



## **National Child Measurement Programme 2007/08:**

***Guidance for analysis by  
Public Health Observatories and PCTs***

A report for the Cross-Government Obesity Unit by the  
National Obesity Observatory on behalf of the  
Association of Public Health Observatories

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Supported by



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## 1. Introduction

This report provides guidance to Public Health Observatories (PHOs) and Primary Care Trusts (PCTs) on further analyses they might undertake using the 2007/08 National Child Measurement Programme (NCMP) dataset to:

- produce a regional or local overview of the data;
- obtain a better understanding of the epidemiology of child obesity and overweight within their area;
- feed back useful information to PCTs, school nursing teams, schools, or other partners, ensuring confidentiality of the data;
- help improve participation and data quality in the 2008/09 NCMP.

Further analysis of the NCMP 2007/08 dataset is optional for both PHOs and PCTs. This guidance is designed to support those organisations that wish to undertake additional investigation of the data.

- 1.1 The aim of this guidance is to provide PHOs and PCTs with:
- Guidance on the appropriate use of the NCMP dataset, to comply with data protection and disclosure rules;
  - Caveats associated with the NCMP data and interpretation;
  - A standard set of recommended regional and local analyses.

## 2. The NCMP 2006/07 national dataset

- 2.1. A CD from the NHS Information Centre (the IC) will be sent to PHOs in December 2008. This will contain the cleaned national dataset from the NCMP 2007/08. This dataset contains individual data records for all children measured for the NCMP.
- 2.2. Additionally, the CD will contain three sets of pupil numbers:
  - the original school-level pupil numbers supplied by the Department for Children, Schools and Families (DCSF) and provided for PCTs within the IC's 2007/08 NCMP data-capture tool;
  - the school level pupil denominators submitted by PCTs;
  - the PCT-level 'eligible pupils' denominators also supplied by PCTs as part of the NCMP upload process.

The database will also contain a table which provides school details for all primary schools in England (supplied by DCSF).

- 2.3. PHOs should note that this dataset has been cleaned according to the IC's data-cleaning protocol.<sup>1</sup> All invalid records have been removed.

Records which are coded to independent or special schools have been flagged. Since PCTs are not required to take measurements at these schools they are not included in the national analysis. These records **need to be excluded** if analysis is to match the IC's figures.

- 2.4. The dataset contains several data fields that the IC has assigned to the data - e.g. codes for local government and health geographies. Local Authority codes and Government Office Region have been assigned on the basis of the postcode location of the child's school. PCT and Strategic Health Authority (SHA) have been assigned according to the PCT that measured that child. Because of boundary differences between PCTs and LAs, as well as differences between those schools allocated to PCTs by postcode and the schools they routinely work with, these two methods of assigning geographies may lead to small differences between LA and PCT, or GOR and SHA, analysis in some cases.

The IC has also added the appropriate z and p scores for BMI, height and weight for each child\*. Also the 'indicator' field in the main table shows whether individual children are classed as obese, overweight or underweight, according to the 2<sup>nd</sup>, 85<sup>th</sup> and 95<sup>th</sup> centiles on the British 1990 growth reference (UK90).<sup>2,3</sup> Code 1 indicates obese, code 3 indicates overweight and code 5 underweight for children in Reception.

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\* z scores for height, weight and BMI provide the number of standard deviations away from the expected value of height, weight or BMI for age. The corresponding p score expresses the z score as a percentile, using the normal distribution.

Code 2 indicates obese, code 4 overweight, and code 6 underweight for children in Year 6.

- 2.5. Under the terms of the data sharing agreement with the IC PHOs are permitted to keep the individual NCMP data lines supplied by the IC for a period of two years. After this point the CD should be securely destroyed and any electronic copies of the dataset deleted. Aggregated summary data from the NCMP may be kept after this point, but if the PHO have a continued need to use the full 2007/08 NCMP dataset they will need to apply to the IC for an extension.
- 2.6. Figures based on five or fewer children (excluding zeros) must be suppressed in any figures made publicly available. This is in line with the IC guidance in the data-sharing agreement.

### **3. Sharing of the NCMP dataset between PHOs and PCTs**

- 3.1. The terms of the data-sharing agreement between the IC and the Association for Public Health Observatories state that these data can be shared with PCTs under certain conditions.
- 3.2. PCTs that want their own cleaned dataset should request it from their PHO. PCTs should note that they will be able to access individual level data for their PCT only. If a PCT requests wider access to NCMP data, for example to make comparisons with the national or regional average, PHOs must ensure that the data are aggregated to ensure individual children cannot be identified. If aggregation precludes useful analysis, the PHO might be better placed to do such analyses on behalf of the PCT.
- 3.3. Although PCTs will already have access to their own NCMP data, it is recommended that cleaned data from the IC are used for local analysis, rather than the records held by PCTs. This is important to ensure consistency of published figures.
- 3.4. The data-sharing agreement states that all record-level data must be treated in accordance with the Data Protection Act 1998,<sup>4</sup> and any data will, therefore, need to be transferred safely and securely to PCTs.
- 3.5. When sharing NCMP data with PCTs, PHOs are advised to ensure PCTs are aware of the terms of the data sharing agreement between PHOs and the IC, and that the relevant individuals in PCTs have read this guidance document. It is particularly important that PCTs appreciate the need to ensure any published analysis does not risk identification of individual children, and that any comparisons made between different prevalence figures are performed using confidence limits or appropriate statistical testing.

