



Assessment of dietary sodium in adults aged 19 to 64 years in England (2011 & 2014), Scotland (2014) and Northern Ireland (2015)

User Guide

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Background

The Scientific Advisory Committee on Nutrition (SACN)¹ recommend a target reduction in the average salt intake of the population to no more than 6g per day. This figure has been adopted by the UK government as the recommended maximum salt intake for adults and children aged 11 years and over. Following publication of the SACN report in 2003, the government began a programme of reformulation work with the food industry aimed at reducing the salt content of processed food products. Voluntary salt reduction targets were first set in 2006, and subsequently in 2009, 2011 and 2014, for a range of food categories that contribute the most to the population's salt intakes.

Dietary salt intake can be assessed by measuring sodium excretion in urine. A 24-hour urine collection method was used as this was consistent with previous surveys. Since the level of sodium in urine fluctuates according to what was eaten at the last meal and how much fluid an individual has drunk, and because salt is the predominant source of sodium in the UK diet, a urine collection over 24 hours is accepted as being the most reliable method for assessing salt intake in the population. To be usable in the final analysis the 24-hour collection had to be complete, which can be measured by analysis of para-aminobenzoic acid (PABA) excretion.

¹ Scientific Advisory Committee on Nutrition (2003). Salt and Health. The Stationery Office.
http://www.sacn.gov.uk/pdfs/sacn_salt_final.pdf (accessed 25/05/17)

National Diet and Nutrition Rolling Programme (NDNS RP) sodium surveys

The NDNS programme began in 1992 as a series of cross-sectional surveys, each covering a different age group. Since 2008, the NDNS has been a RP covering adults and children aged 1.5 years and over. The NDNS collection also includes four separate survey assessments of dietary sodium in adults.

England 2011 sodium study

Estimated salt intake of adults aged 19 to 64 years in England was assessed from 24-hour urinary sodium excretion of 547 adults, selected to be representative of this section of the population and to be sufficient to detect a difference of 0.5g of salt intake compared with the previous UK survey in 2008 (calculated from the standard error in that survey). Urine samples were collected over five months (July to December) in 2011.

<https://www.gov.uk/government/publications/assessment-of-dietary-sodium-levels-among-adults-aged-19-64-in-england-2011>

England 2014 sodium study

Estimated salt intake of adults aged 19 to 64 years in England was assessed from 24-hour urinary sodium excretion of 689 adults, selected to be representative of this section of the population and to be sufficient to detect a difference of 0.5g of salt intake compared with the previous survey in England in 2011 (calculated from the standard error in that survey). Urine samples were collected over five months (May to September) in 2014.

<https://www.gov.uk/government/statistics/national-diet-and-nutrition-survey-assessment-of-dietary-sodium-in-adults-in-england-2014>

Scotland 2014 sodium study

Estimated salt intake of adults aged 19 to 64 years in Scotland was assessed from the 24-hour urinary sodium excretion of 663 adults, selected to be representative of this section of the population and to be sufficient to detect a difference of 0.5g of salt intake compared with the previous survey carried out in Scotland in 2009 (calculated from the standard error in that survey). Urine samples were collected over five months (May to September) in 2014, concurrently with the survey in England.

<http://www.foodstandards.gov.scot/national-diet-and-nutrition-survey-assessment-dietary-sodium>

Northern Ireland 2015 sodium study

Estimated salt intake of adults aged 19 to 64 years in Northern Ireland was assessed from the sodium excretion in complete 24-hour urine collections from 609 participants, selected to be representative of this section of the population. Urine samples were collected over seven months (February to August) in 2015

<https://www.food.gov.uk/northern-ireland/nutritionni/national-diet-and-nutrition-survey-assessment-of-dietary-sodium>

All surveys had the following common aims:

- to assess urinary sodium excretion in adults aged 19 to 64 years by collecting and analysing 24-hour urine samples for a representative sample of the population
- to estimate dietary salt intakes (g/day) from urinary sodium excretion
- to conduct an analysis of trends in estimated salt intake (g/day) based on data collected from previous urinary sodium surveys (not Northern Ireland)
- (For Scotland and Northern Ireland) to statistically compare estimated salt intake with the estimate for the England 2014 sodium survey

Data collected during the four surveys are contained in one combined data file.

