WHO-EM/NUT/279/E

How to obtain measures of population-level sodium intake in 24-hour urine samples

World Health Organization
REGIONAL OFFICE FOR THE Eastern Mediterranean

WHO-EM/NUT/279/E

How to obtain measures of population-level sodium intake in 24-hour urine samples

World Health Organization
Regional Office for the Eastern Mediterranean

WHO Library Cataloguing in Publication Data

World Health Organization. Regional Office for the Eastern Mediterranean
How to obtain measures of population-level sodium intake in 24-hour urine samples / World Health Organization. Regional Office for the Eastern Mediterranean
p.
WHO-EM/NUT/279/E

1. Sodium Chloride, Dietary - urine 2. Circadian Rhythm - physiology 3. Hypertension - urine 4. Waist Circumference 5. Biomarkers - urine 6. Eastern Mediterranean Region 7. Adults 8. Middle Aged I. Title II. Regional Office for the Eastern Mediterranean
(NLM Classification: WB 424)

Contents

Preface **5**

Acknowledgements **8**

1. Introduction **9**

Overview of the regional protocol on how to obtain measures of population-level sodium intake in 24-hour urine samples 9

Rationale for obtaining measures of population-level sodium in 24-hour urine samples 10

2. Field protocol **14**

Overview of the field protocol 14

Planning and conducting a 24-hour urine collection study 15

Selecting the population sample 16

Implementation plan 18

Applying for ethical approval 19

Time frames and data collection considerations 20

Adapting the regional protocol on how to obtain measures of population-level sodium in 24-hour urine samples 21

Pilot testing 21

3. Data collection guide **23**

Instructions for field staff, equipment and analytical methods 23

Guide to physical measurements 24

Measuring blood pressure and heart rate 26

Measuring height 29

Measuring weight 30

Measuring waist circumference 31

Measuring hip circumference 32

4. Detailed instructions for participants in 24-hour urine collection **34**

5. Household salt collection and iodine determination **37**

6. Use of spot urine to estimate 24-hour excretion of sodium, potassium and iodine 38

Questionnaire on how to obtain measures of population-level sodium intake in 24-hour urine samples 39

References 47

Preface

Noncommunicable diseases accounted for nearly half of all deaths in the Eastern Mediterranean region in 2005, and the socioeconomic burden of these diseases continues to increase. In the context of efforts to reduce this burden, initiatives to combat cardiovascular diseases – one of the four main noncommunicable disease killers – are particularly pressing.

There is compelling evidence (epidemiological, clinical and animal-experimental) of the direct relationship between salt consumption and blood pressure, and that current levels of salt intake are a major factor in increasing blood pressure (*3*,*4*,*5*). If people reduce dietary salt, whether they are normotensive or hypertensive, raised blood pressure can be avoided, hypertension better controlled, thousands of deaths from cardiovascular diseases such as stroke, heart and renal disease prevented (*6*), and health care systems spared substantial treatment and health-related costs (*7*, *8* ,*9* ,*10*,*11*).

WHO is coordinating initiatives globally to reduce dietary salt intake at the population level. In 2007 (*12*) and again in 2013 (*13*) WHO stated the objective of reducing population-level salt intake to the internationally recommended target of less than 5 g of salt per adult per day to prevent cardiovascular disease. Fundamental to the WHO Eastern Mediterranean Region initiative in this regard is for countries to estimate a baseline of population-level dietary salt intake, and from there, to monitor trends in intake and the effectiveness of any interventions within and between populations.

The best estimate of the population profile distribution and average level of dietary salt intake is provided by measuring 24-hour urinary sodium excretion in a representative sample of individuals (*15*). A protocol on how to obtain measures of population-level sodium intake in 24-hour urine samples is therefore an essential instrument and resource for countries that want to start, contribute to and share information on dietary salt reduction initiatives. In addition, the surveillance of a number of other factors along with salt intake are important in this context. Information on the main food sources of salt in the diet and the typical frequency of their consumption is essential to guide policy development and associated population-level interventions aimed at reducing dietary salt, while the joint surveillance of potassium – low levels of which are associated with hypertension and stroke – can also inform interventions to improve both sodium and potassium intakes. In addition, the joint surveillance of iodine intake would address the concern regarding the

possible detrimental effect of dietary salt reduction on programmes to prevent Iodine Deficiency Disorder that rely on salt as a carrier of iodine.