#### **4. Headline findings for the 2007/08 school year**

- 4.1. Headline results from the NCMP, at national and sub-national level, have been provided in the IC's report *National Child Measurement Programme: 2007/08 school year, headline results*,<sup>1</sup> published in December 2008. This report also gives a breakdown of the prevalence of child obesity and overweight by sociodemographic groups and a comparison with the 2006/07 data.
- 4.2. Additionally, a number of online resources have been provided by the IC to support analysis of the NCMP data. These are available through the NCMP section of the IC's website.<sup>5</sup> These resources include:
  - data tables used to produce the IC report in Excel format
  - an online database, which can be used to compare results for PCTs and SHAs with the national analysis.
- 4.3. It is vital that, wherever a comparison is possible, any local analysis is checked against the IC's published figures to ensure consistency.
- 4.4. Although the summary figures available in the online database are currently provided without confidence limits, these are published within the Excel data tables and they should always be used when comparing prevalence figures between areas.



## **5. The NCMP reports produced by the National Obesity Observatory (NOO)**

- 5.1. Any staff using the NCMP dataset for analysis are advised to read the NOO report on the 2006/07 NCMP dataset, published in June 2008,<sup>6</sup> in addition to the 2007/08 report published by the IC.
- 5.2. The 2006/07 NOO report looked in detail at the effects of some of the data quality issues that arose in the 2007/08 dataset and showed the possible effect of these on reported prevalence of overweight and obesity.
- 5.3. The report also showed the effect of socio-demographic variables (principally ethnicity and deprivation) on prevalence figures and showed that the combined effect of these, plus data quality indicators, could explain around 70% of the variance in prevalence of obesity at PCT level.
- 5.4. An analytical report of the 2007/08 NCMP results will be published in early 2009 by NOO on behalf of the Cross-Government Obesity Unit. This report will present detailed analysis to complement that provided by the IC's report.

It is anticipated that the 2007/08 NOO NCMP report will examine:

- data quality in 2007/08 compared with that in 2006/07;
  - the effect of time of year of measurement on prevalence figures;
  - the distribution of child BMI in England and comparisons with the 1990 baseline;
  - comparison of BMI distribution in 2007/08 with that in 2006/07;
  - examination of variation in BMI distribution with sex, age and socioeconomic deprivation;
- 5.5. It is not anticipated that the 2007/08 NOO NCMP report will overlap substantially with analyses likely to be done at regional level. There is, therefore no need for PHOs or PCTs to wait for publication of this report before beginning the types of local analyses that are outlined in section 6 of this document.

## 6. Recommended analyses

- 6.1. To help standardise analyses and help comparability of findings across the country, we propose that PHOs or PCTs that wish to do further analysis with their local NCMP data consider some of the following areas for investigation.
- 6.2. We recommend that all analysis begins with the data quality checks described in sections 6.5 to 6.24. The suggested analysis to investigate prevalence of obesity and overweight, described in sections 6.25 to 6.62, could be conducted by PCTs and/or PHOs if there is a local need for such analysis. PCTs should check with their local PHO that they are not duplicating any analysis that is already being produced at a regional level.
- 6.3. PHOs or PCTs undertaking analyses are asked to publish their reports on their own websites where possible. We would be grateful if they would send information about, and links to, any such reports to [ncmp@noo.org.uk](mailto:ncmp@noo.org.uk), so this information can be posted on the NCMP pages of the NOO website and shared with other areas.
- 6.4. If PHOs or PCTs have further queries about doing the analyses outlined in this guidance, they should contact the National Obesity Observatory at [ncmp@noo.org.uk](mailto:ncmp@noo.org.uk)

### ***The importance of data quality checks at local level***

- 6.5. Although the NCMP dataset provided to PHOs has undergone extensive cleaning at national level, there is a limit as to what checks and cleaning can be done centrally on a dataset with approaching one million records from around 17,000 schools. As a result there may be some minor remaining data quality issues within the NCMP dataset.
- 6.6. In the 2006/07 dataset a number of issues were identified during analysis that had not been flagged by the NCMP validation process. For example, in some cases PCTs seemed to have entered the same pupil records for two adjacent schools, entered Year 6 pupils to infant schools or Reception pupils to Junior schools, or submitted a large proportion of records with height and weight measurements rounded to the nearest whole number.
- 6.7. Since the 2006/07 dataset a number of additional validation checks have been introduced as part of the NCMP upload process, and further validation has been done by the IC on the 2007/08 dataset. This process is detailed in the IC's 2007/08 NCMP report.<sup>7</sup> However, some data-quality issues might remain despite these additional checks.

- 6.8. Although these detailed issues have minor effects on national analyses, they may be more important in detailed regional or local analyses by PHOs or PCTs. It is therefore important that basic quality checks on the dataset are performed and any obvious anomalies are clarified with the relevant PCT or with the staff involved in collecting and processing measurements.

### ***Recommended data quality checks***

Users of the 2007/08 dataset are advised to check the following issues before commencing detailed analysis.