Survey Design

England 2011 study

Participants were recruited from two sources:

- **the core England NDNS RP sample** interviewed by nurses in the first five months of Year 4 nurse fieldwork (visits carried out between 07/07/11 and 14/12/11).
- **a “sodium boost” study** that ran separately to, but using the same protocols as, the NDNS RP. A random sample of 43 postcode sectors was selected from the Postcode Address File (PAF). Within the 43 postcode sectors, a random sample of telephone numbers was drawn using Random Digit Dialling (RDD). A maximum of two people aged 19 to 64 years within each household were eligible to take part in the study. Where there were more than two eligible adults in a household, two adults were randomly selected. Females who were pregnant or breastfeeding were not eligible to take part. To increase the number of male participants in this current study, male household members were given a higher chance of being selected. Fieldwork ran between 05/09/11 and 14/12/11.

England 2014, Scotland 2014, Northern Ireland 2015 studies

For each of these studies, a random sample of 45 postcode sectors was selected from the PAF. Within the 45 postcode sectors a random sample of telephone numbers was drawn using RDD. A maximum of two people aged 19 to 64 years within each household were eligible to take part in the study. Where there were more than two eligible adults in a household, two adults were randomly selected. Those living in institutions and females who were pregnant or breastfeeding were not eligible to take part in the survey.

24-hour Urine Collection Protocol

After obtaining written consent, participants were asked to collect all urine they passed during a 24-hour period starting from the second morning urine passed of the 24-hour collection day, and ending with the first urine passed the following morning. Participants were also asked to take three para-amino benzoic acid (PABA) tablets at evenly spaced intervals throughout the day of the collection. Analysis of PABA excretion provided a measure of the completeness of the 24-hour urine sample. However, unlike previous sodium excretion surveys, participants were still eligible to take part if they did not want or were unable to take PABA but were willing to carry out the 24-hour urine collection.

After the collection period, the nurse/fieldworker² weighed the urine that was collected and took two sub-samples from the collected urine and disposed of the remaining urine and equipment. Measurement of urinary sodium was carried out using an ion selective electrode on the Siemens Dimension® Xpand clinical chemistry system with the QuikLYTE® module. The 24-hour excretion was determined by multiplying urinary concentration by 24-hour volume (determined by weighing the collection). See below for notes regarding correction of urinary sodium excretion to allow for slight instrumental negative bias.

Urinary potassium and creatinine were measured simultaneously with sodium.

The data were validated as representing intake over 24 hours by checking completeness of the urine collections by the para-aminobenzoic acid (PABA) method.

² Fieldwork for the 2015 Northern Ireland study was conducted by fieldworkers from the University of Ulster. Fieldwork for the 2011 and 2014 England and 2014 Scotland studies was conducted by NatCen nurses.

Correction of urinary sodium excretion

Urinary sodium for these surveys was measured using the Siemens Dimension Xpand analyser with Quiklyte ISE module. This was shown to have a small negative bias relative to instruments providing accurate urinary sodium measurements as assessed by UK NEQAS; within acceptable limits for diagnostic purposes but not for assessment of population sodium intake and investigation of trends in this over time. A comparison study using over 200 urine samples was therefore conducted between the Siemens Dimension Xpand and an instrument which performs accurately in UKNEQAS; correction factors were determined to enhance the accuracy of measurements of 24-hour urine sodium excretion in these surveys. For England 2011 and 2014 and Scotland 2014, 24-hour excretions were corrected by multiplying by 1.052, and for Northern Ireland 2015 by 1.03. These corrected 24-hour excretions (“UR24hNa_Corrected” in the dataset) should be used. The uncorrected concentrations “Na_mmol” (as determined by the instrument) and uncorrected 24-hour sodium excretion “Ur24hNa” (calculated from this without correction of bias) are also included in the dataset, for completeness.

Results included in the dataset

For the published assessment of dietary sodium^{3 4 5 6}, only participants in the age range 19 to 64 years old with a complete 24-hour urine collection were analysed. These are identifiable in the dataset as 'Include_Analysis = 1'.

