese.</p>	<p>The increase in mean BMI since 2010/11 is spread evenly across the population. Since 2006/07 BMI has increased in girls with a low BMI but remained similar among the most obese.</p>	<p>The increases in mean BMI since 2010/11 are spread evenly across the population. Between 2007/08 and 2011/12 there have been increases in BMI across the whole population, particularly among the 50% of children with the highest BMI.</p>	

2. Introduction

The National Child Measurement Programme (NCMP) is an annual programme that measures the height and weight of children aged 4–5 years (Reception) and 10–11 years (Year 6) in England. The 2011/12 NCMP was the sixth year of this system of national child measurement.^a

This report is the fourth in a series of annual reports from the National Obesity Observatory (NOO) which use NCMP data to examine the changes in children's body mass index that have taken place since 2006/07.^{1,2,3} The first of these reports looked at changes between 2006/07 and 2008/09, and was the first in-depth investigation into trends in the NCMP data. In order to support the most effective possible action to tackle obesity it is important to continue to monitor these trends.

This report uses the same approaches as the previous NOO reports. It examines changes in obesity prevalence in different socioeconomic and ethnic groups, as well as changes in mean BMI, and the distribution of BMI by age and sex. Where percentage change over time is presented throughout the report the values are expressed in absolute terms. A description of the methods used for analysis is included in Appendix 1.

3. The National Child Measurement Programme dataset

The 2011/12 NCMP dataset contains the largest number of child measurements collected to date by the programme, with a total of 1,056,780 measurements of children from state maintained schools. Overall participation in the NCMP was 93.3% in 2011/12, the highest ever achieved. Figure 1a shows the number of children measured by the NCMP by year of measurement, school year, and sex. Figure 1b shows the increases in participation in the NCMP for each year of measurement by school year.

In Reception, both the number of children measured and participation have risen for each year of measurement, and the level of participation in this age group has increased from 92.9% in 2009/10 to 94.2% in 2011/12. In Year 6, a year on year decrease in the number of boys and girls measured has been observed since 2009/10, but this is matched to a fall in the number of children reported by PCTs as being 'eligible for measurement'. The level of participation in this age group has increased from 89.9% in 2009/10 to 92.4% in 2011/12.

^a In 2005/06 the National Child Obesity Database collected child measurements of school children in England, but the data from this programme are not detailed enough, nor of high enough quality, to be used to monitor trends over time.

Figure 1a: Number of children measured by year of measurement, school year, and sex

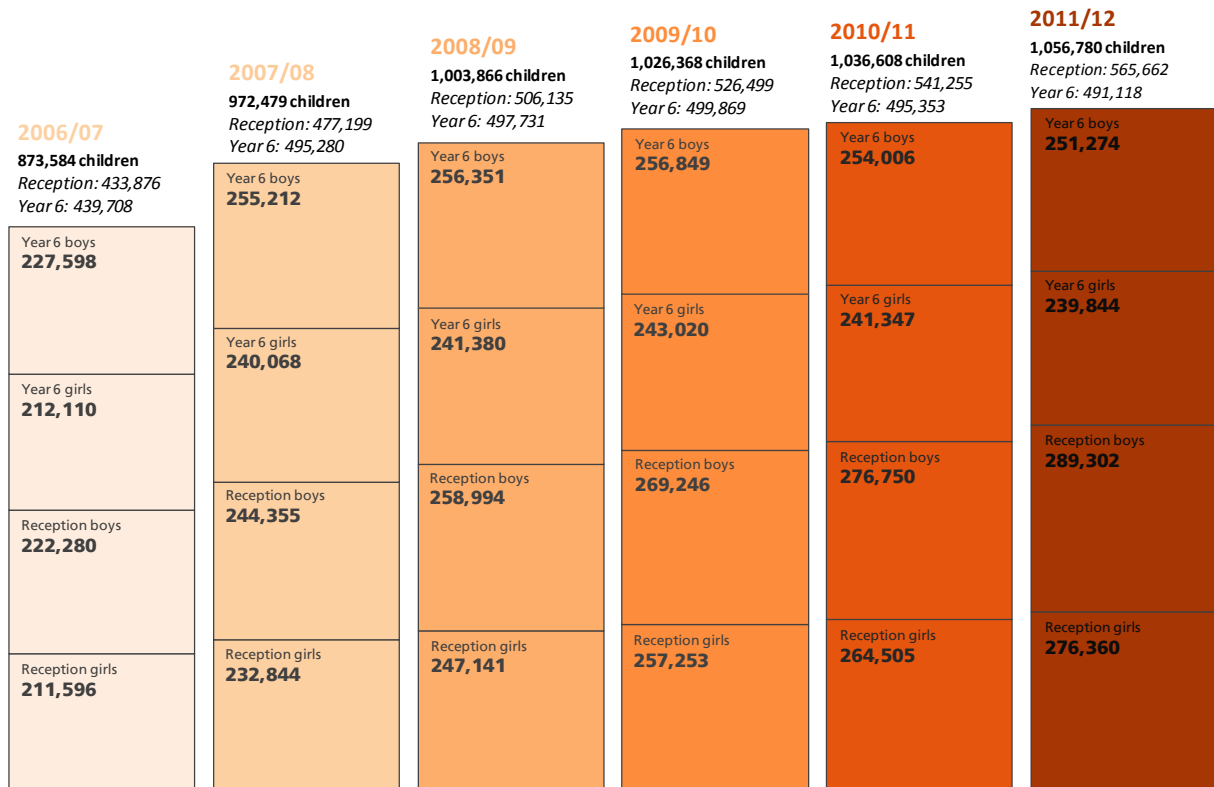
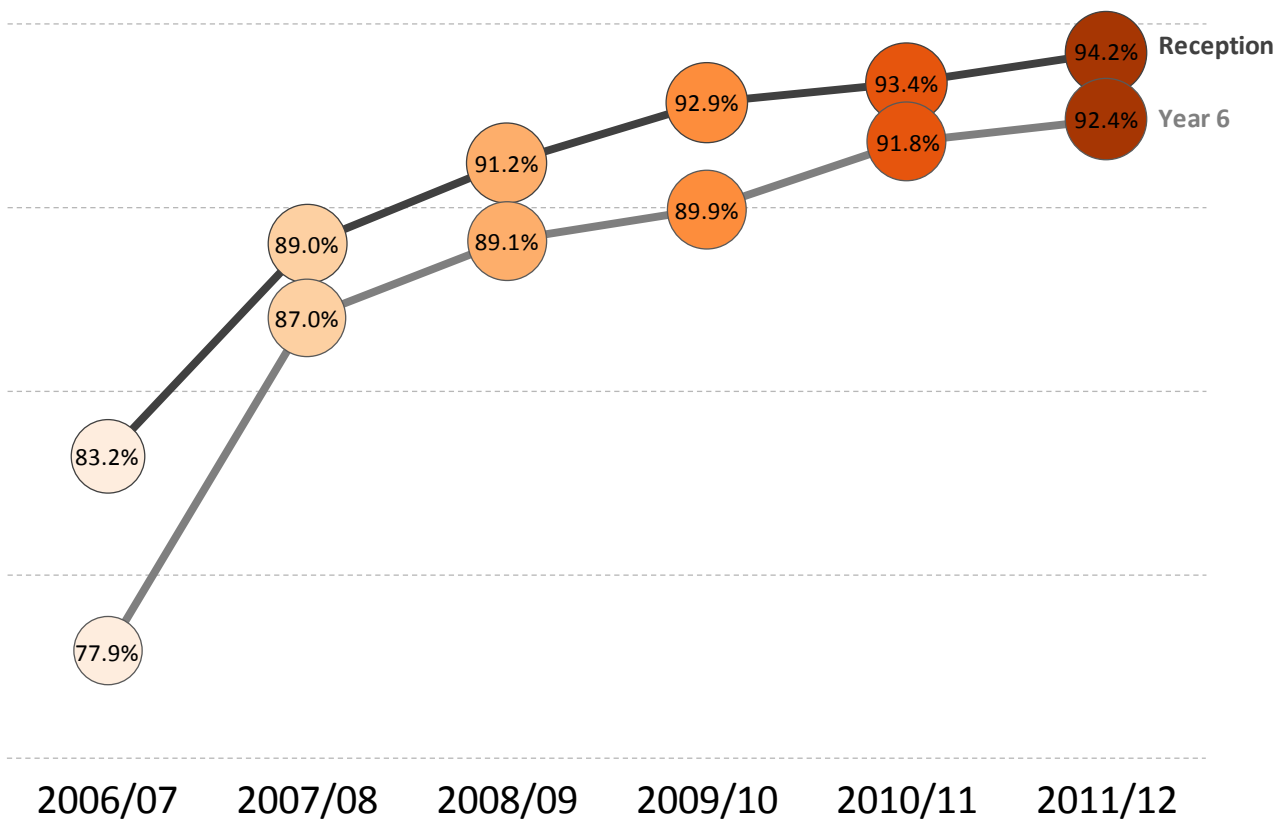
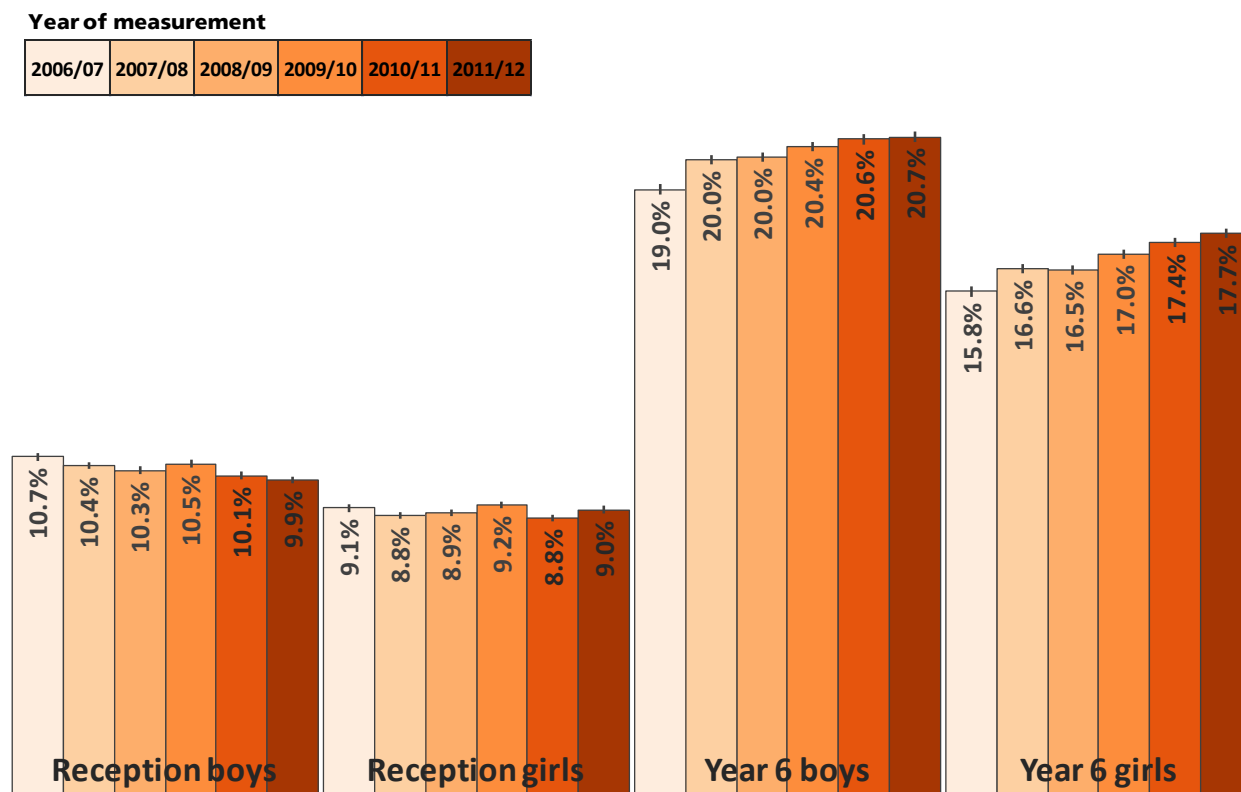


Figure 1b: Level of participation by year of measurement and school year



4. Changes in prevalence of obesity

Figure 2: Prevalence of obesity (with 95% confidence limits) by year of measurement, school year, and sex



Changes since 2010/11

The Health and Social Care Information Centre’s (HSCIC) annual report on the 2011/12 NCMP showed the prevalence of obesity was similar for all children in Reception between 2010/11 and 2011/12, but increased slightly for all children in Year 6.⁴

This report provides further detail on these changes, examining the trend over time by sex as well as by age group (Figure 2). This shows a slightly different pattern when split by sex; **between 2010/11 and 2011/12 obesity prevalence showed a statistically significant increase among girls in both Reception and Year 6, but showed no significant change among boys in Year 6 and decreased (but not statistically significant) for boys in Reception.**

Prevalence of obesity for all children in Reception rose slightly by 0.05%, but this change was not statistically significant (95% confidence limits of -0.06% to 0.28%). When split by sex, obesity prevalence for boys fell by 0.15% (-0.31% to -0.002%), compared to an increase of 0.27% for girls (0.12% to 0.42%), these changes were statistically significant.