- 6.9. **Records assigned to the wrong school:** In the 2006/07 dataset, at least 2,000 children were coded to the wrong school. As this issue could often only be identified in the obvious cases where infant schools had Year 6 pupils coded to them and where Reception pupils were coded to Junior schools, the true scale of this issue may in fact be larger.
- 6.10. In many cases this miscoding seems to have occurred where schools share similar names (e.g. St Mary's Infants and St Mary's Junior) and all records for both schools have been assigned to one of the two institutions.
- 6.11. The 2007/08 upload process introduced additional checks which should reduce this problem. For example, PCTs are warned of the number of schools for which no records are entered and also of the number of schools where the number of pupils measured exceeds the number of pupils reported to be at the school. It is however possible that some incorrect school coding has still have occurred within the 2007/08 dataset.
- 6.12. If analysis is being undertaken at school level, and especially if NCMP feedback is being provided to schools, school level checks should be performed to identify those schools where pupils have been measured from a year group which DCSF headcounts suggest are not educated at that school.
- 6.13. If NCMP analysis is done at PCT level, any issues flagged during such checks could be followed up with the school nursing teams which visit the schools to collect NCMP data, or with staff at the Local Education Authority. Although such staff are unlikely to remember exactly how many pupils at a given school were eligible for the NCMP on the day 2007/08 measures were taken, such staff may be able quickly to resolve whether pupils have been wrongly coded, or whether a school has recently expanded the ages of its intake.
- 6.14. At regional level PHOs may wish to send details of any schools flagged by such checks to PCTs for further investigation before any school level feedback or detailed analysis at school level takes place.

- 6.15. **Duplicate pupils:** Duplicate pupils assigned to a school should have been flagged during the upload process and removed before data were submitted to the NCMP database. However, if duplicate records were submitted to separate schools this would not have been picked up.
- 6.16. Detailed analysis of the 2006/07 dataset showed that a few PCTs had submitted the same set of records for more than one school. Often this occurred where pupils had been inaccurately coded to schools, so, for example, in some cases a group of Reception year pupils had been incorrectly added to a similarly named junior school as well as to the correct infant school.
- 6.17. Although the NCMP dataset is anonymised, it is possible to detect potential duplicate records by matching on fields such as age, date measured, sex, height and weight. Users of the 2007/08 dataset at local level are advised to check for such duplicate records, especially if errors are discovered in the way pupils have been coded to schools.
- 6.18. **School participation rates:** The process of calculating PCT participation rates is complicated. As these figures are used for performance management it is important that PCTs agree they provide an accurate reflection of local participation levels.
- 6.19. Most pupil denominators used to calculate participation rates are based on the PCT level pupil denominators the PCT supplies directly to the IC (the 'PCT eligible' figures), rather than on the sum of the school level pupil numbers also entered by the PCT. These figures should be within 10% of each other but do not necessarily always match. Annex 5 of the IC's 2007/08 report provides further details on this process at PCT level and Appendix 1 of this document illustrates the same issue in the form of a diagram.
- 6.20. As participation rates, and so pupil denominators, are only agreed at PCT level, school level pupil denominators have not undergone the same scrutiny as has been applied for the PCT figures and there is potential for these to be inaccurate for some schools.
- 6.21. Pupil numbers supplied within the NCMP dataset include the DCSF pupil numbers originally provided to PCTs in the data-capture tool (field name 'DCSF\_Year\_R/6\_count'), as well as pupil numbers entered by PCTs and submitted to the IC ('PCT\_year\_R/6\_count').

In general the pupil numbers provided by the PCT should be used as the pupil denominator for school-level participation rates. In some instances PCTs did not provide pupil numbers or may have entered a denominator of zero, even though the DCSF figures show there are pupils at that school. In such circumstances the DCSF figure should be used unless the zero denominator entered by the PCT is known to

be correct. If a PCT did not measure any children at a school, then there will be no PCT supplied pupil number, and again the DCSF figure will need to be used.

In some cases the number of pupils measured at a school exceeds the pupil denominator provided by the PCT (or the DCSF figure if that is being used). In these cases number of pupils measured should be used as the school's pupil denominator to ensure school level participation rates do not exceed 100%.

- 6.22. **Rounded records:** The 2006/07 NCMP report from NOO showed that incorrectly rounded records (especially those for weight in the Reception year) were associated with a lower reported prevalence of obesity.
- 6.23. The IC have introduced a validation check for rounded records in the 2007/08 data upload process, but as this warns PCTs of rounded records only after data have been collected, some PCTs are likely still to have a high proportion of rounded records in the 2007/08 dataset.
- 6.24. A summary of the proportion of rounded records for every PCT has been provided within the IC's 2007/08 NCMP report (Appendix 2). Users of the NCMP data at local level are advised to check this list and, if the data for the population being studied have been submitted with rounded records, this issue may need to be taken into consideration when using prevalence figures for those areas.

### ***Recommended analysis based on prevalence***

- 6.25. **Checking of prevalence rates:** Users should check that their analysis matches prevalence figures published by the IC for PCTs, LAs and SHAs. To do this, we advise use of the indicator field in the dataset, rather than use of the BMI field and reassigning z scores or centiles.
- 6.26. If for any reason users need to calculate their own BMI z scores for NCMP or other data, this can be done using the 'LMS Growth' Microsoft Excel add-in software available at no charge from Professor Tim Cole's website<sup>8</sup>. Due to slight differences in the way children are assigned to age bands between this tool and the NCMP dataset the resulting BMI, height and weight z scores assigned may differ by a small amount. This effect is however small and is unlikely to have any noticeable impact on prevalence figures.
- 6.27. **BMI thresholds:** The NCMP 2006/07 uses the British 1990 growth reference (UK90) for BMI and the 85th and 95th centiles to define children as obese or overweight according to age and sex. This definition is commonly used in the UK for population monitoring – e.g. in recent Health Survey for England (HSE) figures.