The protocol outlined in this manual offers guidelines on planning and preparing the scope and environment for a survey study to estimate dietary salt intake, recruiting and training field staff for data collection, and reporting and disseminating the results. It comprises six sections, which, taken together with the introduction on and rationale for surveillance of salt intake and the joint surveillance of potassium and iodine, follow a sequence that describes the implementation procedure for obtaining measures of population-level sodium in 24-hour urine samples. The protocol contains five data collection components: 1. a questionnaire on demographic and behavioural information; 2. a questionnaire on personal medical history, including drug treatment; 3. physical measurements; 4. 24-hour urine sample collection; and 5. a 50–100 g sample of household salt. The protocol can stand alone or be an additional module to an existing noncommunicable disease risk factor instrument (for example, the Eastern Mediterranean Region version of the WHO STEPwise approach to risk factor surveillance). If stand-alone, all five components of the protocol are required.

The primary aims of the protocol are: to estimate the average intake of dietary salt in men and women in the Eastern Mediterranean Region in the age stratum 25 to 64 through measurement of 24-hour urinary sodium excretion; to provide information for designing and implementing interventions aimed at reducing population-level dietary salt; to determine subsequent estimates of salt intake in the same population to assist monitoring intake over time; and to provide trends in salt intake against which to monitor and evaluate the effectiveness of interventions aimed at population-level dietary salt reduction. Additional aims are: to estimate the average intake of dietary potassium and iodine through joint measurement of 24-hour urinary potassium excretion, and determine creatinine excretion. Other possible aims are: to estimate intake of sodium, potassium and iodine in populations otherwise differentiated, for example, by ethnicity, socioeconomic status, geographic location, other target age groups, etc.; support health economic analysis by estimating salt intake for specific age strata; and estimate fluoride excretion (if required).

The protocol is primarily intended for principle investigator(s) of studies of sodium, potassium and iodine intake. Parts of the manual are also intended for field staff who are to interact with survey participants. The protocol contains both general information and specific instructional material that can be extracted and used for training and data collection. Section 3 of the manual – Data collection guide – offers field staff/survey team detailed instructions on carrying out 24-hour urine sample collections, including: interactions with participants; the equipment needed, both for field staff and for participants; and how to carry out selected physical measurements of participants. The

information sheet on the 24-hour urine collection to be given to participants is provided in section 4, and the full questionnaire of the protocol can be found at the end of the manual.

Acknowledgements

This document was prepared for the WHO Regional Office for the Eastern Mediterranean Region following the regional workshop on salt and fat reduction and setting up protocols for measuring salt and fat intake and content in food, held in Amman, Jordan on 10–12 September 2013. This document was prepared by the WHO Collaborating Centre for Nutrition of the University of Warwick, UK (Head: F.P. Cappuccio).

The Regional Office gratefully acknowledges the support of Dr Ala Alwan, Dr Ayoub Al Jawaldeh, Prof Philip James, Prof Graham MacGregor, and all participants and organizers of the workshop for the completion of this document.

This protocol is an update of the protocol developed by members of the PAHO/WHO Sub-Group on Surveillance of the Regional Expert Group for Cardiovascular Disease Prevention through population-wide dietary salt reduction (2009–2011): Norm Campbell, Francesco Cappuccio (Chair), Anselm Hennis, Simon Barquera, Ricardo Correa Rotter, Omar Dary, Rainford Wilks, Daniel Ferrante, and Roxana Buscaglione. It has been adapted for application in the WHO Eastern Mediterranean Region. Special thanks go to the Members of the Sub-Group, the Scientific Secretariat[2] and the supporting agencies[3].

[2]Barbara Legowski, Branka Legetic.
[3]National Institute of Public Health and the Salvador Zubiran National Institute of Medical Sciences and Nutrition of Mexico.

1. Introduction

Overview of the regional protocol on how to obtain measures of population-level sodium intake in 24-hour urine samples

The regional protocol on how to obtain measures of population-level sodium intake in 24-hour urine samples is a resource for countries that want to start, contribute to and share information on dietary salt reduction initiatives. It will assist with:

- planning and preparing the scope and environment for a survey study to estimate dietary salt intake
- recruiting and training field staff for data collection
- reporting and disseminating the results.

While the substance of concern to health is sodium, strategies to reduce its intake are aimed at its main source in the diet – salt (sodium chloride) – used in the household at the table or in cooking and as an additive in industrially manufactured foods.