The prevalence of obesity for all children in Year 6 rose significantly by 0.16% (0.01% to 0.32%) between 2010/11 and 2011/12. Among boys of this age the obesity prevalence rose by 0.06%, but this change was not significant (95% confidence limits of -0.16% to 0.29%), however there was a significant increase among girls of 0.27% (0.06% to 0.49%).

Trend over all years of NCMP measurements

Assessed over all six years of NCMP measurements two different trends in obesity prevalence appear to be emerging, which are broadly in line with the changes observed between 2010/11 and 2011/12. In the Reception year obesity prevalence seems to be decreasing among boys, although for girls there is no

strong evidence of any change. In Year 6 the data show a pattern of increasing obesity prevalence over the period covered by the NCMP for both boys and girls.

In the Reception year, obesity prevalence has decreased at a rate of around 0.07% per year over the period covered by the NCMP, but this finding is not statistically significant ($p=0.128$, 95% confidence limits of -0.16% to 0.03%).

Boys in Reception show a more consistent pattern of decrease in obesity prevalence than girls; the reported obesity prevalence has fallen in each year of measurement, with the exception of 2009/10. **Across the six years of NCMP measurements there has been a statistically significant decrease of around 0.13% per year in the prevalence of obesity among boys of this age ($p=0.018$, -0.22% to -0.04%).**

Changes in obesity prevalence among girls in Reception over the period covered by the NCMP do not show a significant trend (-0.01% (-0.12% to 0.11%) $p=0.886$).

In Year 6 the pattern is much more clear-cut. **Overall obesity prevalence for children of this age shows a statistically significant increase of 0.32% per year** over the period covered by the NCMP ($p=0.002$, 0.19% to 0.45%), and the rate of increase has been similar, and statistically significant, both for boys at 0.30% ($p=0.008$, 0.13% to 0.47%) and girls at 0.35% ($p<0.001$, 0.24% to 0.45%).

As described in previous reports, between 2006/07 and 2007/08 there was a significant increase in the reported obesity prevalence for children in Year 6, but the apparent rise may have resulted from the substantial change in both participation and data quality in the NCMP between those years.⁵

If the 2006/07 data are excluded from analysis the trend in obesity prevalence for all Year 6 children still shows a statistically significant annual increase of 0.25% per year ($p=0.005$, 0.14% to 0.36%). Splitting the data by sex shows a statistically significant increase of 0.20% per year for boys ($p=0.005$, 0.12% to 0.28%) and a statistically significant increase of 0.31% per year for girls ($p=0.007$, 0.16% to 0.46%).

5. Changes in health inequalities

Child obesity prevalence shows a close association with socioeconomic deprivation. **Obesity prevalence among children living in the 10% most deprived areas around the country is nearly twice that for children living in the least deprived 10% of areas**, and increases in a near linear fashion between these extremes.

In order to assess how obesity prevalence has changed across socioeconomic groups, the child population has been divided into ten deciles based on the Index of Multiple Deprivation (IMD) 2010 for each child's place of residence. In this analysis, decile 1 contains the least deprived 10% of the child population, and decile 10 contains the most deprived 10%.

Only children with valid geographical coding have been included in this analysis. The proportion of records with such coding has increased over the six years of the NCMP. In 2006/07 around 57% of child records included valid coding for place of residence, increasing to 95% in 2007/08, and over 99% in 2008/09 and later years.

Figures 3a–d show the association between obesity prevalence and deprivation by year of NCMP measurement.

Changes since 2010/11

In Reception, the decrease in obesity prevalence for boys observed at national level between 2010/11 and 2011/12 appears to have affected all deciles of deprivation relatively equally. However there was a statistically significant decrease in obesity prevalence in only one decile for boys (decile 7). The increase seen among girls at a national level is also spread relatively evenly across the child population of Reception age, regardless of socioeconomic status, with a statistically significant increase in the most deprived decile (decile 10).

In Year 6, no individual deprivation deciles showed a statistically significant change in obesity prevalence between 2010/11 and 2011/12 for boys and only in one decile (decile 8) for girls. But when the changes are assessed across all deciles, **there does appear to be a pattern of larger increases in obesity prevalence among the more deprived sections of the child population.**

Figure 3a: Prevalence of obesity (with 95% confidence limits) by IMD 2010 decile and year of measurement: Reception, boys

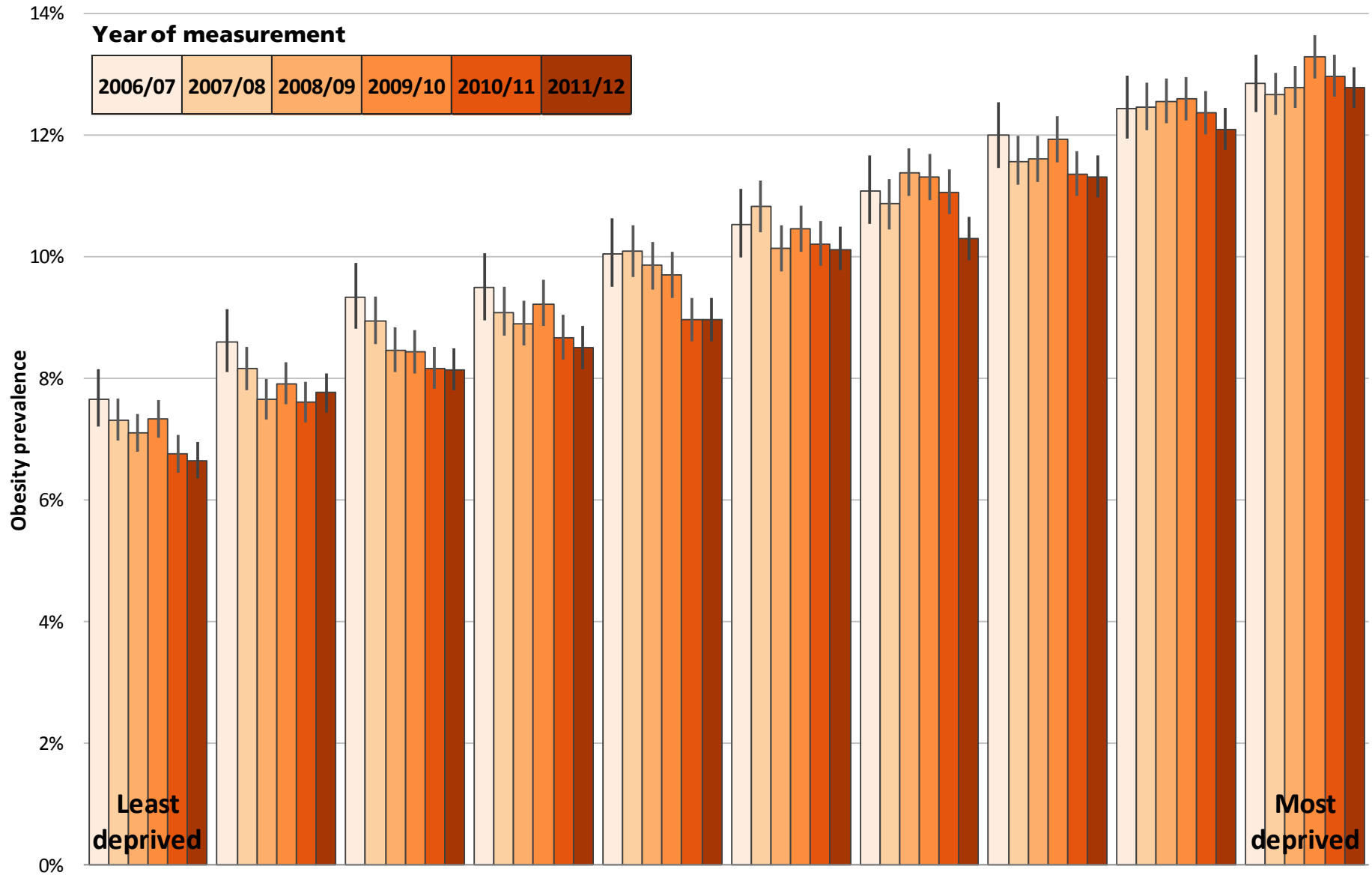


Figure 3b: Prevalence of obesity (with 95% confidence limits) by IMD 2010 decile and year of measurement: Reception, girls

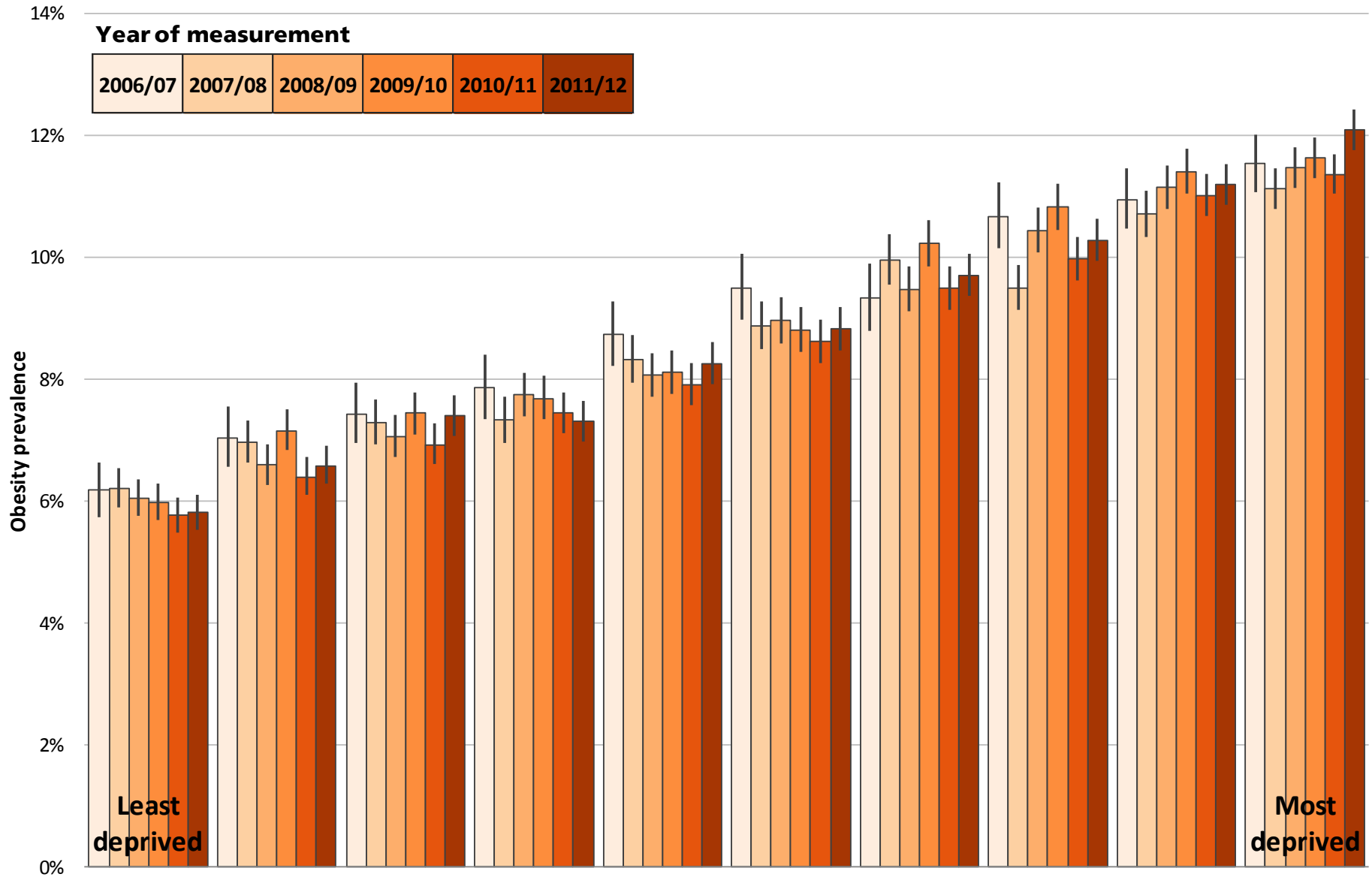


Figure 3c: Prevalence of obesity (with 95% confidence limits) by IMD 2010 decile and year of measurement: Year 6, boys