- 6.28. It is important to note that the 85th and 95th centiles used in the NCMP are intended for population-monitoring use only, and do not provide the number or percentage of individual children clinically defined as overweight or obese. In a clinical or individual setting, the 91st and 98th centiles are used in the UK to define individual children as overweight and obese respectively, and several additional measures and indicators would be taken into account before a clinical diagnosis was made.
- 6.29. As a result, when presenting prevalence figures based on the 85<sup>th</sup> and 95th cut offs, it is important to provide an explanation of the nature of the prevalence figures presented. Ideally wording such as 'x percent of children are obese or overweight' should be avoided. More appropriate wording may be 'x percent of children are above the 95th centile of the UK90 distribution', or 'x percent of children are at risk of obesity'. The latter term is used in the NICE guidance on obesity,<sup>9</sup> though no formal recommendations are made as to the definitions or terminology that should be employed for public health purposes.
- 6.30. Users of the NCMP dataset should also note that other growth references are sometimes used to classify children as overweight or obese, for example the World Health Organisation (WHO) 2007 or International Obesity Task Force (IOTF) thresholds are sometimes used within the UK. The IOTF thresholds were used in the Foresight Obesity modelling,<sup>10</sup> and also used for the recently published child obesity prevalence figures from the Millennium Cohort Study.<sup>11</sup>
- 6.31. It is recommended that most published NCMP analyses use the recommended UK90 population monitoring thresholds to ensure consistency between published figures, but users must ensure that, if making comparisons with other published prevalence figures, the same definition is applied across all figures to determine which children are obese and overweight.
- 6.32. **Prevalence by school year and age:** Prevalence figures should always be produced separately for Reception and Year 6, rather than combining prevalence figures. Prevalence of obesity and overweight differs with age, tending to be higher in the older age-groups. As a result, a combined prevalence figure will tend to be lower if a larger proportion of Reception children have been measured, and higher for areas in which a larger proportion of Year 6 children have been measured.

Although combined prevalence figures should not be produced, if there is no alternative then they must be age standardised, rather than simply combining crude prevalence rates.

- 6.33. PHOs may also wish to compare the average age of children measured in each age-group with the reported prevalence. It is known that prevalence of obesity increases with age and that, since PCTs

measure children throughout the year, there is potential for substantial variation in age by PCT even within the two age-groups.

- 6.34. **Prevalence by sex:** Obesity and overweight prevalence for children is known to vary by sex. Users of the NCMP dataset might want to provide prevalence figures for their local areas broken down by sex. The IC has produced national-level analysis for girls and boys separately, but has not done so at regional or local level.
- 6.35. The 2006/07 NOO NCMP report noted substantial differences between the sex ratios of children measured in different areas. Although this appeared to have a minimal effect on PCT level prevalence figures, at more local levels the possible impact of a skewed sex ratio is greater. Users should be aware of this issue and, if prevalence figures are compared for boys and girls combined, ensure that there are no large differences between the populations being studied.
- 6.36. This issue is likely to be particularly important at school level. Comparing prevalence of obesity at a single sex school with a prevalence figure for the PCT or region that includes girls and boys would be inaccurate. This issue needs consideration, especially if feeding back results to schools.
- 6.37. **Prevalence - effect of participation rate:** The published analysis of the 2006/07 and 2007/08 NCMP datasets suggests that the participation rate by PCT affects the reported prevalence of obesity, especially for Year 6. This effect is likely to be due to selection bias in children who were measured, whereby children who do not participate in the NCMP are more likely to be obese than those who do participate.
- 6.38. Users of the NCMP dataset might wish to examine whether participation rate appears to be related to prevalence of obesity locally before using prevalence figures. The potential impact of participation should always be considered, especially if comparing areas with very different participation rates or looking at change over time.
- 6.39. When examining participation rates in relation to prevalence figures, we advise that participation rate is measured with a different method from that used for performance management purposes. Participation rates calculated for performance management include numbers of children attending schools in which no measures were submitted. If no pupils within a school have been measured it is unlikely this is due to selective opt-out of obese children and so the possible effect on prevalence figures is minimal. PHOs should calculate participation rates for each PCT based on the proportion of children measured in schools in which measurements were submitted. This rate is calculated by dividing the number of children measured by a PCT in each school year by the sum of the pupil numbers in schools in which

measures were taken. This figure will be equal to, or higher than, the published participation rate for the PCT.

6.40. Analysis of the 2006/07 dataset, published in the NOO NCMP report, also showed that the participation rate for girls nationally appeared to be lower than that for boys. If this is due to a selective opt-out of overweight and obese girls from the NCMP measurements, this bias could be stronger for girls than for boys. This issue might benefit from local analysis, where more detailed information may be available on the expected sex ratio of children within schools. It should also be considered when looking at differences in prevalence by sex (see section 6.35).

6.41. **Prevalence - effect of deprivation, setting, and ethnicity:** The published NCMP analysis shows that deprivation, urban/rural environment and ethnicity influence prevalence of obesity overweight and underweight.

PCTs and PHOs should use their local intelligence and data to determine to what extent the variation within their local area can be explained by these variables (as well as by factors such as data quality and the participation rate).

6.42. To undertake more detailed investigation, users of the NCMP dataset might want to use the child's super output area of residence (the child's home postcode was a mandatory field in 2007/08 and should be available for most children) or school postcode to group children across the region according to quintiles or deciles of socioeconomic indicators (eg, the Index of Multiple Deprivation 2007). Analyses can then be produced for these groupings to determine more accurately the links between factors such as deprivation or urban/rural environment and prevalence of obesity.

6.43. An example of such analysis can be found in figures 12 and 13 of the IC's 2007/08 NCMP report

6.44. **Children at risk of underweight:** Although no agreed definition of underweight exists for the UK90 dataset, the IC's 2007/08 NCMP analysis has used the 2<sup>nd</sup> centile to define children as underweight.