Primary aims

- Estimate the average intake of dietary salt in men and women in the Eastern Mediterranean Region in the age stratum 25 to 64 years through measurement of 24-hour urinary sodium excretion.
- Provide information for designing and implementing interventions aimed at reducing population-level dietary salt.
- Determine subsequent estimates of salt intake in the same population to assist monitoring intake over time.
- Provide trends in salt intake against which to monitor and evaluate the effectiveness of interventions aimed at population-level dietary salt reduction.

Additional aims

- Estimate the average intake of dietary potassium through joint measurement of 24-hour urinary potassium excretion.
- Estimate the average intake of iodine through joint measurement of 24-hour urinary iodine excretion.
- Determine creatinine excretion.

Other possible aims

- Estimate intake of sodium, potassium and iodine in populations otherwise differentiated, for example, by ethnicity, socioeconomic status, geographic location, other target age groups, etc.
- Support health economic analysis by estimating salt intake for specific age strata.
- Estimate fluoride excretion (if required).

Intended audience

The protocol is primarily intended for principle investigator(s) of studies of sodium, potassium and iodine intake. Parts of the manual are also intended for field staff who are to interact with survey participants.

Structure

The protocol has six main sections which, taken together with the Introduction, follow a sequence that describes the implementation procedure for obtaining measures of population-level sodium, potassium and iodine intake in 24-hour urine samples.

There is both general information and specific instructional material that can be extracted and used for training and data collection.

Important conversions

5g salt (Na^+Cl^-) = 2,000 mg Na^+ = 87 mmol (or mEq) Na^+
23 mg Na^+ = 1 mmol (mEq) Na^+
39.1 mg K^+ = 1 mmol (mEq) K^+
126.9 mg I^- = 1 mmol (mEq) I^-
113.12 g Cr = 1 mol Cr

Na^+ = sodium K^+ = potassium
I^- = iodine Cr = creatinine

Rationale for obtaining measures of population-level sodium in 24-hour urine samples

Background

The regional burden of noncommunicable diseases continues to grow, and tackling it constitutes one of the major challenges for development in the 21st century. Cardiovascular diseases, cancers, diabetes and chronic pulmonary diseases accounted for half of all deaths in 2005. Globally, an estimated 35

million deaths related to noncommunicable diseases occur every year, representing 60% of all deaths, with 80% of these deaths occurring in developing countries. Approximately 16 million of these deaths occur among people under 70 years of age.

The total number of deaths from noncommunicable diseases is projected to increase by a further 17% over the next 10 years. WHO estimates that the highest increase in the number of deaths will occur in the African Region (27%), followed by the Eastern Mediterranean Region (25%) (*1*).

The cost of treatment of noncommunicable diseases is high. If it is not addressed, the economic impact will be enormous to both sufferers and society. Interventions aimed at reducing the burden of noncommunicable diseases and the main modifiable risk factors will provide the highest return on investment (*2*).

There is compelling evidence (epidemiological, clinical and animal-experimental) of the direct relationship between salt consumption and blood pressure, and that current levels of salt intake are a major factor in increasing blood pressure (*3*,*4*,*5*). If people reduce dietary salt, whether they are normotensive or hypertensive, raised blood pressure can be avoided, hypertension better controlled, thousands of deaths from stroke, heart and renal disease prevented (*6*) and health care systems spared substantial treatment and health-related costs (*7*,*8*,*9*,*10*,*11*).

WHO is coordinating initiatives globally to reduce dietary salt intake at the population level. In 2007 (*12*) and again in 2013 (*13*) WHO stated the objective of reducing population-level salt intake to the internationally recommended target of less than 5 g of salt per adult per day to prevent cardiovascular disease. Articles 43 and 44 of the United Nations Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases (2011) endorsed the policy and gave a mandate to WHO to implement it worldwide (*14*).

Rationale for surveillance of salt intake

Fundamental to the regional initiative is for countries to estimate a baseline of population-level dietary salt intake, and, from there, to monitor trends in intake and the effectiveness of any interventions within and between populations.

The best estimate of the population profile distribution and average level of dietary salt intake is provided by measuring 24-hour urinary sodium excretion in a representative sample of individuals (*15*).

Rationale for complementary food consumption information

To guide policy development and associated population-level interventions aimed at reducing dietary salt, not only is information needed on salt intake but also on the main food sources of salt in the diet and the typical frequency of their consumption. There are several methods available for collecting information on food consumption, among them 24-hour food recall. The INTERMAP Study is an international, cross-sectional, epidemiologic study where in-depth 24-hour dietary recall was used to identify foods that account for most dietary sodium intake (*16*).

