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National Diet and Nutrition Survey: Assessment of salt intake from urinary sodium in adults (aged 19 to 64 years) in England, 2018/19

User Guide

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Background

The Scientific Advisory Committee on Nutrition (SACN) recommends a target reduction in the average salt intake of the UK population to a maximum of 6 g/day.¹ This level has been set as the UK government recommended maximum salt intake for adults and children aged 11 years and over. Following publication of the SACN Salt and Health report in 2003, the UK 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 for a range of food categories that contribute the most to the population's salt intakes and further revised in 2009, 2011 and 2014.²

Dietary salt is the predominant source of sodium in the UK diet. As the majority (93%) of ingested sodium is excreted in urine, intake can best be assessed by measuring sodium excretion in urine.³ This method is considered more reliable than dietary assessment methods because of the known limitations in self reporting and quantifying discretionary salt used in cooking and prior to the consumption of food.⁴ A 24-hour urine collection method, validated by the *para*-aminobenzoic acid (PABA) method, was used for this survey, consistent with the previous UK government sodium surveys.^{5,6,7,8,9,10,11,12} This method is accepted as being the most reliable method for estimating salt intake in the population.¹³

Prior to this report, there have been 4 sodium surveys of representative samples of adults aged 19 to 64 years in England, all using 24-hour urine collections.^{5,6,7,12}

2018/19 England Sodium Survey

Estimated salt intake of adults aged 19 to 64 years in England was assessed from 24-hour urinary sodium excretion of 596 adults, selected to be representative of this section of the population and to be sufficient to detect a difference of 0.5 g of salt intake compared with the previous survey in England in 2014 (using an estimate of variation from the England 2011 and 2014 surveys). Urine samples were collected over seven months (November 2018 to May 2019).

The full report can be found at:

<https://www.gov.uk/government/statistics/announcements/national-diet-and-nutrition-survey-assessment-of-dietary-sodium-in-adults-aged-19-to-64-years-in-england-201819>

Survey Design

Participants were sampled from the Health Survey for England (HSE) 2017 cohort.ⁱ The HSE sample was designed to be representative of the population living in private households in England. Full details of the HSE sample design are reported in the Health Survey for England 2017 Methods Report.¹⁴ Individuals in the required age range who, at the time of their HSE 2017 interview, consented to be contacted for follow-up research and provided a telephone number for this purpose were included in the sample for the 2018/19 England Sodium Survey. In each household, up to 2 individuals fulfilling the above eligibility criteria were selected to participate. Females who were pregnant or breastfeeding were not eligible to take part. To compensate for lower response rates amongst younger adults, those aged 19 to 34 years in mixed-age households (i.e. containing adult(s) aged 19 to 34 years and aged 35 to 64 years) received a boosted probability of selection.

NatCen's Telephone Unit (TU) interviewers attempted to contact the 2,540 sampled households to introduce the survey and check the eligibility of individuals. If the individual(s) were deemed eligible (that is aged 19 to 64 years, had not moved home, were not pregnant/breastfeeding and no language barriers prevented them from participating), the interviewer then sought their willingness to take part in the survey and confirmed agreement for a NatCen nurse to make contact to arrange a home visit for collection of the 24-hour urine sample(s).

See the full report for more details regarding the survey design.

<https://www.gov.uk/government/statistics/announcements/national-diet-and-nutrition-survey-assessment-of-dietary-sodium-in-adults-aged-19-to-64-years-in-england-201819>

ⁱ Previous standalone sodium surveys in England (2011, 2014) used a sample design based on Random Digit Dialling. See the relevant reports for full detail of the methodology.^{7,12}

24-hour urine collection protocol

After obtaining written consent, the nurse instructed participants in the 24-hour urine protocol. Participants were asked to collect all urine during a 24-hour period starting from the second morning urine pass of the 24-hour collection day, until and including the first urine pass the following morning. The nurse used the Computer Assisted Personal Interview (CAPI) programme to randomly allocate a day of collection for the participant. If the allocated date was unsuitable for the participant, CAPI would randomly allocate an alternative start day. Nurses would discuss the allocation of the collection day with participant to emphasise the importance of the representativeness of the survey across the whole week. However, in order to maximise the number of samples collected, participants were allowed to collect their sample on the day of their choice if the allocated day was inconvenient or unsuitable. Women were guided to collect their urine when they were not menstruating, however samples were accepted if collected during menstruation.