6.45. Users may however wish to consider use of the 5<sup>th</sup> centile to provide an indication of the prevalence of underweight children for population-monitoring purposes. Use of the 5<sup>th</sup> centile is arguably more consistent with use of the 85<sup>th</sup> and 95<sup>th</sup> population-monitoring centiles for overweight and obese.

6.46. The 2<sup>nd</sup> centile tends to be used most frequently to define underweight in clinical settings. In such settings, specificity is important since a definition is required that classifies children as underweight only if low BMI is truly a problem. If a definition were used that flags many



children as underweight who are in fact at a healthy weight, clinical resources would be wasted on unnecessary examination or monitoring of these children.

- 6.47. In population monitoring, sensitivity is more of a consideration than is specificity. It is important that the definition used includes all those children for whom a low BMI might be an issue. In population monitoring a few 'false positives' have little effect, since the classification made is not being used to allocate interventions or treatment to individual children. Additionally, inclusion of larger numbers of children provides greater statistical power to detect changes over time or differences between populations.
- 6.48. A discussion of the issues around defining underweight is provided in a publication by Professor Tim Cole<sup>12</sup> (see the section 'choice of cut offs at age 18').
- 6.49. If underweight figures are produced using the 5<sup>th</sup> centile, these should be used **only** for internal discussion or analysis, for example to investigate the determinants of underweight or to determine which areas have the highest proportion of children who are likely to be underweight. They **should not** be used in publications to avoid contradicting the published NCMP underweight prevalence figures from the IC.
- 6.50. **Confidence limits around prevalence and change in prevalence:** Comparisons of prevalence figures with the regional or national rate, between different populations or over time should always take into account the degree of uncertainty around these figures.
- 6.51. The IC dataset provides approximate confidence limits for PHO and LA prevalence rates. In some cases (e.g. for PCTs) these confidence limits have been adjusted to take account of the participation rate within the PCT, as where participation is low there is less certainty about where the true prevalence figure may lie.
- 6.52. If users of the NCMP dataset want to calculate their own confidence limits for other geographical areas, or if they need to produce confidence limits for prevalence by sex or for underweight, the 'Wilson Score' method is recommended. This method is also used for the APHO Health profiles.
- 6.53. If examining a reported change in rate for statistical significance, the approach recommended by Altman et al. should be used. *Appendix 2* provides further detail on both these methods.
- 6.54. PHOs might also consider using funnel plots or control charts to show PCT prevalence rates with an indication of the expected variation around these figures dependent on the size of the population.

- 6.55. **Sub-PCT level analysis:** Many areas wish to use the NCMP to identify 'hot spots' of child obesity within their local area. Often the intention of this is to target resources at these areas, and sometimes in order to compare with other variables that are available for small geographies in order to investigate the local determinants of obesity.
- 6.56. Whilst sub-PCT level geographical analysis is of course possible, for example using school, SOA or ward as a unit, such analysis needs to be performed with caution for two reasons.
- 6.57. Firstly prevalence figures for sub-PCT populations are likely to be based on small numbers and so are subject to a high degree of natural variation. Confidence limits should always be employed to ensure any apparent differences in prevalence between areas are statistically significant and not just the result of the small sample size at this level of analysis.
- 6.58. Secondly, the variation between wards or SOAs in terms of socio-economic variation, ethnic mix or even the degree of selective opt-out of the NCMP are likely to be far higher than seen for bigger populations such as PCTs. Analysis of the 2006/07 NCMP dataset showed that a substantial proportion of the variation in prevalence between PCTs could be explained by such factors, and this effect is likely to be even stronger at sub-PCT level.
- 6.59. This does not mean that such analyses are not useful, but it is important to consider what any observed variation in prevalence really means. In some cases the priority may be to identify the areas with the most obese or overweight individual, for example if targeting an intervention, and the use of straight prevalence figures may be appropriate. However, in other situations it might be deemed more appropriate to standardise for any known confounders and determinants, for example if trying to gain a better understanding of local level geographical variations in prevalence.
- 6.60. If the purpose of sub-PCT analysis is to investigate the determinants of obesity, users of the dataset might be advised to use an approach such as grouping individual children, using their postcode of residence or school, into decile or quintile groups, based on the variable under investigation (as described in section 6.42). This approach means indicators or variables that are only available for very small geographies, such as SOA, can be used, yet the groups compared are still based on relatively larger numbers.
- 6.61. It is also worth considering whether such investigation of determinants could also be used to target resources better than straight prevalence figures. For example, if children living in the most deprived 10% of SOAs of a PCT have a significantly higher prevalence of obesity than children in the most affluent 10%, this provides useful data for

targeting resources that may overcome problems associated with small numbers in local level analyses of the NCMP.

- 6.62. An established indicator of deprivation that is known accurately to reflect the local population may thus prove a more robust indicator than small areas child obesity prevalence figures, which could always be subject to natural small number variation or localised data quality issues.

