Appendix S Supplementary 24-hour urine analytes

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S.1 Introduction

Urinary potassium, urea, creatinine and nitrogen results are presented in this Appendix for all age groups (ie 4 to 6 years, 7 to 10 years, 11 to 18 years, 19 to 64 years and 65 years and over) and split by sex. Results for sodium excretion and estimated salt intake (excluding those aged 19 to 64 years) are presented in Chapter 7, along with more general information about the 24-hour urine collection protocol.

Data for the urine analytes in Table S.1 have been weighted to account for differential non-response to providing a 24-hour urine collection, in order to adjust for any bias arising from refusals and/or failures to provide a complete 24-hour urine collection. Details of the methodology used to weight the data are provided in Chapter 2 and Appendix B of this report.

S.2 Urine collection and processing

Eligible participants who agreed to the nurse visit were asked to provide a 24-hour urine collection for measurement of sodium, potassium, creatinine, urea and nitrogen excretion. Full details of the 24-hour urine collection protocol urine processing and storage are given in Appendix T.

S.3 Results used in the data analysis

Urine collections from 3,672 individuals aged 4 years and older (1,702 males and 1,970 females)[1] were analysed for potassium, urea, nitrogen and creatinine.[2] Of these, 53.7% of collections (1,971) were classified as ‘complete’ and are included in the descriptive statistics; 46.3% (1,701) were classified as ‘incomplete or unreliable’ and have been omitted (See Table T.1).

Potassium, urea and creatinine results from complete collections were converted to mmol/24hr based on the weight of the full collection in kg and the assumption of a specific gravity of 1.0 kg/litre. Nitrogen results were similarly converted to g/24hr.

S.4 Assessment of completeness of collection

As explained in Appendix T, “standard criteria” were used to classify participant 24-hour urine collections as “complete” or “incomplete / unreliable”. These included collections judged to be “complete by PABA” or “complete by claim”. An alternative child “claim only” criterion has additionally been applied for children aged 4 to 10 years in the light of the compliance difficulties with the PABA protocol (swallowing tablets) for young children.

Data are provided for adults and for children in accordance with the standard criteria. For the 4 to 10 years age group, data comprising 24-hour urines deemed complete by the standard criteria and by the additional child criterion are tabulated separately. For every analyte the application of the alternative child criterion made only a small difference to the population statistics.

(Table S.1)

S.5 Urinary potassium

A variety of food groups such as fruit and vegetables, meat, drinks, cereals and milk products contribute to potassium intake. Plasma potassium is subject to very tight homeostatic control and the great majority of ingested potassium from the diet is excreted in the urine.

Urinary potassium measurement has been suggested to be useful for validating dietary intake information on a population basis.[3]

(Table S.1)

S.6 Urinary urea

Urea is the main detoxification and excretory product of the ammonia derived from the de-amination of amino acids. Urea is therefore the most common nitrogen-containing end product of protein catabolism. It is synthesized in the liver and excreted by the kidneys. Urea production is increased when excess protein is ingested or when body protein is catabolised, regardless of cause. In most people the rate of production and urinary excretion is a reflection of the protein intake and the rate of degradation of tissue proteins. Urinary urea has been measured in the NDNS RP as an additional measure of total nitrogen excretion and therefore as an indication of protein intake.

(Table S.1)

S.7 Creatinine

Creatinine is the waste product derived from muscle creatinine and is released into the blood and excreted in the urine at a relatively constant rate which depends on the body muscle mass and meat intake. Creatinine is present in the ultra-filtrate of plasma which is formed by the glomerulus of the kidney, and is largely unaffected by passage through the kidney tubule. Therefore the daily creatinine excretion in urine reflects muscle mass, meat intake and renal glomerular function and although it is reasonably constant day-to-day for each individual it varies considerably between individuals and during the life course. Urinary creatinine has been measured in the NDNS RP so that current and future urinary analytes can, if required, be expressed as a ratio to creatinine excretion.

(Table S.1)

S.8 Urinary nitrogen

Nitrogen is an essential component of protein. For individuals in nitrogen balance, nitrogen excreted in the urine is a useful indicator of protein intake. However this is not the case if there is either an accumulation of total body nitrogen (eg growth, repair of lost muscle tissue) in which case urinary nitrogen underestimates protein intake, or loss of muscle mass due to starvation, dieting, injury or in old age, which would result in overestimation of protein intake.

(Table S.1)

[1] The percentage of complete urines in Appendices S and T is higher than that quoted in Chapter 7 for sodium analysis because the latter does not include adults aged 19-64 and as shown in Table T.1 this age-group was the most successful at making complete 24-hour urine collections.

[2] Urine samples were collected from a further four individuals (from three males and one female) but the samples were lost in the post and hence were not analysed (as shown in Table T.1).

[3] Tasevska, N., Runswick, S A., Bingham, S.A., (2006). Urinary potassium is as reliable as urinary nitrogen for use as a recovery biomarker in dietary studies of free living individuals. Journal of Nutrition, 136 (5), 1334-1340.