The archived dataset contains additional 828 individuals who were not included in the published survey reports as they either did not provide a complete 24-hour urine collection or were outside the 19-64 years age range. These individuals are identifiable in the dataset as 'Include_Analysis = 2'. Certain results – see list below – are not available for these individuals:

Results not available for those participants who did not provide a complete 24-hour urine collection		
2011	2014	2015
UrineWt_KG	UrineWt_KG	UrineWt_KG
Ur24hNa_Uncorrected	Ur24hNa_Uncorrected	Ur24hNa_Uncorrected
UR24hNa_Corrected	UR24hNa_Corrected	UR24hNa_Corrected
Ur24hK	Ur24hK	Ur24hK
Ur24hCreatinine	Ur24hCreatinine	Ur24hCreatinine
Salt24h_intake	Salt24h_intake	Salt24h_intake
	Na_mmol_Uncorrected	Na_mmol_Uncorrected ^a

^a Na_mmol is not available for 26 of the 158 participants who did not provide a complete 24-hour urine collection

³ <https://www.gov.uk/government/publications/assessment-of-dietary-sodium-levels-among-adults-aged-19-64-in-england-2011>

⁴ <https://www.gov.uk/government/statistics/national-diet-and-nutrition-survey-assessment-of-dietary-sodium-in-adults-in-england-2014>

⁵ <http://www.foodstandards.gov.scot/national-diet-and-nutrition-survey-assessment-dietary-sodium>

⁶ <https://www.food.gov.uk/northern-ireland/nutritionni/national-diet-and-nutrition-survey-assessment-of-dietary-sodium>

Weighting

There were two stages to the weighting:

- the first step was to generate a set of weights to correct for unequal selection probabilities of individuals within households.
- the second stage was to make an adjustment for different levels of non-response.

A set of selection weights were generated to adjust the sample for selection of individuals within eligible households. Selection probabilities varied depending on the sample source.

In each eligible **NDNS RP** household (England 2011 study only), one adult had been selected (at random with equal probability) hence the selection weights are equal to 1. The selection weights are then equal to the inverse of this selection probability. The selection weights were then adjusted to create a final set of weights for analysis.

More information about the National Diet and Nutrition Survey Years 1 to 4 (combined) and the results can be found here:

<https://www.gov.uk/government/statistics/national-diet-and-nutrition-survey-results-from-years-1-to-4-combined-of-the-rolling-programme-for-2008-and-2009-to-2011-and-2012>

Further documents relating to NDNS Years 1 to 4 (combined) such as the user guide and variable list can be found on the data archive here:

<https://discover.ukdataservice.ac.uk/catalogue/?sn=6533&type=Data%20catalogue>

For the **samples for each of the sodium boost studies** up to two adults aged 19 to 64 years were selected from each household, with male household members having a higher chance of being selected. Men in households with three or more eligible individuals were weighted by a factor of 1.56, whilst women within the households were given a weight of 1.00. A factor of 1.56 was chosen as it was estimated that this would increase young males in the responding sample by around 30% (as previous studies had shown that men had lower response rates). Two household members were then selected at random with probability proportional to this weight. The selection probabilities for boost sample members in households with more than two eligible household members (i.e. more than two adults who were eligible for selection for the main study) are equal to: $2 \times \text{weighting factor} / \text{total weighting factor}$, where the weighting factor is 1.56 if the individual was male and 1.00 if the individual was female, and the total weighting factor is the sum of the weighting factors of all eligible household members.

The analysis weights (“wt_urine” in the dataset) were generated using calibration methods. The aim was to reduce bias resulting from sampling error and differential non-response by sex and age and Government Office Region (GOR). An iterative procedure was used to adjust the selection weight until the distribution of the (weighted) sample matched that of the population living in England by age, sex and GOR. The adjustment keeps the values of the final weights as close as possible to those of the initial weights to ensure the properties of the initial weights are retained in the final calibrated weights. Population information about individuals aged 19 to 64 and living in England was taken from the 2010 mid-year population estimates.

For the England 2011 sodium survey, only individuals who provided a complete 24-hour urine collection have an analysis weight.⁷ For England 2014, Scotland 2014 and Northern Ireland 2015, both individuals with a complete 24-hour urine collection and those without have an analysis weight.

When analysing the data from these four sodium surveys (England 2011, England 2014, Scotland 2014 and Northern Ireland 2015) it should be noted that the weights are only appropriate when comparing **between** surveys (i.e. England 2011 vs England 2014 or Northern Ireland 2015 vs England 2014). The weights **should not** be used to calculate summaries based on a combination of the surveys (i.e. England (England 2011 + England 2014), or 2014 (England 2014 + Scotland 2014)). If this is required an adjustment would be needed to the weights to reflect the combined sample population distribution.

⁷ One participant who does not have a complete 24-hour urine collection does have an analysis weight as they were reclassified as being incomplete after the weightings were calculated.