## 7. Further local analysis

- 7.1. Section 6 of this document details the sorts of analyses that are recommended for all users of the NCMP dataset. Those undertaking additional analyses might wish to consider the following issues.
- 7.2. NOO will investigate these methods for their 2007/08 NCMP report, and further advice will be provided with the 2008/09 NCMP guidance. Any users who wish to experiment with these techniques to compare NCMP datasets are advised to refer to the articles referenced at the present time, or to contact NOO at [ncmp@noo.org.uk](mailto:ncmp@noo.org.uk). We are keen to hear about local experiences with these data, and to learn of ways in which we may usefully support such work.
- 7.3. **Comparisons with the NCMP 2006/07 results:** Results from the NCMP 2006/07 can be downloaded from the IC website, or produced locally through analysis of the 2006/07 dataset as provided to PHOs by the IC.
- 7.4. If users want to make comparisons with the NCMP 2006/07, then the impact of changing participation rates and changes in data quality between the years should always be taken into account, and appropriate confidence limits or statistical testing introduced to ensure any reported differences are indeed significant. The suggested method for use when detecting a change in prevalence is described in appendix 2 of this guidance.
- 7.5. Where changes in prevalence are identified at local level users should be careful to ensure these changes could not have resulted merely from variations in data quality or participation rates.
- 7.6. When looking for change in populations over time a number of papers have suggested looking at change in a measure such as mean z score, rather than change in prevalence figures.<sup>13, 14</sup>
- 7.7. **BMI distribution:** Users of the 2007/08 NCMP dataset may want to make use of the full range of height, weight and BMI measures to comment on the population as a whole rather than only the overweight, obese and underweight children.
- 7.8. If this is done, the possible confounding effect of age on such analysis should be addressed. The expected height, weight and BMI of children vary substantially with age, so if age is not considered, the shape of the distribution will be affected. Users should therefore consider the use of the height, weight and BMI z scores for age of individual children (which is also available in the dataset provided by the IC). It is important to note however that use of z scores from the UK90 growth reference will have the effect of normalising the distribution, so these curves should be interpreted in terms of difference from the normal distribution, rather than as the population distribution per se.

## 8. Feeding back results to schools

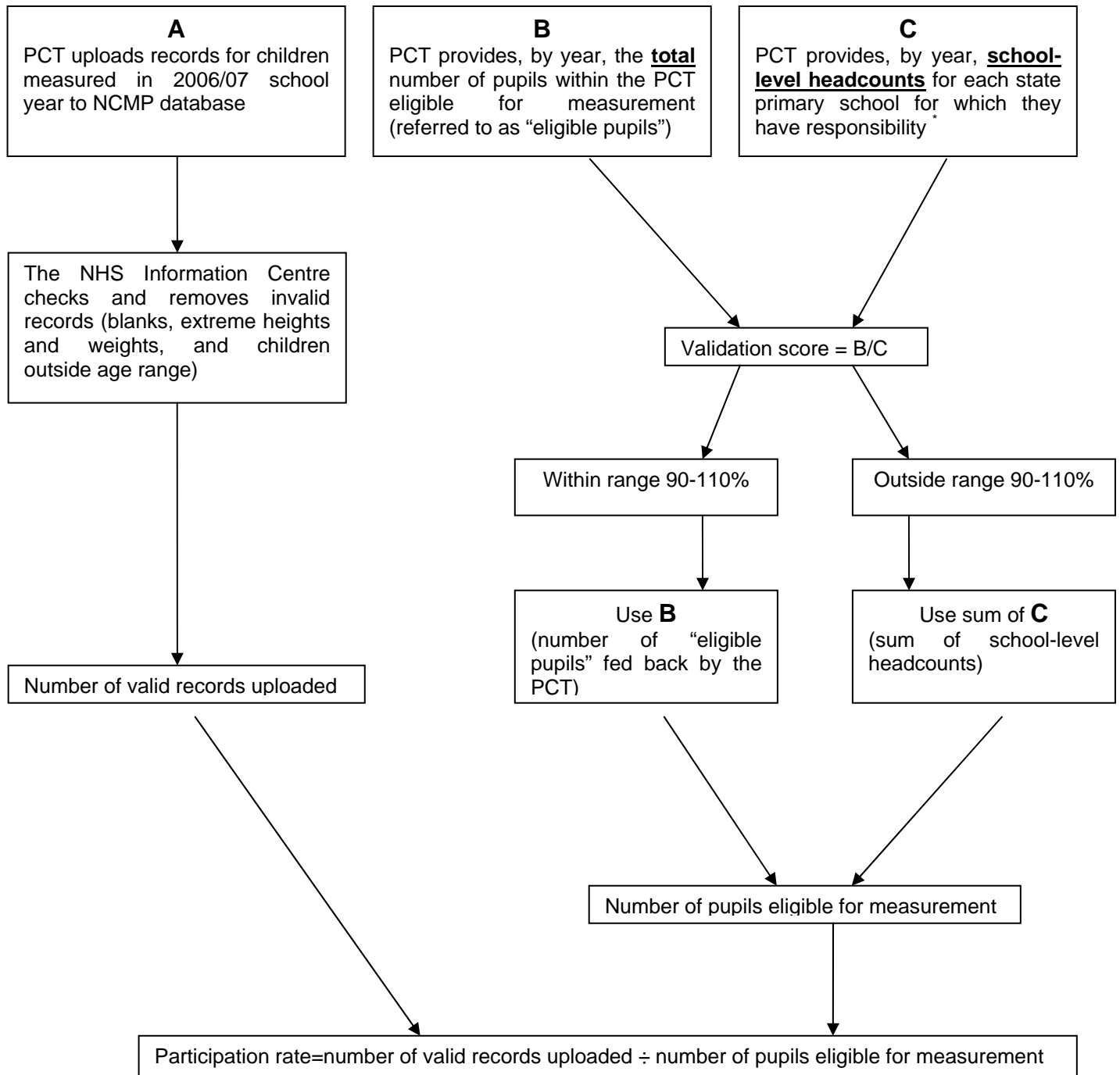
If the data quality checks and other analysis described above raise no substantial concerns, users of the NCMP dataset might want to feed back some information to schools. If feedback is given, it is important to ensure it is based on robust data and does not risk identification of results of individual children.