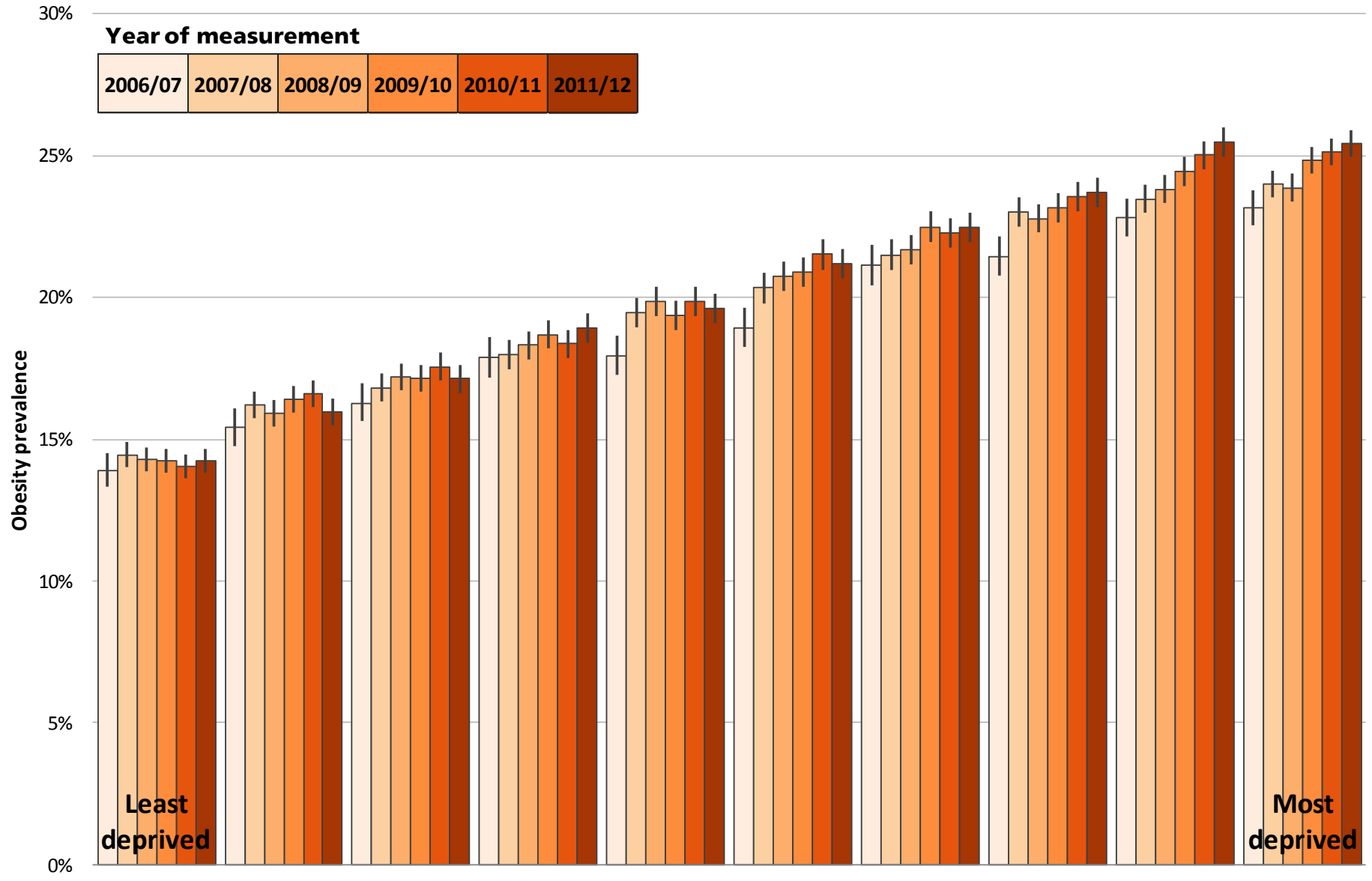
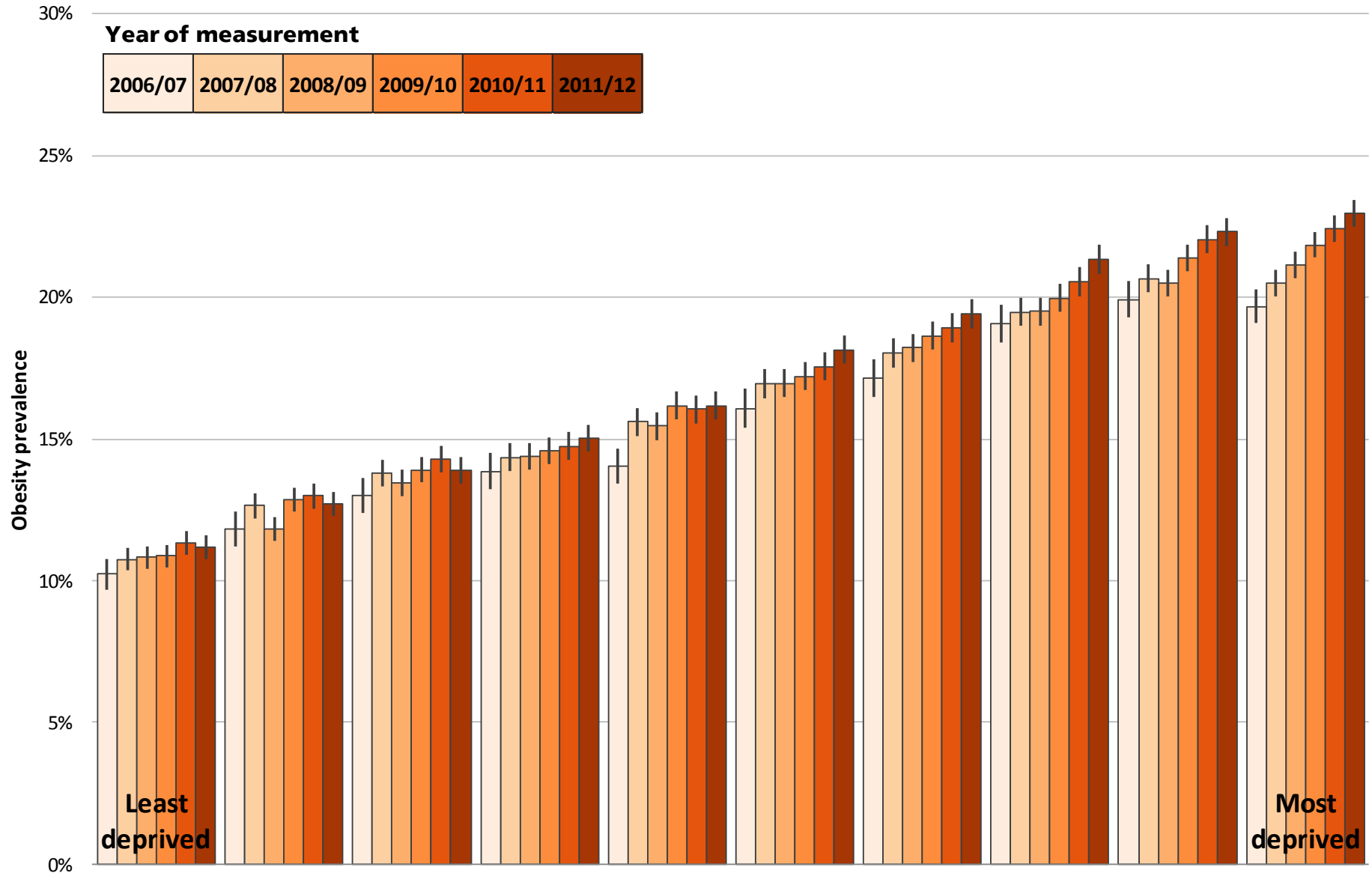


Figure 3d: Prevalence of obesity (with 95% confidence limits) by IMD 2010 decile and year of measurement: Year 6, girls



Trend over all years of NCMP measurement

As in the 2010/11 NCMP trends report, the trend in obesity prevalence across all years of NCMP measurements for each decile of deprivation has been assessed using linear regression and is presented in Figures 3e–f.

This analysis uses data from 2006/07 to 2011/12 for the Reception year but only data from 2007/08 onwards for Year 6, due to low participation and reporting of child postcode in the 2006/06 Year 6 data. The pattern of change is very similar regardless of whether the 2006/07 data are included or excluded; the magnitude of change in Year 6 is larger when the 2006/07 data are used, but this is likely to overestimate the real underlying change.

In both school years there is evidence that socioeconomic inequalities in obesity prevalence have been widening over the period of time covered by the NCMP. The nature of this change varies between the two age groups examined.

In Reception, the overall pattern suggests that obesity prevalence is decreasing by around 0.1% to 0.3% per year in the least deprived areas but remaining constant in the most deprived areas. Although this pattern is similar for both boys and girls, the evidence for widening health inequalities is stronger for boys: there have been statistically significant decreases in obesity prevalence among those boys living in the least deprived 50% of areas, but only among girls from the least deprived 10% of areas.

The evidence for widening socioeconomic inequalities in child obesity among older children is more robust. In addition the widening of health inequalities seems to be taking place at a more rapid pace. **In Year 6, obesity prevalence is increasing at a rate of around 0.5% per year in the most deprived areas, whilst remaining relatively stable in the least deprived areas.** These increases are statistically significant for both boys and girls living in the most deprived 50% of areas.

Figure 3e: Annual change in obesity prevalence 2006/07 to 2011/12 (with 95% confidence limits) by deprivation decile and sex; Reception

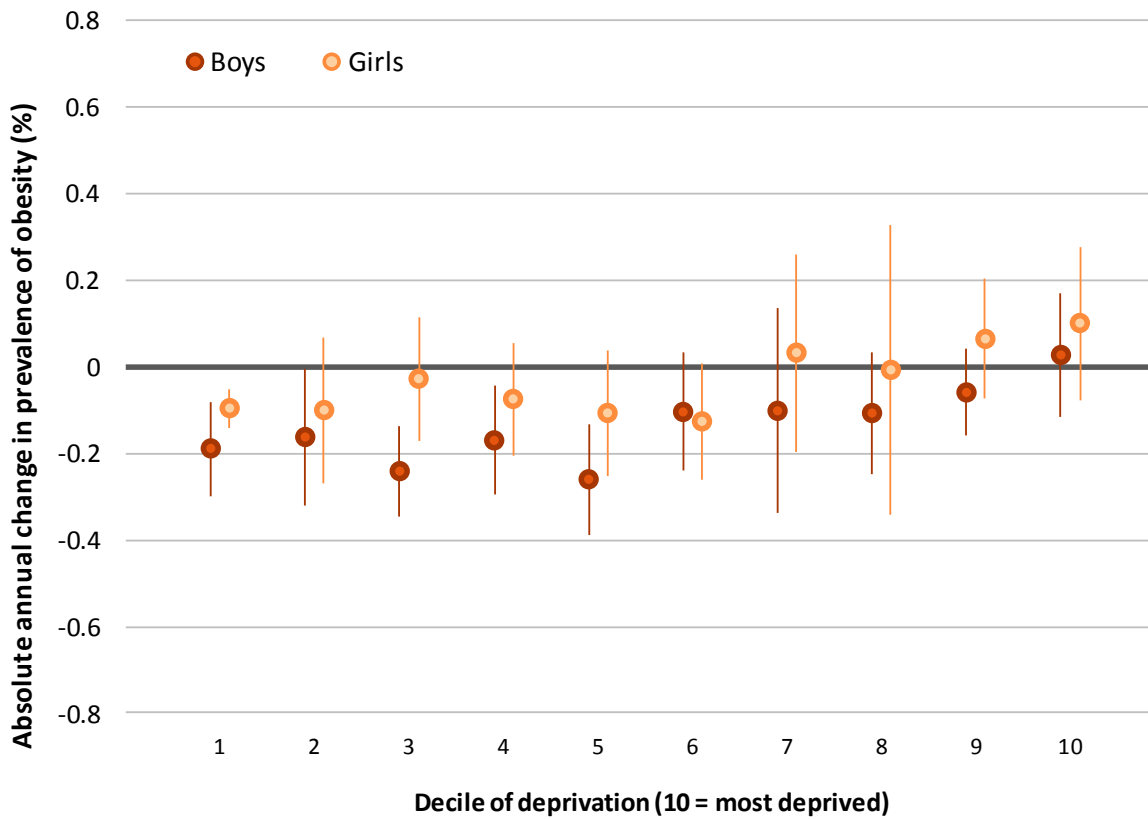
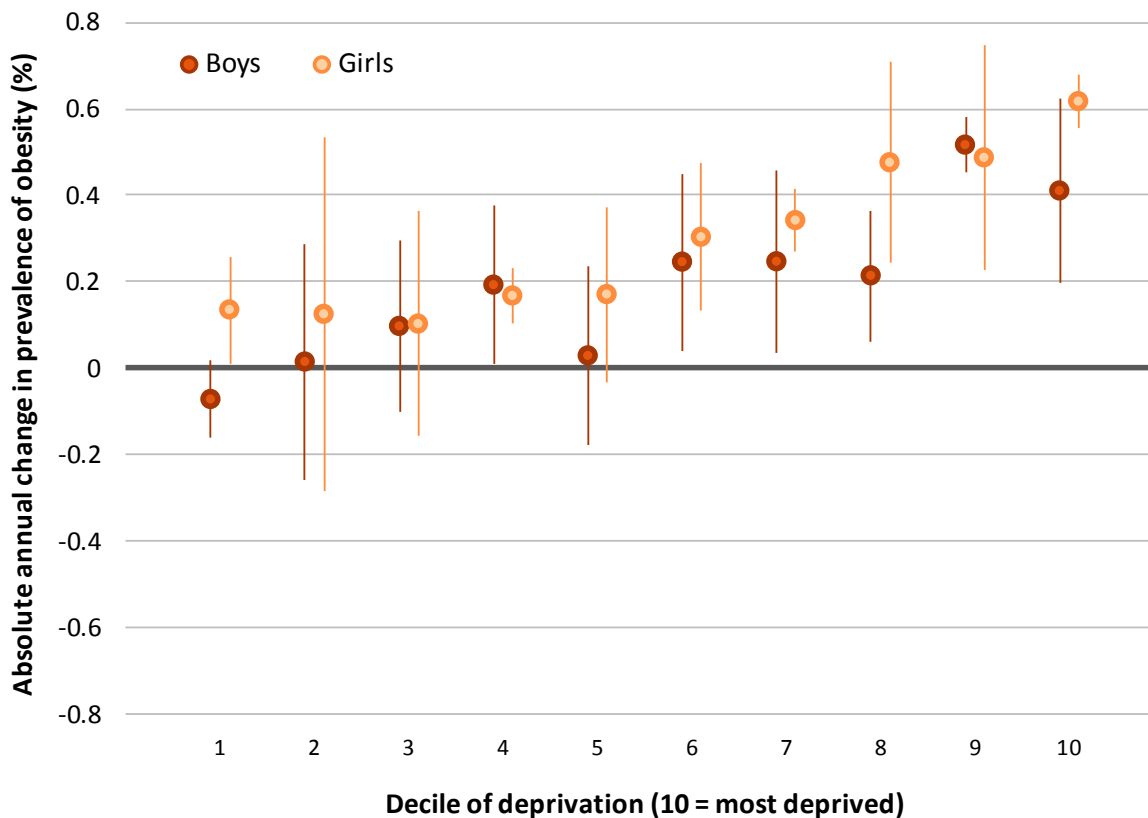