Participants were provided with the necessary equipment to do the 24-hour collection and were asked to take 3 PABA tablets at evenly spaced intervalsⁱⁱ throughout the day of the collection to check the completeness of the collection. Participants were still eligible to take part if they were willing to carry out the 24-hour urine collection but could not (or did not want to) take PABA.ⁱⁱⁱ During the collection period, participants were required to record the time they took the PABA tablets, the start and finish times of their urine collection, any missed urine passes, and any medication or supplements taken during the collection period. The nurse revisited participants on the day or the day after the 24-hour urine collection was completed to pick up the samples, complete paperwork and send to the Cambridge BRC NDNS team for analysis. The nurse thoroughly mixed the urine collection before weighing. Urine was weighed using Salter Brecknell ElectroSamson digital handheld scales in order to determine total urine volume. The nurse collected 2 samples from the mixed, total 24-hour urine collection and disposed of the remaining urine and equipment. The nurse then packaged and posted the samples and paperwork to the Cambridge BRC NDNS team.

See the full report for more details regarding the 24-hour urine collection protocol.
<https://www.gov.uk/government/statistics/announcements/national-diet-and-nutrition-survey-assessment-of-dietary-sodium-in-adults-aged-19-to-64-years-in-england-201819>

Full fieldworker instructions are available on request.

ⁱⁱ Participants were asked to take the first tablet at the beginning of the collection period and the following 2 tablets 4-6 hours after the previous tablet.

ⁱⁱⁱ Participants who were allergic to vitamin preparations, hair dyes or sunscreen lotions were ineligible to take PABA.

Measurement of urinary sodium excretion and calculation of estimated dietary salt intake

Urinary sodium and PABA were measured by the Cambridge BRC NDNS team (NIHR BRC Nutritional Biomarker Laboratory). Measurement of urinary sodium^{iv} was performed using ion selective electrode (ISE) technology on the Roche Cobas C111 analyser (Roche Diagnostics Ltd, Burgess Hill, UK). Measurement of PABA was performed by high performance liquid chromatography (HPLC), based on a published method with modifications.^{15,16} Urinary creatinine was measured on the Siemens RXL clinical chemistry analyser at the Core Biochemical Assay Laboratory at Addenbrooke's Hospital, Cambridge.

At the time of the 2014 England Sodium Survey,⁷ urinary sodium concentrations from some of the previous surveys that used different laboratory analytical methods were adjusted using factors to take account of method-specific analytical biases so that the results were more directly comparable between surveys.

For the 2018/19 survey, a cross-validation using samples from the 2014 England Sodium Survey was performed to compare adjusted results from 2014 to results for the same samples measured using the Roche Cobas C111 analyser. The cross-validation demonstrated excellent comparability between the results and therefore no further method-specific correction factor was required and no adjustment was made to 2018/19 sodium results.

PABA concentration was measured in units of mg/L (PabaConc_mgL). PABA excreted over 24 hours (PABAmg24hr) was calculated by multiplying the PABA concentration by total urine volume (UrineWt_Kg). Where participants reported taking the three 80 mg PABA tablets (NoPABA), PABA excretion was expressed as the percentage of the 240 mg dose of PABA given to participants (PABA) with values between 70 and 103% indicating a complete 24-hour urine collection (CompStat).

Sodium concentration in urine was measured in units of mmol/L (Na_mmol). The total amount of sodium excreted over 24 hours was calculated by multiplying the sodium concentration by total urine volume (UrineWt_Kg) to provide sodium excretion per 24 hours (UR24hNa). Similar calculations were performed for potassium and creatinine.

In line with previous sodium surveys in the UK, estimated dietary salt intake (Salt24h_intake) was then calculated using the equation: 17.1 mmol of sodium = 1.0 g of salt.

^{iv} Urinary potassium and urinary creatinine concentration were also measured and are included in the dataset.

Results included in the dataset

For the published assessment of dietary sodium, participants in the age range 19 to 64 years old with a complete 24-hour urine collection were analysed and included in the dataset. The archived dataset contains additional 301 individuals who were not included in the published survey reports as they either did not provide a complete 24-hour urine collection. These individuals are identifiable in the dataset as 'Include_Analysis = 2'.

Weighting and stratification

There were 3 stages to the weighting. These are described in detail in appendices A.9 of the main report but in summary, the steps were to:

- account for differences in the willingness of HSE 2017 participants to consent to being contacted about future research
- combine this weight with another set of weights which corrects for unequal selection probabilities of individuals within households
- make an adjustment for different levels of non-response to this survey.

The 3 points at which non-response could occur were accounted for with the resulting weights then calibrated to ONS mid-year population estimates for 2018¹⁷ by age, sex and region to produce the final weights (finwt_validsamp). As such, the weighted profile of participants who provided a useable urine sample matches the profile of the population by age, sex and region. The distributions of the population and weighted and unweighted achieved sample are shown in table 12 of the report. The weight for complete and incomplete urine collections (finwt_anysamp) was also included in the dataset.

The stratification variable used in all analysis for the 2018/19 England Sodium Survey report was Government Office Region (GOR).

References

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