- 8.1. Neither school-level obesity prevalence rates, nor raw numerical data, should be fed back to schools. The reasons for this are:
  - With small denominator populations, such as those for primary schools, the numbers of overweight and obese children are likely to be small. Publication of these small number data might therefore allow individual children to be identified. This would contravene disclosure rules and is not permissible.
  - Class sizes in primary schools are small, so school-level prevalence figures will be subject to small number variation. They would, therefore, not provide robust measures of obesity prevalence, even if there were 100% coverage of all children in the relevant age-groups within a school.
  - Most schools will have less than 100% coverage. Some groups, such as overweight or obese children, are more likely to opt out of the exercise than others, thus introducing bias into the results and rendering them less reliable at school level.
- 8.2. As a result, any school feedback should be provided using one of the following categories (using the statistical methods provided in *appendix 2*):
  - significantly higher than the national/regional/PCT average
  - significantly lower than the national/regional/PCT average
  - no different from the national/regional/PCT average
  - insufficient information to provide feedback.
- 8.3. The fourth category should be used if the participation rate is low (eg, less than 70%) in a school.
- 8.4. Since the limits set out above are likely to exclude at least a third of schools from school-level feedback, PHOs may wish to consider clustering schools to enable feedback to be provided for all schools. Schools could be clustered geographically, or according to shared characteristics such as deprivation. PHOs should use local intelligence to determine how this could best be done for their area.
- 8.5. The choice of a suitable comparator (ie national, regional or PCT) should be made by the PHO dependent on local data. For a small PCT, comparison with the PCT average is unlikely to show many significant differences at school level (because of the wide confidence limits around the PCT figure). Use of the national average reduces this

problem, but for a region in which obesity prevalence is substantially lower or higher than the national average, this could mean that most schools are rated as being significantly higher or lower than the comparator. The regional average might provide a good compromise in such situations and will also reduce the workload if school-level feedback is to be produced at PHO level.

- 8.6. It is important that great care is taken to ensure that prevalence and participation information is fed back to the correct school (given the evidence that some pupils have been miscoded to schools within the NCMP dataset as described in section 6.13). If, for example, prevalence and participation information for Year 6 pupils were fed back to an infant school that does not have Year 6 pupils, or if a school were incorrectly told none of their pupils were measured in 2006/07, there is a real danger that this could prejudice school engagement in the NCMP for future years.
- 8.7. A standard school feedback letter - for PCTs to use to return school or school cluster data to participating schools - is provided in *appendix 3*.
- 8.8. To support the use of this letter, NOO have developed an Excel-based tool which can be used by PHOs or PCTs automatically to generate and populate these school feedback letters. A test version of this tool has already been circulated to PHOs for comments, and a revised version, which will include both 2006/07 and 2007/08 data will be released in January 2009. If PCTs have any questions about this tool and how it can be used, they are advised to contact their local PHO in the first instance.

## Appendix 1: calculation of participation rates



\* Where the "school-level headcount" provided by a PCT for an age-group is less than the number of pupils measured for that age-group, the number of pupils measured is used as the school-level headcount. This ensures participation rates do not exceed 100% for any school for either reception year or year six.

## Appendix 2: Methods for confidence limits

We recommend that 95% confidence intervals are calculated with the method described by Wilson<sup>15</sup> and Newcombe<sup>16</sup> which is a good approximation of the exact method.

The estimated proportions of children with and without the feature of interest were calculated:

observed number of obese children in each area =  $r$

sample size =  $n$

proportion with feature of interest =  $p = r/n$

proportion without feature of interest =  $q = (1 - p)$

Three values (A, B and C) were then calculated as follows:

$$A = 2r + z^2; \quad B = z\sqrt{z^2 + 4rq}; \quad \text{and} \quad C = 2(n + z^2)$$

where  $z$  is the appropriate value,  $z_{1-\alpha/2}$ , from the standard Normal distribution. Then the confidence interval for the population proportion is given by

$$(A-B)/C \quad \text{to} \quad (A+B)/C$$

This method is superior to other approaches (e.g. the Aiken/Likelihood method currently used in the national Compendium of Clinical and Health Indicators) because it can be used for any data. When there are no observed events, then  $r$  and hence  $p$  are both zero, and the recommended confidence interval simplifies to 0 to  $z^2/(n+z^2)$ . When  $r = n$  so that  $p = 1$ , the interval becomes  $n/(n+z^2)$  to 1.

If the difference between two rates or proportions is being calculated, we recommend the use of the approach outlined in Statistics with Confidence (edition 2):<sup>17</sup>

Where the difference in two rates or proportions,  $\hat{D} = \hat{p}_2 - \hat{p}_1$

has confidence limits from:

$$\hat{D} - \sqrt{(\hat{p}_2 - l_2)^2 + (u_1 - \hat{p}_1)^2} \quad \text{to} \quad \hat{D} + \sqrt{(\hat{p}_1 - l_1)^2 + (u_2 - \hat{p}_2)^2}$$

where  $\hat{p}_i$  is the estimated prevalence for year  $i$ , and  $l_i$  and  $u_i$  are the lower and upper confidence intervals for  $\hat{p}_i$  respectively.