Figure 3f: Annual change in obesity prevalence 2007/08 to 2011/12 (with 95% confidence limits) by deprivation decile and sex; Year 6



6. Changes in obesity prevalence by ethnic group

Previous analyses using both NCMP and Health Survey for England^b (HSE) data have shown that child obesity prevalence varies substantially between ethnic groups.⁶ In general, such analyses shows that children classed as White British have lower obesity prevalence than most other ethnic groups.

Figures 4a–d show the prevalence of obesity by ethnic group across all years of NCMP measurement, split by school year and sex. In these figures ethnic groups are ordered by lowest to highest prevalence of obesity using the 2011/12 data.

It is important to note that the number of records with valid ethnicity coding has increased substantially over the five years of the NCMP. In 2006/07 only 32% of child records were provided with a valid ethnic code. This increased to 67% in 2007/08, 77% in 2008/09, 83% in both 2009/10 and 2010/11, and 85% in 2011/12. This increase means the trend over time must be assessed with caution, especially where the 2006/07 data are included.

Changes since 2010/11

There are few statistically significant differences in obesity prevalence between 2010/11 and 2011/12 when the data are analysed by ethnic group.

In Reception, the only statistically significant changes in obesity prevalence were among girls of White British and Black African ethnicity. **Obesity prevalence among White British girls increased by 0.26% (95% confidence limits of 0.07% to 0.45%) and among Black African girls by 1.45% (0.29% to 2.61%).**

In Year 6, obesity prevalence for girls classed as White British showed a statistically significant increase between 2010/11 and 2011/12 – rising by 0.33% (0.05% to 0.60%). Among boys in Year 6, only those in the 'Other Black' ethnic group showed a significant increase in prevalence, rising by 4.02% (1.39% to 6.66%).

Trend over all years of NCMP measurement

There are very few ethnic groups where a consistent trend can be detected using linear regression across all years of NCMP measurement. Due to the substantial increase in levels of ethnic coding in the NCMP data between 2006/07 and later years (which could affect the reported trend over time by ethnic group), the results below are based on analysis of data from 2007/08 to 2011/12 for both Reception and Year 6.

In the Reception year, linear regression of the trend within each ethnic group shows that obesity prevalence for boys classed as White British has decreased by 0.13% per year since 2007/08 (p=0.019, 95% confidence limits of -0.22% to -0.03%). Obesity prevalence appears to have increased among girls of Chinese ethnicity at a rate of 0.80% per year (p=0.008, 0.35% to 1.25%). However, the small number of children measured within the Chinese ethnic group and the resulting wide confidence limits around the estimates of obesity prevalence within each year, means the apparent trend should be treated with caution.

In Year 6 there is a statistically significant linear trend of increase in child obesity for girls classed as White British and within most Asian ethnic groups, and for boys classed as White British, and Black African.

Since 2007/08 obesity prevalence among White British girls in Year 6 has increased by 0.35% per year (p=0.003, 0.20% to 0.49%). In addition, there is a trend of increasing obesity prevalence for

^b The Health Survey for England (HSE) is an annual survey designed to measure health and health related behaviours in adults and children living in private households in England, the survey includes recording of measured height and weight. Since 1995 the survey has included children aged 2–15 years.

Bangladeshi girls at a rate of 1.13% per year ($p < 0.001$, 0.98% to 1.28%), **Pakistani girls at a rate of 0.66%** ($p = 0.025$, 0.14 to 1.18) **and for girls classed as 'Any Other Asian Background' at a rate of 0.68% per year** ($p = 0.005$, 0.32% to 0.93%).

Since 2007/08 obesity prevalence has increased among White British boys in Year 6 by 0.12% per year ($p = 0.045$, 0.005% to 0.23%) **and Black African boys by 0.57% per year** ($p = 0.035$, 0.07 to 1.07). The data also suggest that increases in obesity prevalence may be taking place among boys in Year 6 of Pakistani ($p = 0.061$) ethnicity, although this is not statistically significant at the 95% level.

Figure 4a: Prevalence of obesity (with 95% confidence limits) by ethnic group and year of measurement: Reception, boys

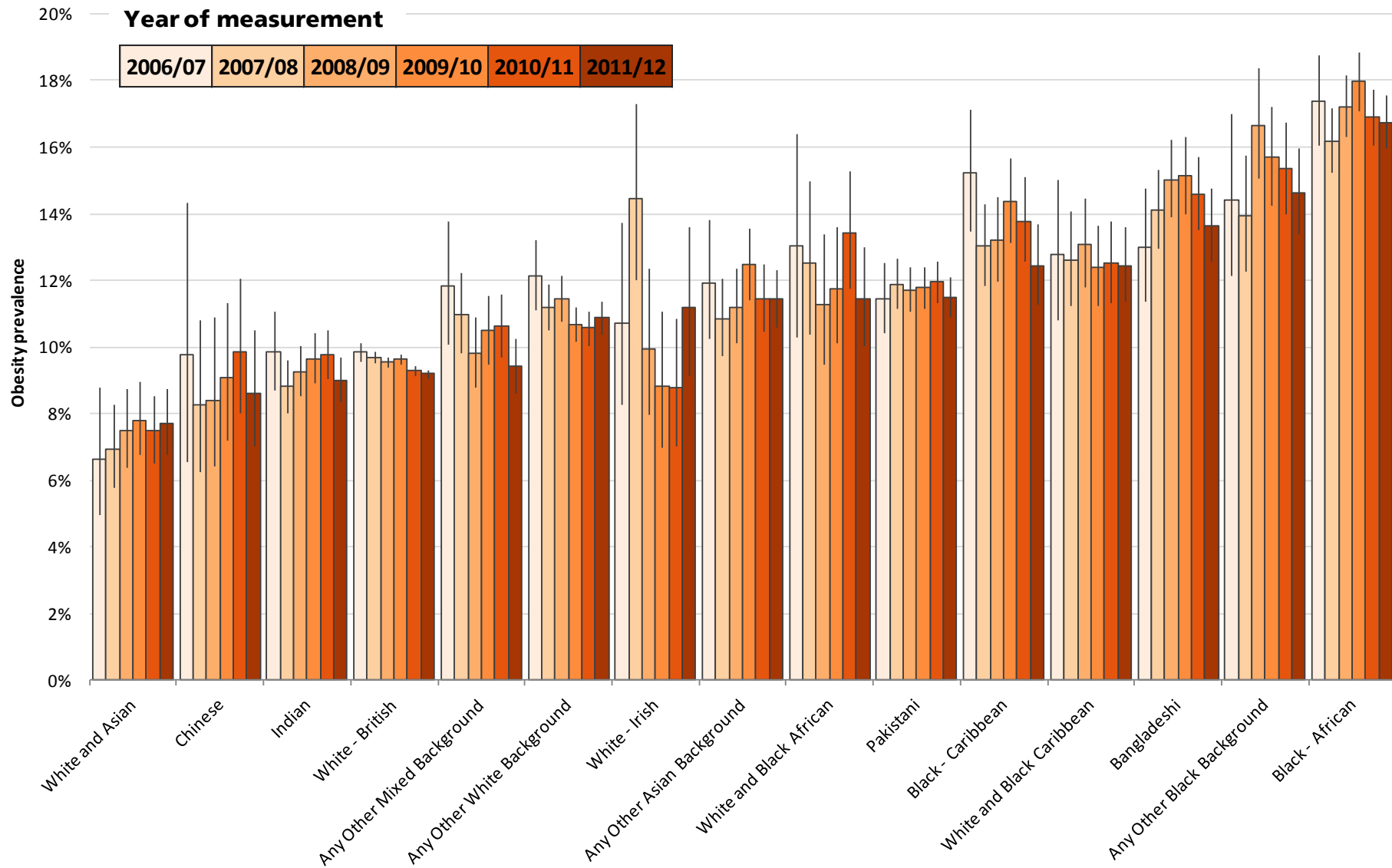


Figure 4b: Prevalence of obesity (with 95% confidence limits) by ethnic group and year of measurement: Reception, girls

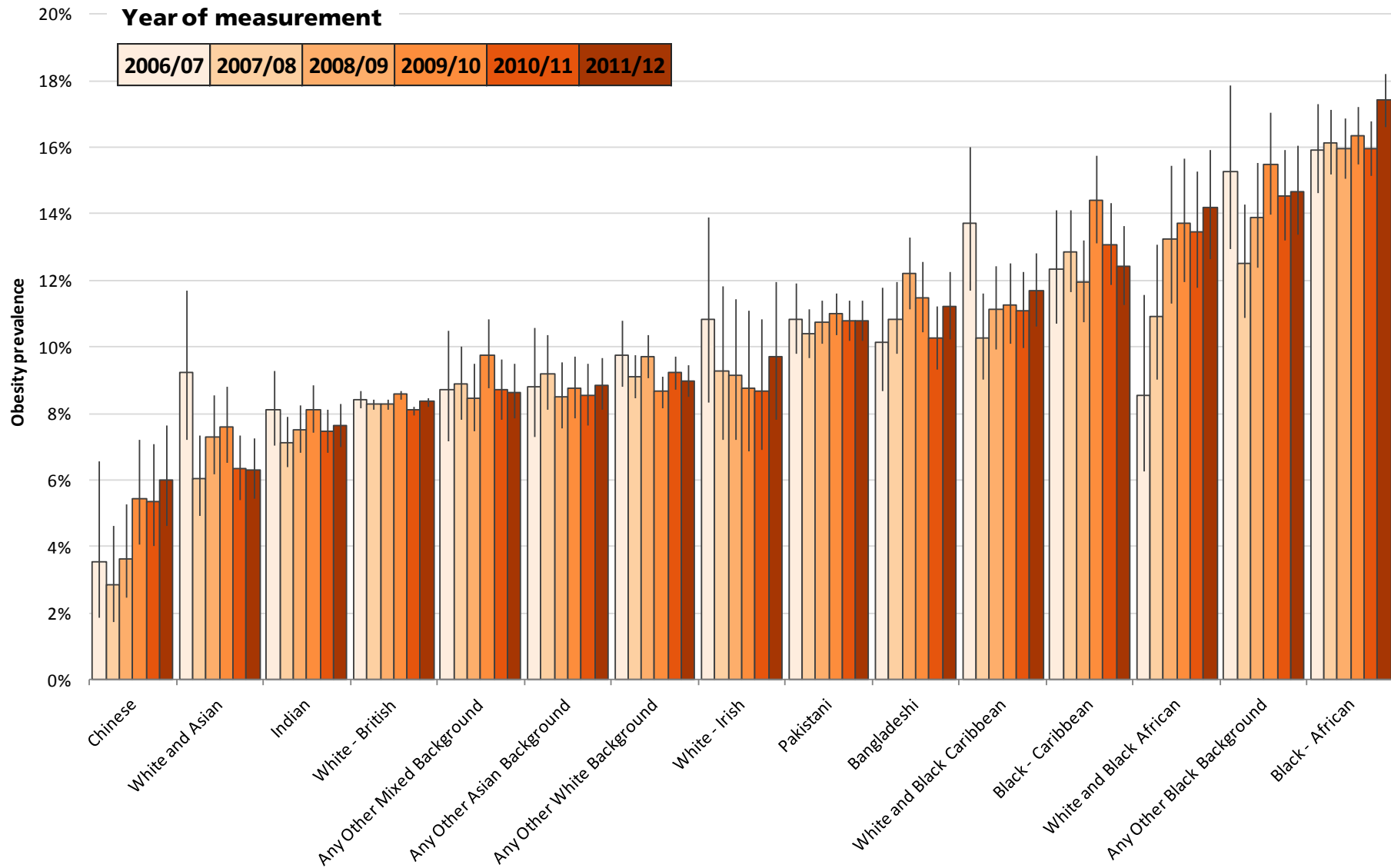


Figure 4c: Prevalence of obesity (with 95% confidence limits) by ethnic group and year of measurement: Year 6, boys

