

# **National Diet and Nutrition Survey: Headline results from Years 1 and 2 (combined) of the Rolling Programme (2008/2009 – 2009/10)**

## **Supplementary report on blood analytes**

### **Executive summary**

#### **Introduction**

The National Diet and Nutrition Survey (NDNS) is a continuous survey programme designed to assess the diet, nutrient intake and nutritional status of the general population aged 18 months upwards living in private households in the UK. The NDNS is jointly funded by the Department of Health in England and the UK Food Standards Agency and is carried out by a consortium of three organisations: National Centre for Social Research (NatCen), MRC Human Nutrition Research (HNR) and the University College London Medical School (UCL). Additional recruitment was undertaken in Scotland, Northern Ireland and Wales, funded by organisations in those countries, in order to achieve large enough samples to report separate results for each country. These results will be reported at a later date when sufficient numbers are available for analysis.

The design and methods used in the NDNS rolling programme are described in the main report of results from Years 1 and 2 combined, published in July 2011.<sup>1</sup> This supplementary report covers the results from analysis of blood samples for Years 1 and 2 combined, for adults aged 19 to 64 years and children aged 11 to 18 years.

Blood samples were taken (with written consent from the participant or a parent/guardian for children under 16 years) by qualified nurses (paediatric phlebotomists for children under 11 years) and analysed for a range of biochemical indices of nutritional status. These results were compared with reference values where available.

## **What this report adds to the main report**

The results in this report give a fuller picture of the nutrition of the population than can be obtained by analysis of the diet alone.

The results in the main report were based on assessment of food consumption over four days and so tell us about diet over a relatively short period. Analysis of blood samples can provide an indication of the nutritional status of the population over a longer period. Nutritional status means the level of nutrients available to the body (after absorption) for use in metabolic processes. For some micronutrients, status can be assessed by directly measuring the level of the nutrient in blood, while for others it is assessed by a functional measure such as the activity of vitamin-dependent enzymes, for example the red cell enzyme glutathione reductase is dependent on a co-factor derived from riboflavin. Threshold levels, below or above which low status is indicated, have been set for some, though not all micronutrients. A value indicating that the individual has low status for that micronutrient usually means that body stores or tissue levels are depleted and the individual is at greater risk of deficiency. This may reflect dietary inadequacy or health issues such as blood loss. However a level indicating low status does not necessarily mean that the individual is clinically deficient, rather that they are at risk of becoming deficient. The concentrations of some nutrients in the body, for example iron, are regulated by homeostatic mechanisms and are less subject to fluctuations due to day-to-day variations in diet. Some nutritional status measures, such as plasma retinol and plasma ferritin, reflect body stores of nutrients (vitamin A and iron respectively in this case), and are relatively insensitive to short term fluctuations in intake. Other measures such as plasma vitamin C reflect recent intake more closely.

At a population level measures of nutritional status do give a broad indication of diet. For example higher vegetable and fruit consumption is associated with higher blood levels of vitamin C and carotenoids. However it is not possible to use the results from the blood sample to validate or check the dietary results at an individual level. Additionally, as the blood sample was collected up to 5 months after the dietary data a close correlation between diet and status measures in this survey would not be expected, even for those nutrients for which blood levels reflect recent intake. The nutritional status data from the blood samples are influenced by factors other than

diet. For example iron status is affected by controls on intestinal absorption and by blood loss, such as menstrual loss in women. For vitamin D, generally the major determinant of status is exposure to summer sunlight rather than diet.

### **Methodological issues**

The data presented in this report are based on relatively small numbers - approximately 360 for adults aged 19 to 64 years and 160 for children aged 11 to 18 years.<sup>ii</sup> The number of adult women in the sample (231) is larger than adult men (160) as women had a higher response to the dietary survey component. However for the 11 to 18 year age group the number of participants was smaller for girls (79) than for boys (99) as girls had a lower response to both stages of the survey. It is because of the relatively small numbers that this report does not make definitive statements about the proportion of the population with biomarker values outside normal ranges or below or above thresholds indicative of low status where these have been set. It is intended to report this in future years when the numbers have accumulated.

The response rate for blood sample collection was lower than for the dietary survey component and it is possible that the sample may be biased – those participants who agreed to be visited by a nurse and then went on to give a blood sample may have different characteristics from those who did not. The response rate for the dietary part of the survey was 55%. However some participants dropped out when asked to agree to a nurse visit and a further percentage declined to give a blood sample. In Years 1 and 2 (combined) 48% of adults aged 19 to 64 years and 40% of children aged 11 to 18 years who took part in the dietary survey component went on to give a blood sample. The data are weighted to correct for non-response to giving a blood sample.

The NDNS rolling programme collected blood samples following an overnight fast for all age groups except children under four years. Fasting blood samples are considered to be scientifically more robust because some analytes are affected by recent food consumption. This is a change in methodology from the previous NDNS of adults carried out in 2000/01, which collected non-fasting samples and means that comparisons with that survey cannot be made for nutrients affected by recent

consumption. In addition, some of the analytical methods have changed since previous NDNS in 1997 and 2000/01 and the new analytical methods are not always comparable with those used in the previous surveys. Because of these methodological changes we have not made comparisons between the blood results in this report with those in previous NDNS surveys.

### **Content of this report**

This report presents descriptive statistics on blood status indicators for the following micronutrients: iron; vitamin C; vitamin B<sub>12</sub>; vitamin B<sub>1</sub> (thiamin); vitamin B<sub>2</sub> (riboflavin); vitamin B<sub>6</sub>; retinol; carotenoids; vitamin D; vitamin E; selenium; zinc. Results are also reported for blood lipids, homocysteine and C-reactive protein.

### **Key findings**

The results in this report suggest that the areas of concern with respect to the nutritional status of adults and older children are similar to those found in previous NDNS carried out in 1997 and 2000/01 and are also in line with findings from other surveys where similar analytes have been measured. The findings are also not inconsistent with the findings from the dietary data. The results do not indicate any new areas of concern in the nutritional status of these population groups.

- There is evidence of iron-deficiency anaemia (as indicated by low haemoglobin levels) and low iron stores (plasma ferritin) in a proportion of adult women and older girls. This is in line with findings from previous surveys and does have health implications for these groups.
- There is evidence of low vitamin D status in adults and older children, both male and female. This has implications for bone health, in particular increased risk of rickets and osteomalacia.
- A substantial proportion of adults and older children have functional riboflavin status values indicative of low status. However the health implications of this are not known.
- There is no evidence of low status for other micronutrients where normal ranges or thresholds for low status have been set. Levels of vitamin C, B<sub>6</sub>, B<sub>12</sub>, thiamin, retinol and vitamin E fell within the normal range.

- A proportion of adults had elevated levels of blood lipids, increasing risk of cardiovascular disease. This is well known and in line with findings from health surveys.

### **Future reporting of blood analytes**

Combined data for Years 1-3 of the rolling programme are due to be published in summer 2012 alongside food consumption and nutrient intakes for the same period. This will give even more robust results for the same age groups based on a larger sample size. A full report of data from Years 1-4 is planned for publication in 2013. This will also include results from the blood analytes.

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<sup>i</sup> Bates B, Lennox A, Bates C, Swan G (eds) National Diet and Nutrition Survey: Headline results from Years 1 and 2 (combined) of the Rolling Programme (2008/09-2009/10). Available from:

[http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH\\_128166](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_128166)

<sup>ii</sup> Cell sizes vary slightly for each analyte as analyses are carried out in pre-determined priority order so lower priority analytes may not be possible for some individuals if the quantity of blood collected is not sufficient.