This method is also provided as 'method 10' in the Newcombe paper 'interval estimation for the difference between independent proportions: comparison of eleven methods'.<sup>18</sup>



## Appendix 3: Specimen school feedback letter



<< PCT name >>  
<< PCT address line 1 >>  
<< PCT address line 2 >>  
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<< PCT postcode >>

<< School name >>  
<< School address line 1 >>  
<< School address line 2 >>  
<< School address line 3 >>  
<< School address line 4 >>  
<< School postcode >>

<< Date >>

### Results from the National Child Measurement Programme 2007/08

Dear Headteacher

I am writing to thank you for taking part in the National Child Measurement Programme (NCMP) in 2007/08 and to provide you with some feedback from the programme. Nationally, we are delighted that schools achieved a great improvement over the first year with xx% participation by eligible children.

The NCMP is an integral component of the Government's Healthy Weight, Healthy Lives: A Cross-Government Strategy For England (published Jan 08). This has the ambition: of being the first major country to reverse the rising tide of obesity and overweight in the population by ensuring that all individuals are able to maintain a healthy weight. Now in its third year, the NCMP is providing valuable information on rates of underweight, overweight and obesity in children. This vital information is already being used to inform children's service planning and delivery locally, regionally and nationally. Parents can also receive their children's results from the PCT, encouraging their engagement with healthy lifestyles and weight issues.

Your school's continuing engagement in the programme is important in helping to achieve the 100% coverage of the programme needed if we are to deliver the challenging ambition for healthy weight and growth.

The national results from the 2007/08 year of measurement were recently published by the NHS Information Centre. You can find the results for your local area or download the full report at:  
**<http://www.ic.nhs.uk/ncmp>**

In addition I am attaching a summary of the 2007/08 results for your school with some supporting information. This includes a comparison of the prevalence of underweight, overweight and obese children in your school with national, regional and local Primary Care Trust figures. Please note that specific percentages cannot be disclosed for individual schools because of the need to avoid identification of individual children.

So thank you again for your school's participation. If you want to discuss these results, please feel free to contact **[Insert name and contact details for appropriate contact]**

Yours sincerely

PCT obesity lead

# NCMP 2007/08 Results Summary

Results for: << School name >>

PCT Name: << PCT name >>

Region used for comparison: << PCT region >>

## Participation rates

National participation rate:

Reception	x%
Year 6	x%
Total	x%

Regional participation rate:

Reception	x%
Year 6	x%
Total	x%

PCT participation rate:

Reception	x%
Year 6	x%
Total	x%

School participation rate:

Reception	x%
Year 6	x%
Total	x%

Your school's participation in the 2007/08 NCMP was << statistically significantly above / statistically significantly below / not statistically different from >> the England average.\*

<< For those schools with below average participation rates, it is very important that these are improved upon in future years. / Even in areas where participation was good, it is important to try and maintain, or ideally increase participation rates in future years. >>

Analysis at the national level shows that lower participation rates are associated with lower reported prevalence of obesity. This is likely to be due to a selective opt-out of heavier children from the programme.

<< If your participation rates are lower than the regional average, it is quite possible that the prevalence figures below may underestimate the true prevalence of obesity in your school. / Even for schools with a good participation rate in 2007/08, it is still possible that such selective opt-out may occur, leading to an underestimation of the true prevalence of obesity for your school. >>

It is therefore important that all schools strive to achieve as high a participation rate as is possible in future years of the NCMP.

If participation rates fall below 70%, the data for your school will be considered too unreliable to provide any meaningful information, and so your school will be shown as having 'insufficient information'.

\* In this report any differences between your school and the area of comparison have been checked for statistical significance. This means that, if your school appears to have a different participation rate or prevalence to the comparator, there is a 95% chance that these differences are real, and only a 5% chance that they have arisen by chance due to the random natural variation amongst schools.

## Prevalence of obesity, overweight and underweight

National prevalence rates:

	Underweight	Overweight	Obesity
Reception	x%	x%	x%
Year 6	x%	x%	x%

Regional prevalence rates:

	Underweight	Overweight	Obesity
Reception	x%	x%	x%
Year 6	x%	x%	x%

PCT prevalence rates:

	Underweight	Overweight	Obesity
Reception	x%	x%	x%
Year 6	x%	x%	x%

It is important to note that the prevalence figures shown here use population monitoring definitions which are different, and less specific, than the definitions that would be used in a clinical setting. As a result these figures will be slightly higher than the percentage of children who would be clinically diagnosed as being obese, overweight or underweight.

School prevalence indicator:

Reception		No data or insufficient data	Statistically significantly below the England average	Not statistically significantly different from the England average	Statistically significantly higher than the England average
	Underweight				
	Overweight				
	Obese				
Year 6		No data or insufficient data	Statistically significantly below the England average	Not statistically significantly different from the England average	Statistically significantly higher than the England average
	Underweight				
	Overweight				
	Obese				

If your school has a higher obesity and overweight prevalence than the region as a whole, you will want to consider whether you can make your school a healthier place as part of contributing to the wider well-being of children at school. The Government wants all children and young people to be healthy and to achieve their full potential. A range of resources and support has been developed to help make schools healthier places for pupils and staff to work and learn in.

If your school has a prevalence rate as good, or better, than the region as a whole, I would encourage you to consider how you can continue this record and make your school healthier by further promoting healthy weight and wider well-being.

If your school is shown to have 'insufficient data' this is because your school had a very low participation rate in the NCMP and so it is not possible to provide accurate comparisons of the levels of child obesity. If your school has a low participation rate, encouraging full participation in the 2008/09 NCMP as part of contributing to the wider well-being of children at school may make it possible to provide prevalence figures for your school next year.

Useful resources to help you make your school a healthier place, and to improve NCMP response rates, are available at: [www.teachernet.gov.uk/wholeschool/obesity](http://www.teachernet.gov.uk/wholeschool/obesity).

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