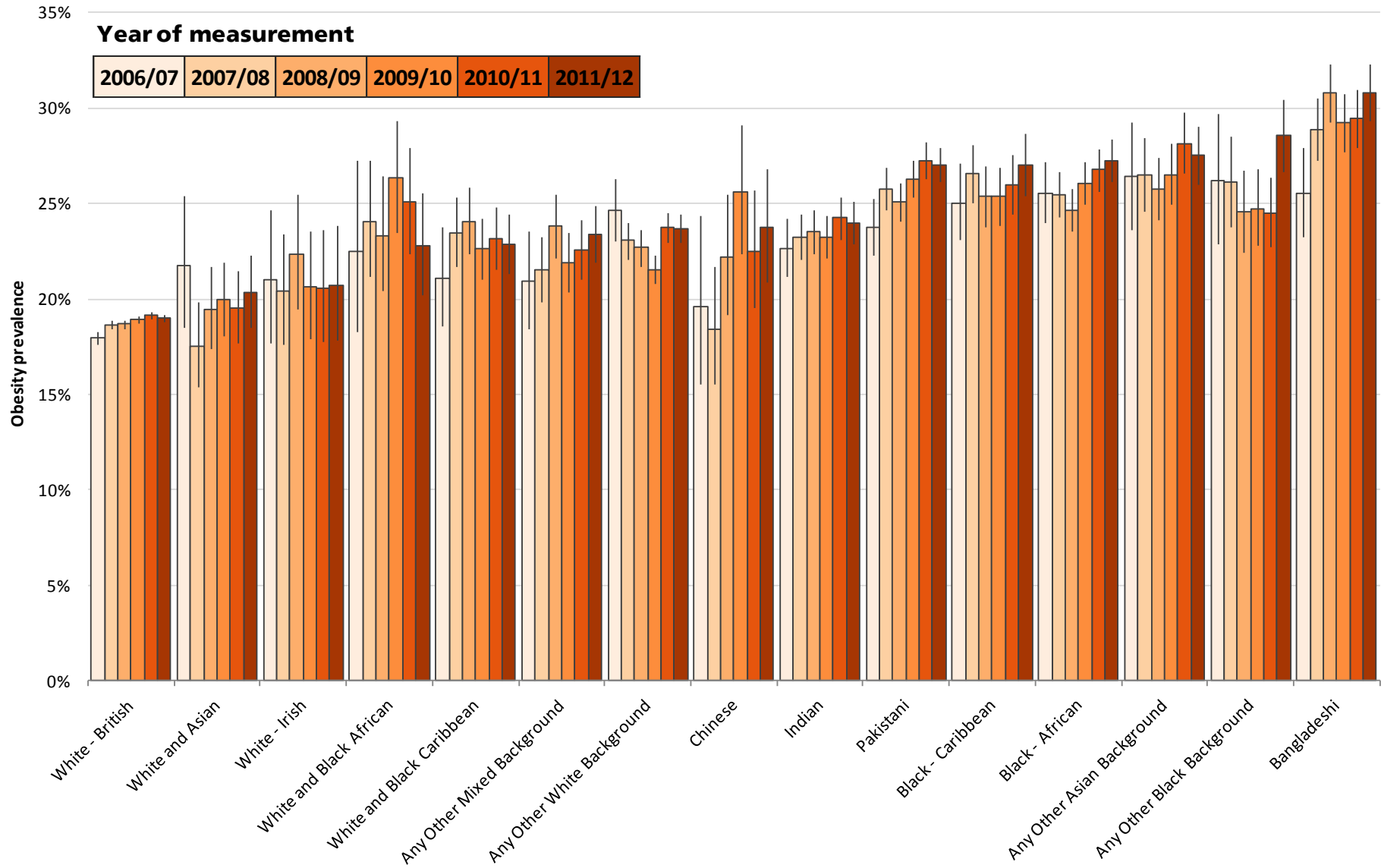
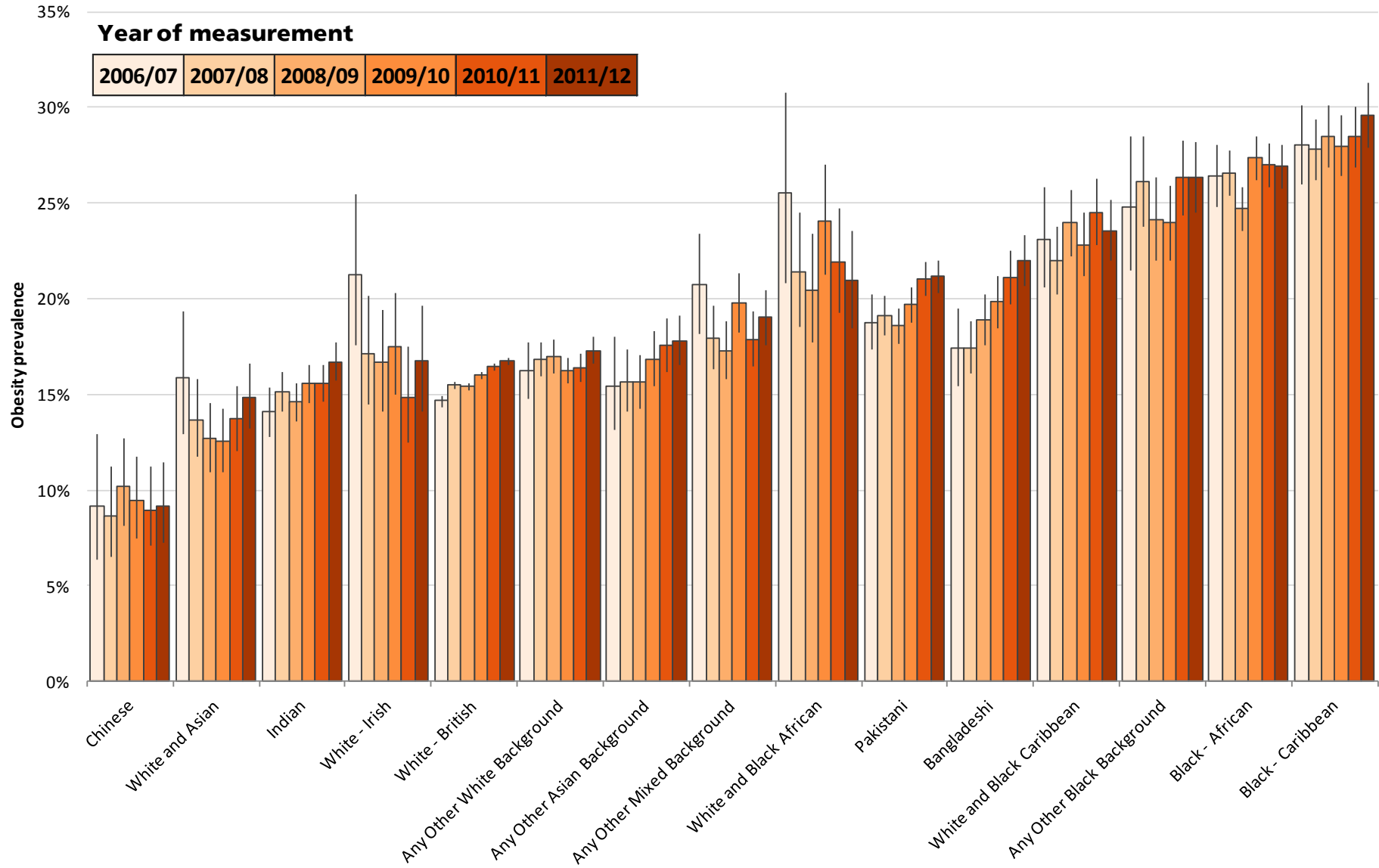


Figure 4d: Prevalence of obesity (with 95% confidence limits) by ethnic group and year of measurement: Year 6, girls



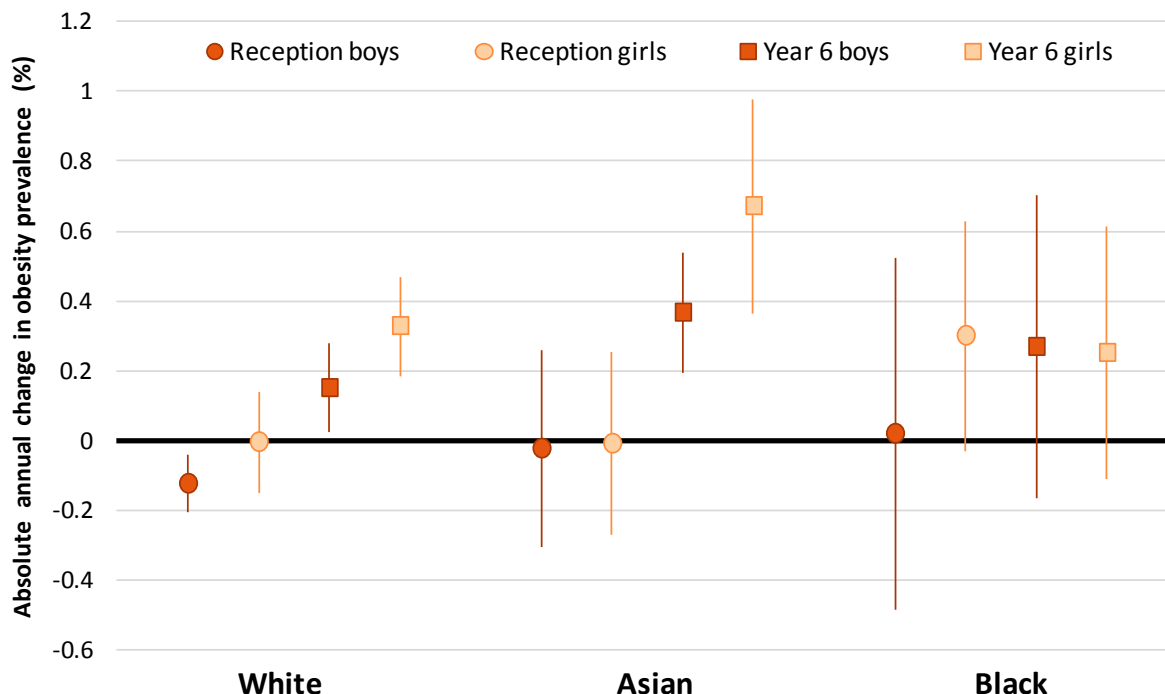
As Figures 4a–d demonstrate, when the NCMP data are split by ethnic group the confidence limits around the estimates of obesity prevalence are large, as is the amount of year on year variation within ethnic groups. This makes it difficult to assess whether there has been a significant linear trend over time, especially when only five robust data points are available for analysis. The data have therefore also been analysed using the broader categories, displayed in Figure 4e, of White (containing the White British, White Irish, Any Other White Background), Asian (Bangladeshi, Indian, Pakistani, Any Other Asian Background, Mixed White and Asian), and Black (Black African, Black Caribbean, Any Other Black Background, Mixed White and Black African, and Mixed White and Black Caribbean).

When the data are examined using these broad ethnic groups, the only population group to show a statistically significant decrease in obesity prevalence since 2007/08 is White boys in Reception. Obesity prevalence appears to be decreasing by around 0.12% per year ($p=0.014$, 95% confidence limits of -0.20 to -0.04) among this group.

By contrast, there is a statistically significant linear trend of increasing obesity prevalence for boys and girls in Year 6 from the White and Asian ethnic groups. Obesity prevalence among White girls in Year 6 has risen by 0.33% per year ($p=0.003$, 0.19% to 0.47%) and among Asian girls of this age by 0.67% per year ($p=0.004$, 0.37% to 0.98%). Obesity prevalence among White boys in Year 6 has risen by 0.15% per year ($p=0.030$, 0.02% to 0.28%) and among Asian boys of this age by 0.37% per year ($p=0.004$, 0.20% to 0.54%).

When grouped in this way there were no statistically significant changes in obesity prevalence among the Black ethnic group. However, with the exception of boys in Reception, the data do suggest that obesity prevalence in this ethnic group may be rising, although at this point these changes are not statistically significant.