While the instruments that collect food consumption information are typically very detailed in terms of the food products listed in order for survey participants to be able to select the specific products they consume, it is recommended that the products be grouped into a smaller number of broad categories. They become the basis for raising awareness among consumers as to the food categories that contribute the most salt to the diet, and are also the basis for policies and interventions with industry that include target setting per category. If a category is too wide and varied, it is difficult to set a target; if there are too many categories, target setting and monitoring can become unmanageable.

There are a number of examples of food categories to consider, among them the 12 food categories used in the Salt Campaign of the European Commission (17) and the 19 basic product groups and eight non-basic groups in the Choices Programme (18).

Rationale for joint surveillance of potassium

Low dietary potassium is associated with hypertension (*19*) and stroke (*20*) and supplementing potassium to hypertensive individuals lowers blood pressure (*21,22*) and reduces the use of anti-hypertensive medications (*23*). Increased potassium intake also reduces the hypertensive response to high dietary sodium. WHO now recommends increasing dietary potassium intake for the prevention of cardiovascular disease (*24*). Some populations are deficient in dietary potassium if they rely on processed foods, but there is a deficiency in data on the intake of potassium in most populations. Estimating potassium and sodium intake at the same time can inform the design of potential population interventions to improve both sodium and potassium intakes.

Rationale for joint surveillance of iodine

To address the concern regarding the possible detrimental effect of dietary salt reduction on programmes to prevent iodine deficiency disorder that rely

on salt as a carrier of iodine, it is recommended that iodine intake be assessed along with salt (*25*). The inclusion of this variable in studies of salt intake that use 24-hour urine samples would in fact benefit iodine deficiency disorder prevention programmes (*26*,*27*). The method provides the most accurate and appropriate indicator of whether populations, regardless of age, gender or climatic environment, are receiving the recommended amounts of this nutrient, which, judging from current salt intake and salt iodization levels, may be insufficient, sufficient and even excessive (*28*).

Use of spot- or timed urine testing

Collecting 24-hour urine samples has been considered difficult, and therefore the use of the spot-urine method has been proposed as an alternative (*29*). A number of papers have assessed the validity, reliability and reproducibility of several methods available in the literature that claim to be able to estimate 24-hour urinary sodium output from spot or timed collections (*30*,*35*). The results of these methodological assessments are all concordant in showing that every method leads to biased estimates of 24-hour urinary sodium excretions, although some are less biased than others.

To estimate intake of sodium, potassium and iodine, the use of spot urine is not recommended unless the following conditions are met:

- a baseline estimate of these analites has been conducted using the recommended methods for 24-hour urine assessment; and
- a calibration study for use of spot urine has been done in the specific population of interest.

Once the above conditions are met, 'timed' urine collections (over three or more hours with provision of water) would be preferred over non-timed ('spot') samples as they reduce the errors due to residual urine in the bladder.

[**Even if the above conditions are met, the results are likely to be unreliable, especially for population subgroups or time trends.**] See Section 6 for further information and advice on calibration.

2. Field protocol

Overview of the field protocol

Components

The protocol on how to obtain measures of population-level sodium intake in 24-hour urine samples can stand alone or be an additional module to an existing chronic noncommunicable disease risk factor instrument (for example, the regional version of the WHO STEPwise approach to risk factor surveillance) (*36*). If stand-alone, the following are the required components of the protocol.

	Description	Purpose
1	Questionnaire on demographic and behavioural information	To obtain data on: • Socio-demographic information • Tobacco and alcohol use • Dietary habits • Physical activity • Knowledge, attitudes and behaviour towards dietary salt
2	Questionnaire on personal medical history, including drug treatment	To determine the proportion of adults who: • Currently suffer from chronic noncommunicable diseases, and their complications • Are under daily long-term medical treatment for any condition
3	Physical measurements with simple methods	To determine the proportion of adults who: • Are overweight and obese • Have high blood pressure
4	24-hour urine sample collection	• To determine sodium, potassium and iodine excretion • To determine creatinine excretion
5	A 50–100 g sample of household salt	To determine the iodine content of household salt

If performed as part of another risk factor study that collects the data described in components 1 to 3, only components 4 and 5 of the protocol are required.

The data elements for components 1 to 3 are provided in the table below. They were developed with reference to the framework for risk factor surveillance in PanAmerican STEPS and an instrument from the University of Warwick WHO Collaborating Centre for Nutrition. The PAHO/WHO Expert Group for Cardiovascular Disease Prevention through Population-wide Dietary Salt Reduction developed the questions on knowledge, attitudes and behaviour towards dietary salt.