Figure 4e: Annual change in obesity prevalence 2007/08 to 2011/12 (with 95% confidence limits) by ethnic group, school year and sex



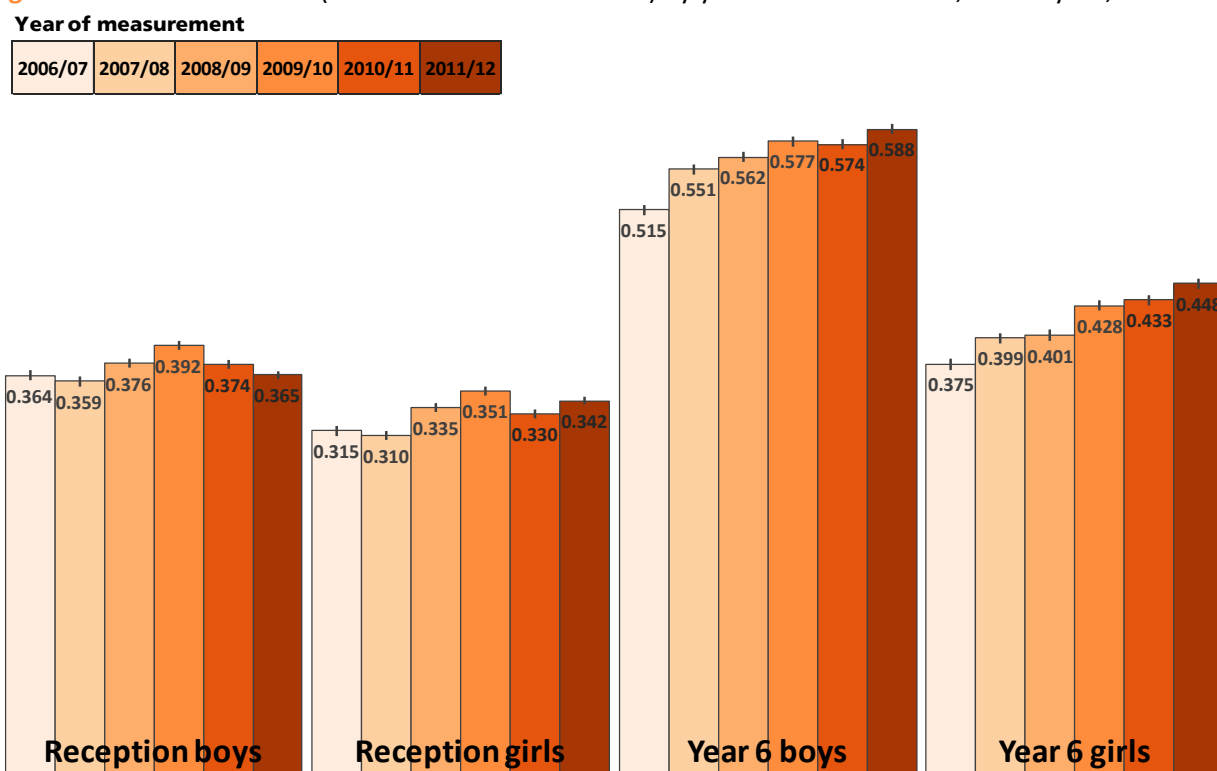
7. Changes in the distribution of children’s BMI

Changes in mean BMI z score

Mean BMI z score^c provides an alternative summary measure of BMI across the child population. Children’s BMI changes with age, and so use of the BMI z score rather than actual BMI values will adjust for any small differences in the age of children between years of NCMP measurements.

One advantage of examining the mean BMI of the child population, rather than only examining the prevalence of obesity, is that this measure takes account of the BMI of all children measured. It can therefore pick up changes in the BMI of children who are under the threshold for obesity. Figure 5 shows BMI z score by age and sex groups for all years of NCMP measurement.

Figure 5: Mean BMI z score (with 95% confidence limits) by year of measurement, school year, and sex



Changes since 2010/11

Between 2010/11 and 2011/12 mean BMI decreased for boys and increased for girls in Reception. The mean BMI of boys decreased by 0.009 standard deviations (SDS) (95% confidence limits of -0.015 to -0.004) and increased for girls by 0.012 SDS (0.006 to 0.017).

In Year 6 mean BMI increased for boys and girls between 2010/11 and 2011/12. The mean BMI of boys increased by 0.013 SDS (0.007 to 0.020) and increased for girls by 0.015 SDS (0.008 to 0.022).

Trend over all years of NCMP measurements

When assessed over all six years of NCMP measurements, mean BMI shows a very similar pattern of change to that seen between 2010/11 and 2011/12. **There remains little evidence of consistent change over time in Reception, but Year 6 continues to show a significant increase.**

^c BMI adjusted for age and sex, based on the BMI reference within the British 1990 growth reference.

Linear regression of the six years of BMI measurements shows a small non-significant increase of around 0.004 SDS per year for children in Reception ($p=0.241$, 95% confidence limits of -0.004 to 0.012). Analysis for boys and girls separately shows similar results.

In Year 6 the mean BMI of boys has shown an average statistically significant increase of 0.013 SDS per year across all years of NCMP measurements ($p=0.009$, 0.005 to 0.020). For girls the change has been 0.014 SDS ($p<0.001$, 0.010 to 0.018). When the 2006/07 data are excluded from the analysis, the increase over time remains significant at the 95% confidence level for boys and girls; 0.008 SDS per year for boys ($p=0.011$, 0.004 to 0.013) and 0.013 SDS per year for girls ($p=0.006$, 0.007 to 0.019).

If the observed trend in mean BMI among Year 6 children represents a real underlying change in the population, the rate of increase equates to a rise of over one BMI centile for this age group as a whole since 2007/08. Based on the results of the linear regression model, **the mean BMI of girls in Year 6 was on the 64.9th centile of the UK90 BMI reference in 2007/08 compared to the 66.3rd centile in 2011/12, an increase of 1.4 centiles. The mean BMI of boys of this age increased from the 70.7th centile in 2007/08 to the 71.6th in 2011/12, an increase of 0.9 centiles.**

Changes by twentile of BMI z score

It is possible to use NCMP data to examine how the observed changes in children's BMI are distributed across the population. The data have been divided into twenty groups (twentiles) based on the child's BMI z score for each age group and sex. The first twentile contains the 5% of the child population with the lowest BMI for age, and the 20th twentile contains the 5% of the population with the highest BMI for age.

Figures 6a–d show the change in mean BMI z score across all years of NCMP measurements for each twentile of the population. The figures shown represent the difference from the mean BMI z score for that section of the BMI distribution in the UK90 reference population.

Confidence limits are not shown on these charts as in most cases, they would not be visible. In addition, as even very small differences between years would be statistically significant, changes between 2010/11 and 2011/12 for each twentile have not been individually tested for significant differences. Instead the overall pattern of change has been described.

The change in BMI z score since the 1990 baseline differs substantially between children in Reception and Year 6. For both girls and boys in Year 6, the increase in mean z score is smallest in the 5% of the population with the lowest BMI for age and greatest in the 5% of the population with the highest BMI, with a gradual increase between these groups. For children in Reception the pattern is somewhat different. Although there have been very large increases in mean BMI z score in the 5% of the population with the highest BMI for age, the rest of the population has increased by a similar amount.⁵

Changes since 2010/11

The changes in mean BMI between 2010/11 and 2011/12 seen for Reception year boys and girls appear to be spread relatively evenly across the population. For boys in Reception the overall decrease in mean BMI has affected most parts of the BMI distribution except those boys with the lowest BMI for age. There was a small increase in the BMI of the 5% of boys with the lowest BMI and no change among the next lowest twentile. For girls in Reception, all twentiles showed some increase in mean BMI between 2010/11 and 2011/12, but the increases tended to be slightly larger among those girls in the top 10% and bottom 10% of the BMI distribution.

A different pattern is seen however in Year 6 between 2010/11 and 2011/12. Again the data show an increase in BMI for boys and girls spread relatively evenly across the whole distribution, but in this age group there appears to have been greater increases towards the lower end of the BMI distribution than towards the top. For boys the increases are smallest among those with the highest BMI. For girls, increases were observed among all but the 5% of the population with the highest BMI.

Figure 6a: Change in mean BMI z score since 1990, by twentile of BMI distribution and year of measurement; Reception, boys

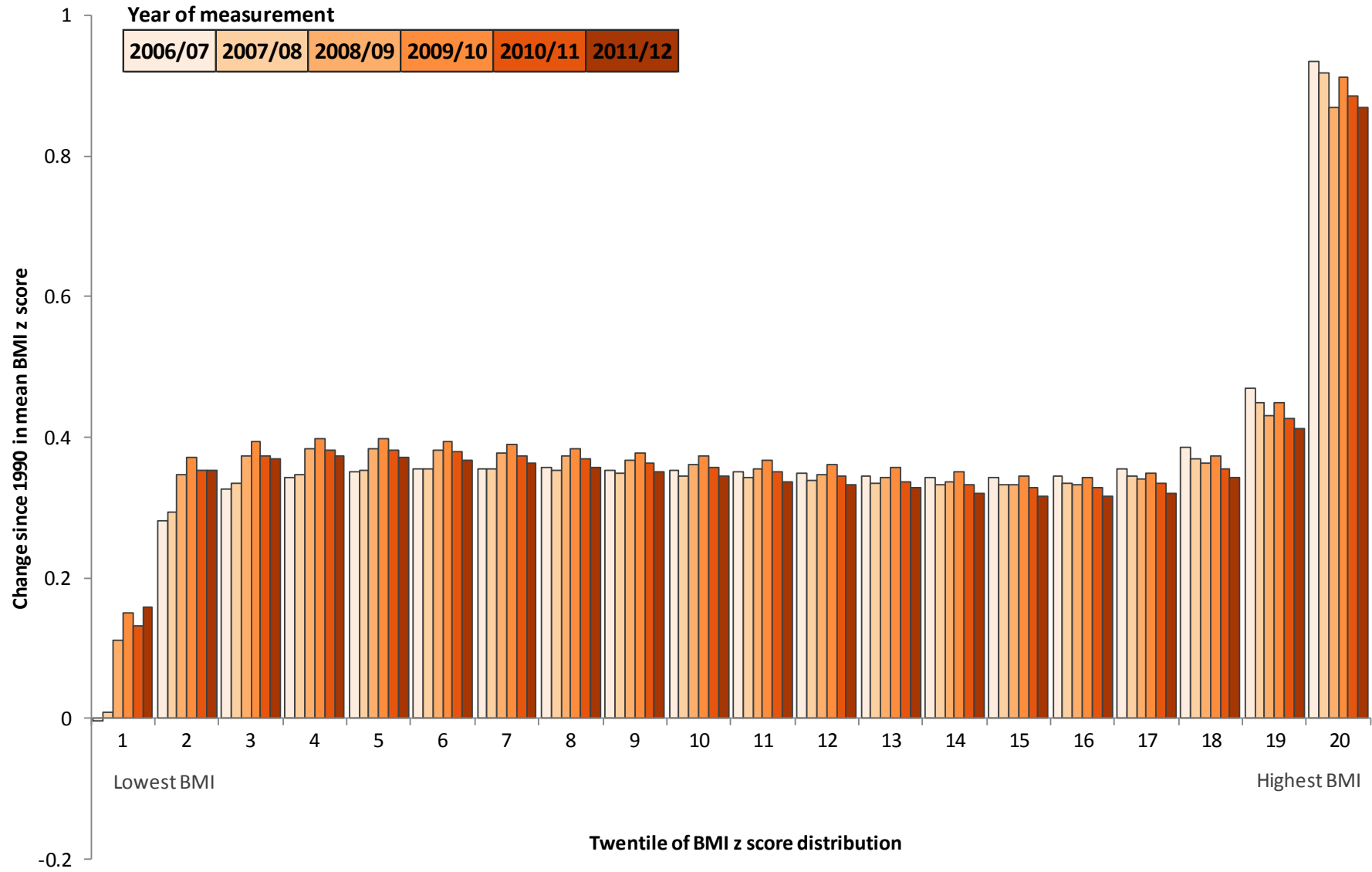


Figure 6b: Change in mean BMI z score since 1990, by twentile of BMI distribution and year of measurement; Reception, girls

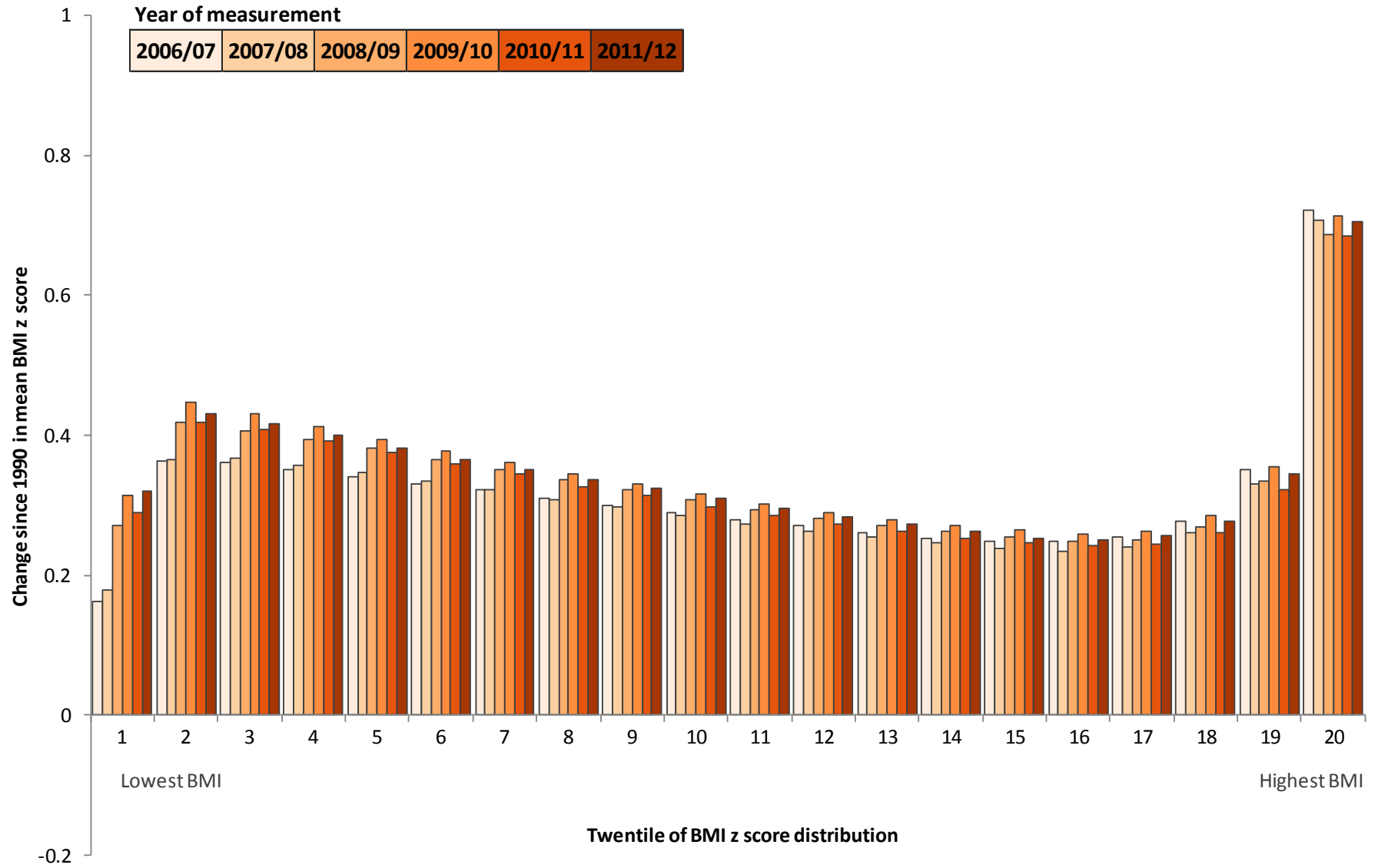


Figure 6c: Change in mean BMI z score since 1990, by twentile of BMI distribution and year of measurement; Year 6, boys

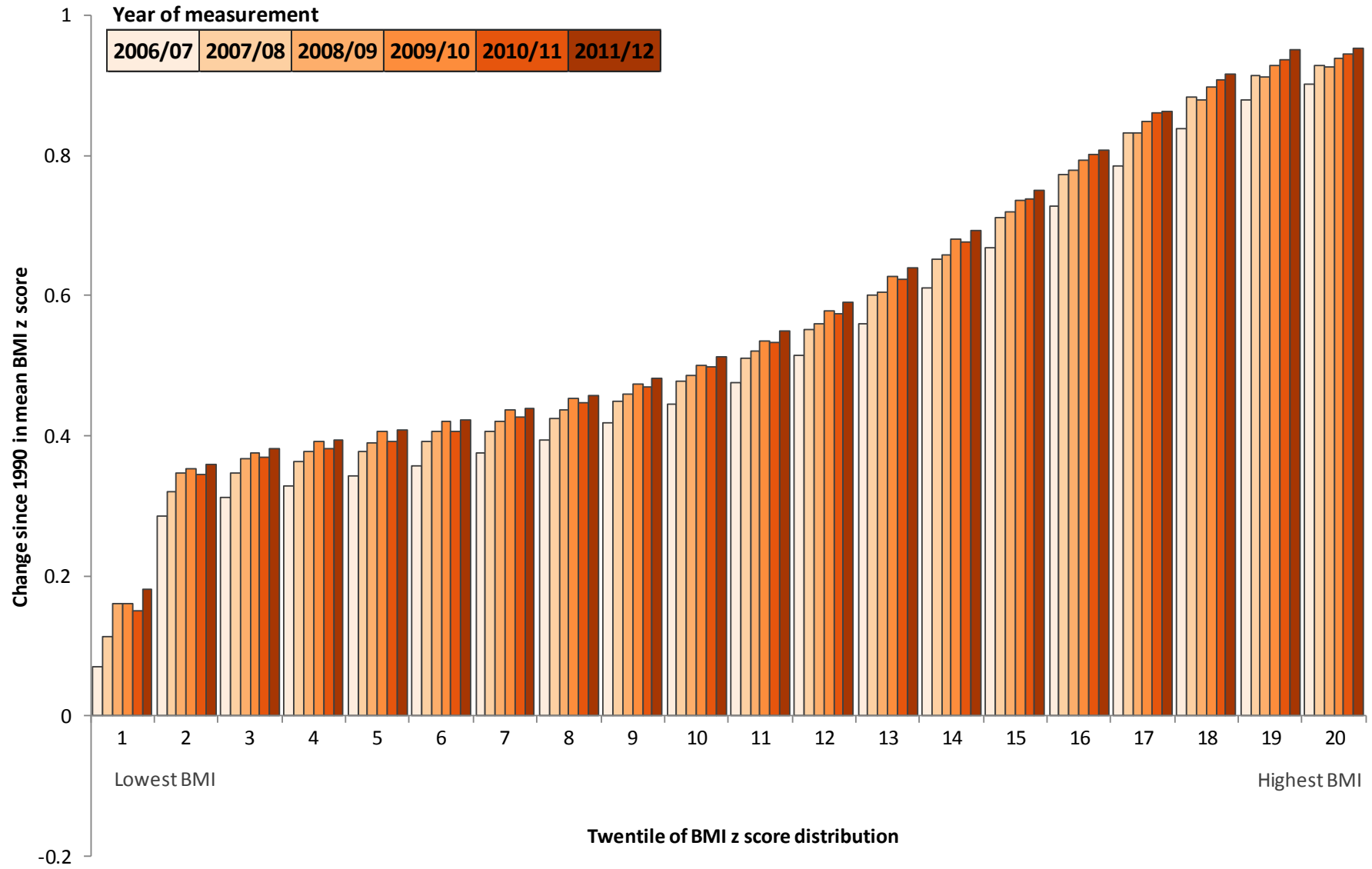
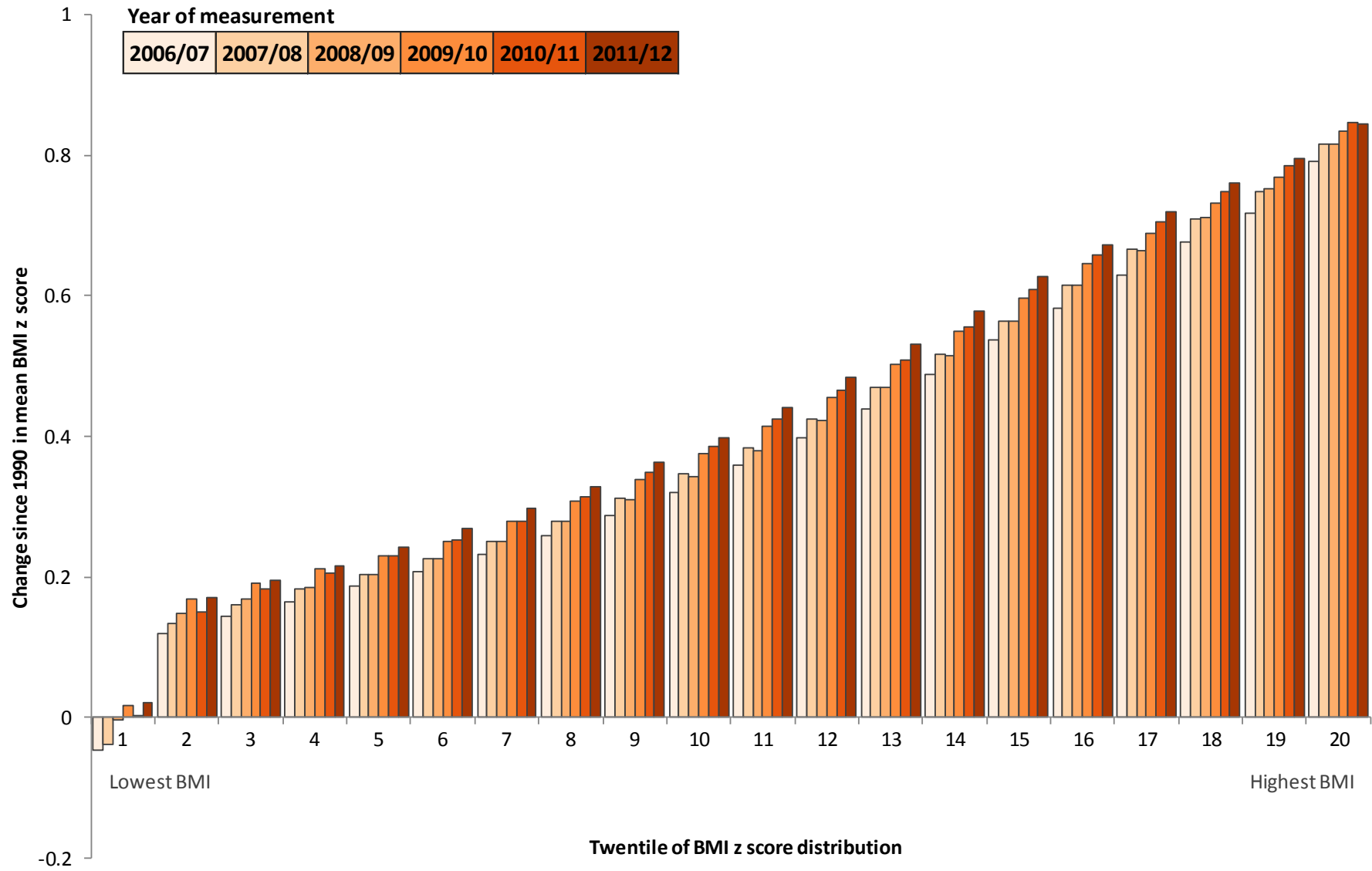


Figure 6d: Change in mean BMI z score since 1990, by twentile of BMI distribution and year of measurement; Year 6, girls



Trend over all years of NCMP measurements

Linear regression has been used to quantify the trend over time within each twentile group and to test for statistical significance. Figures 6e and 6f show the estimated annual change in mean BMI z score for each twentile of the BMI distribution by age and sex, with 95% confidence limits.

Analysis for Reception year has been based on all data from 2006/07 to 2011/12, but that for Year 6 uses data from 2007/08 onwards. In both cases the inclusion or exclusion of 2006/07 data makes very little difference to the actual pattern of change across the distribution. However, inclusion of the 2006/07 data substantially increases the magnitude of the reported change for children in Year 6. As this effect is likely to result from the improvements in NCMP participation and data quality between 2006/07 and 2007/08 for this age group, the 2006/07 data have not been included when producing the estimates for Year 6.

Assessed in this way, the trend across all six years of NCMP measurements exhibits a slightly different pattern to that seen in the period 2010/11 to 2011/12.

As Figure 6e shows, the pattern across all twentiles of the BMI distribution for boys in Reception ranges from increases for boys with the lowest BMIs to decreases among boys with the highest BMIs. There is a similar pattern for girls in Reception of BMI increases among those with the lowest BMI for age, but there is less evidence for decreases among the girls with the highest BMI for age. Statistically significant increases are occurring among the 20% of girls with the lowest BMI for age (twentiles 1 to 4) and the 10% of boys with the lowest BMI for age (twentiles 1 to 2). There is evidence for a statistically significant trend of decrease in mean BMI for age among boys in twentiles 17 to 19.

In Year 6 the pattern across the past five years of NCMP measurements is different (Figure 6f). Here the increases in mean BMI at population level since 2007/08 (as shown in Figure 5) are spread across the whole BMI distribution. The trend of increase is statistically significant for the 80% of girls (twentiles 5 to 20) and the 60% of boys at the upper end of the BMI for age distribution (twentiles 9 to 20).

Figure 6e: Annual change in mean BMI z score 2006/07 to 2011/12 (with 95% confidence limits) by twentile of BMI distribution and sex; Reception

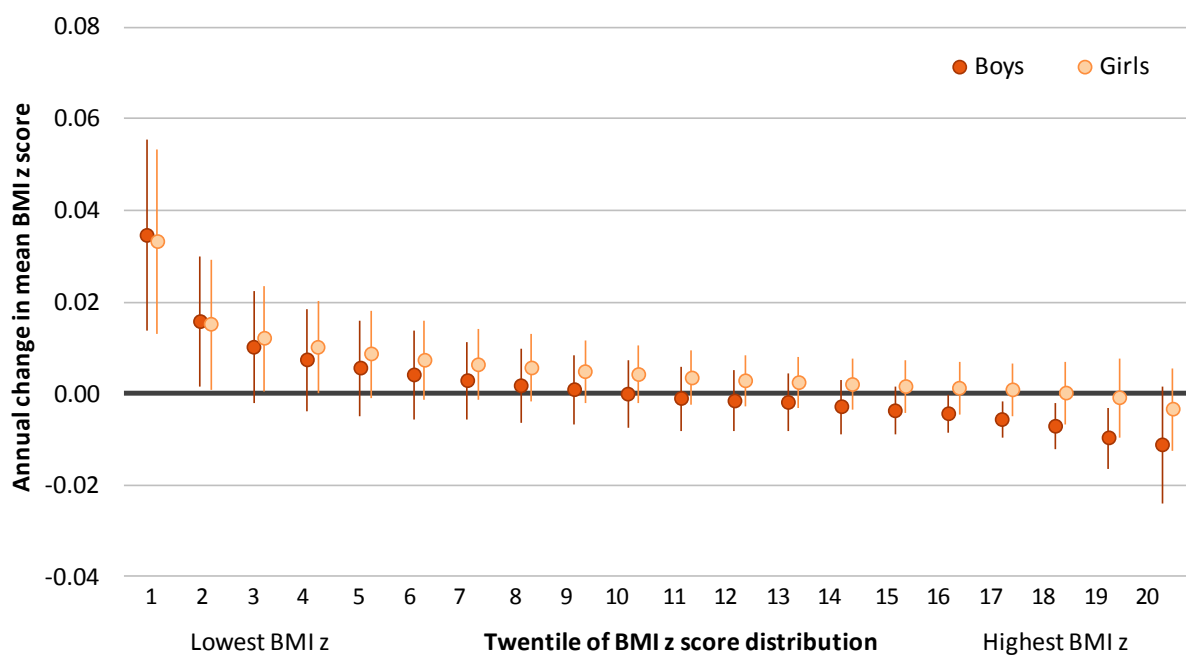
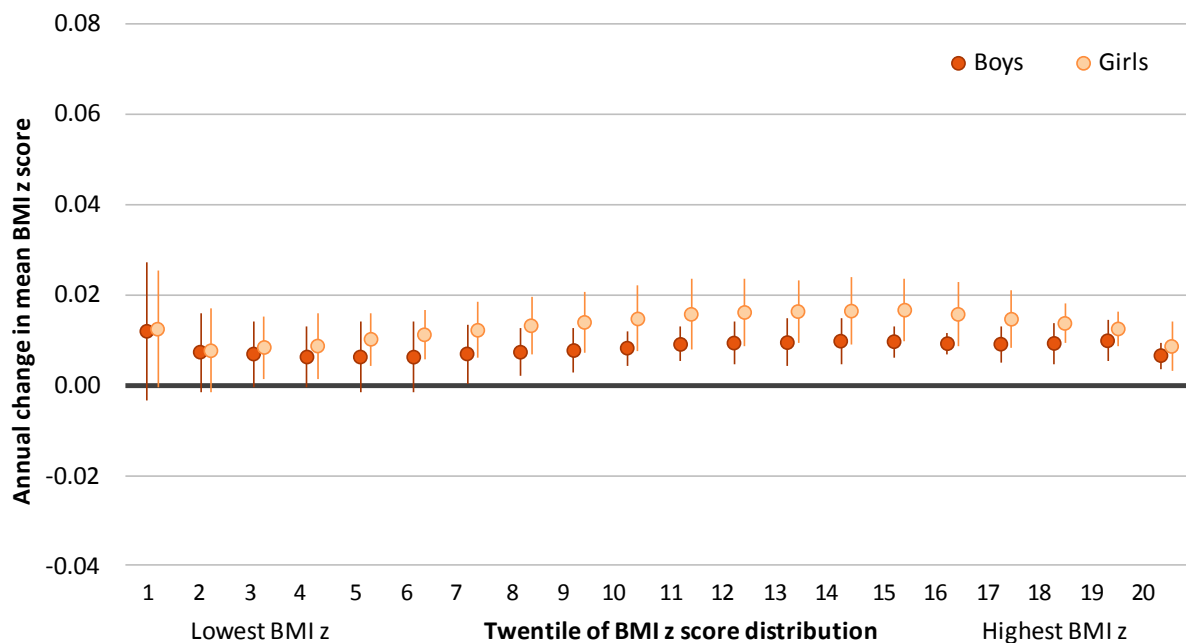


Figure 6f: Annual change in mean BMI z score 2007/08 to 2011/12 (with 95% confidence limits) by twentile of BMI distribution and sex; Year 6



8. Conclusions

Even with a dataset the size of the NCMP, the variation around year to year estimates for obesity prevalence, especially when split by age and sex or other population groups, means there is only limited potential to reliably detect changes from one year to the next. However, as more years of NCMP data become available it becomes increasingly possible to identify statistically significant trends over the whole period covered by the NCMP.

The addition of the 2011/12 NCMP data broadly supports the findings reported in the 2012 report.¹ They provide increased confidence that conclusions previously drawn were accurate, and that the same trends are continuing in the child population. Furthermore the additional data confirm some trends which were apparent in the previous analysis but which were not statistically significant at the time.

Trend in the prevalence of obesity

Across the whole period covered by the NCMP, obesity prevalence has decreased among boys in Reception, but remained stable for girls of this year group. In Year 6 obesity prevalence has increased for both boys and girls. These patterns were evident in the previous analysis and the latest NCMP data add additional weight to these findings.

Based on existing data there is no statistically significant difference between the rate of increase for boys and girls in Year 6. However the shape of the trend, as well the size of the increases over previous years, suggests that obesity prevalence may have increased at a slightly faster rate for girls than for boys.

Trend in socioeconomic inequalities

Over the time period covered by the NCMP, socioeconomic inequalities appear to have widened. This is occurring in different ways for Reception and Year 6.

In Reception obesity prevalence is decreasing among children living in the least deprived areas, but remaining broadly the same in the most deprived areas. In Year 6 the most deprived areas are seeing increases in obesity prevalence whereas prevalence remains relatively stable in the least deprived areas.

Again, these findings reinforce the conclusions of NOO's 2012 report.¹ As was the case with data up to 2010/11, evidence of widening health inequalities is still less strong for girls in Reception than for the other age/sex groups covered by the NCMP. However, the overall pattern suggests that girls of this age are likely to be experiencing similar changes in health inequalities as boys.

Trends by ethnic group

Trends by ethnic group are less conclusive. When broken down into the full range of available ethnic groups it is difficult to pick out statistically significant trends for any particular group. However, when aggregated into fewer categories, some patterns become clear.

Across all White ethnic groups the trend in obesity prevalence is very similar to that for the population as a whole; i.e. obesity prevalence appears to be falling among boys in Reception but remaining the same for girls of this age. In Year 6 obesity prevalence is increasing, and seems to be doing so at a more rapid rate for girls than for boys.

The pattern is similar across all Asian groups, except that in Reception there is no evidence that obesity prevalence is decreasing for boys, as there is for the White ethnic groups. Furthermore it appears that the apparent year on year increases in obesity prevalence observed for Asian children in Year 6 may be greater than those observed for the White ethnic groups.

Across all Black ethnic groups there is no consistent trend and no age/sex groups within the Black groups show a statistically significant trend. It is important to note that this finding does not mean that obesity prevalence is not increasing among children from Black ethnic groups, simply that the data cannot demonstrate that this is the case with an adequate level of reliability. Considering that Black ethnic groups tend to have the highest prevalence of obesity, even if levels of obesity were not increasing these groups still should remain high priority for obesity-related interventions.

Changes in the BMI distribution

Over the period covered by the NCMP the pattern of change in the BMI distribution among boys in Reception has seen increases in the BMI of those with the lowest BMI and decreases in the BMI of those at the top end of the distribution.

This pattern is likely to represent a positive, or healthy, change in the BMI distribution for boys in Reception, and it is encouraging that this pattern, which was also observed in the previous analysis, appears to be continuing.

For girls in Reception the pattern is not quite so positive. As with boys, Reception girls with a low BMI appear to be showing increases in BMI, which is likely to be a healthy change, but unlike among boys there is very little evidence of any decrease in the BMI of girls with a high BMI. The addition of the 2011/12 data to this analysis highlights some differences between boys and girls in this regard, something not evident in earlier analyses.

Among children in Year 6, there appear to have been increases in the BMI of children across the whole BMI distribution, suggesting that increasing weight is occurring over the entire child population of this age, not just the most obese.

Appendix 1: Methods

This report is based on the NCMP datasets for the six years 2006/07, 2007/08, 2008/09, 2009/10, 2010/11, and 2011/12.

Only data for pupils attending state-maintained schools have been included in the analysis. Only a very small proportion of independent and special schools are covered in the NCMP datasets and therefore for consistency over time and between areas, these records have been excluded from the analysis for this and previous reports.

The number of valid records remaining after data cleaning by the HSCIC for the six years of measurement is shown in Figure 1a, broken down by school year and sex. The whole sample for each survey year has been used for the analyses presented, unless specified otherwise.

In this analysis children with a BMI greater than or equal to the 95th centile of the British 1990 growth reference (UK90)⁷ for BMI have been classified as obese. This definition is the most commonly used for child obesity prevalence figures in England, and is consistent with that used in the Health Survey for England (HSE) and NCMP reports published by the HSCIC.

Where appropriate, trends over time have been analysed using un-weighted linear regression. The data from each year of NCMP measurements have not been weighted by the number of children measured as this variable does not vary substantially in relative terms, with the exception of 2006/07. The increase in participation between 2006/07 and later years may have had a disproportionately large effect on reported trends, especially in Year 6. As a result most trend analysis for Year 6 has been presented both including and excluding the 2006/07 data. Due to the low levels of completeness of ethnicity coding in 2006/07 all trend analysis based on ethnicity has been conducted with data from 2007/08 to 2011/12 only.

Any differences reported between population groups or between 2010/11 and 2011/12 have been found to be statistically significant at a 95% significance level using the techniques recommended by Altman et al.⁸ It is important to note that a statistically significant difference may exist between two values, even where 95% confidence limits appear to overlap on the charts shown.

The trend analysis within this report is based on only five or six data points, which limits the potential to detect statistically significant differences over time. Therefore, where such analysis is presented, some differences over time have been identified despite not being strictly significant at the 95% significance level. P-values have been provided for all trend analysis to show the probability that the apparent trend has occurred by chance. All the analysis was performed in Microsoft Access and Excel.

Caveats and limitations of this analysis

As noted in previous NOO NCMP reports, the large number of records within the NCMP dataset allows a level of detailed analysis that is not possible with most data sources. However the surveillance approach that results in such large numbers of child measurements brings some disadvantages. Primarily, the sample cannot be controlled as carefully as it would be in most research studies. Such studies typically use a sampling framework to ensure the sample is representative of the national population, and employ quality control measures to ensure data quality is consistent across all data collection units and over time.

In previous years of NCMP analysis, links have been shown between the reported prevalence of obesity and factors such as local participation rate and data quality measures. The significant increase in obesity prevalence among children in Year 6 between 2006/07 and 2007/08 has been largely attributed to the improvements made in this regard over this period.

Over the last five years of the NCMP, data quality has improved further. However, the improvements since 2006/07 have not been as dramatic as those between 2006/07 and 2007/08. It therefore seems unlikely that the changes between 2007/08 and 2011/12 presented within this report could be caused entirely by changes in NCMP participation or data quality.

It is possible that other factors, which have not yet been assessed in detail, could affect the observed trend over time. There have, for example, been some changes in the timing of NCMP measures throughout the school year over the past four years. These could potentially have had an impact on the reported trend in obesity prevalence. Further detailed analysis into such aspects of the NCMP dataset would be needed to fully understand if these can explain some of the observed changes in obesity prevalence and mean BMI.

Another limitation of this analysis is that trend over time has been assessed within this report using a linear regression model. This is effective at determining whether a consistent pattern of increase or decrease has taken place within child BMI measurements. However, this approach will not yield a significant result if the prevailing trend is not linear – for example if child obesity had increased in earlier years, but begun to decrease in later years of measurement.

With only five years of robust NCMP data available for the analysis of trend it is not yet possible to test for changes over time that are non-linear in nature. Such analysis will however be possible in future years.

This analysis has also not considered the trend in child BMI classifications other than obese. Further analysis of the trend in child underweight, healthy weight and overweight might provide additional findings of interest. However, the analysis of BMI distribution presented within this report does give some indication of the sort of changes that could be expected.

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(All web links were accessed on 30/01/2013)

Reader information

Title	National Child Measurement Programme: Changes in children's body mass index between 2006/07 and 2011/12
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