Core and expanded data

Each of the first three components of the protocol has a minimum core of required data and a set of expanded desirable data for collection, shown below. Whether core or core plus expanded data are collected depends on what can realistically be accomplished in each country setting (financially, logistically and in terms of human and clinical resources).

	Core	Expanded
1	• Basic demographic information including: {inset following 3 bullet points only} • Country and region of origin (if relevant) • Age • Sex • Tobacco use • Alcohol consumption • Physical activity • Sedentary behaviour • Fruit and vegetable consumption • Knowledge, attitudes and behaviour towards dietary salt	• Expanded demographic information including: {inset following 4 bullet points only} • Ethnicity • Highest level of education • Employment • Household income • History of tobacco use • Patterns of alcohol drinking • Oil and fat consumption • History of raised blood pressure • History of diabetes
2	• Current drug treatment used • Personal medical history	• Family medical history
3	• Height (cm) and weight (kg) • Waist circumference (cm) • Systolic and diastolic blood pressures (mmHg) and heart rate (bpm)	• Hip circumference (cm)

Planning and conducting a 24-hour urine collection study

Tasks and time frames

Below are the recommended tasks to plan and conduct a 24-hour urine collection study. The time frames will be situation specific, to be estimated to support the planning process.

Intended audience

This information is primarily intended for those fulfilling the roles of site coordinator or coordinating committee.

Tasks	Time frame
Develop implementation plan	
Identify scope of study	
Gain ethical approval	
Schedule data collection	
Adapting and translating the field protocol questionnaire	
Pilot test	

Selecting the population sample

Sample population

The sample size is determined by precision, variability within and between subjects, statistical power, play of chance, representativeness, feasibility and cost. Below is a matrix showing the relationship between sample size, precision in the difference in excreted sodium to be detected and variations in measurements.

In general, to detect approximately 1 g reduction in salt intake over time using 24-hour urinary sodium excretion, with a standard deviation of 75 mmol/day (alpha = 0.05, power = 0.80), a minimum sample of 120 individuals per age and sex stratum is recommended. To account for attrition (for example, non-participation, incomplete collection or implausible values), which may be as high as 50%, up to 240 people per age and sex stratum should be invited to participate.

Requirements for sample selection

- Sample should be random or otherwise probabilistic.
- Sample should be selected using culturally appropriate methods.
- Sample should be stratified by age group and sex with a minimum of four groups, that is, men and women each in two age groups 25–44 and 45–64 (or men and women in each of four age groups 25–34, 35–44, 45–54, 55–64).
- If a sentinel site is selected, long-term monitoring must be justifiable and feasible.
- Age and sex of respondents and non-respondents should be noted.
- If sodium excretion data from 24-hour urine samples are to inform health economics analysis of changes in sodium intake, see table below for the full dataset required.

Exclusion criteria

The survey should exclude:

- people unable to provide informed consent
- those with a known history of heart or kidney failure, stroke, liver disease
- those who recently began therapy with diuretics (less than two weeks prior to the proposed urine sample collection date)
- any other conditions that would make 24-hour urine collection difficult.

If pregnant women are included in the sample, their results must be analysed separately from those of other adult participants.

Matrix to determine sample size

Minimum difference in sodium excretion to be detected δ (mmol/day)	**Standard deviation S (SD)**	**Sample size *n* (for each age stratum)**	$n = 2\ \{[z(1-\alpha)/2] + [z(1-\beta)]\}^2 / \Delta^2$
10	10	16	
	20	63	
	30	141	
	40	251	
	50	392	
	60	565	
	70	769	where α = 0.05 and (1-β= 0.90 or 0.80, z=1.96 and 0.8416 respectively.
	80	1005	
20	10	4	$\Delta = \delta/s$
	20	16	where Δ = standardized difference i.e. (μ1 - μ2) / s
	30	35	δ = clinically important difference to be detected
	40	63	s = standard deviation
	50	98	
	60	141	
	70	192	
	80	251	
	10	2	
	20	7	
	30	16	
30	40	28	
	50	44	
	60	63	
	70	85	
	80	112	
40	10	1	
	20	4	
	30	9	
	40	16	
	50	25	
	60	35	
	70	48	
	80	63	
50	10	1	
	20	3	
	30	6	
	40	10	
	50	16	
	60	23	
	70	31	
	80	40	

Implementation plan

A detailed implementation plan for the 24-hour urine sample study is needed for all stakeholders involved in the surveillance process.

Purpose

The implementation plan is to:

- set out the scope of the surveillance and desired goals
- identify required resources
- lay out an action plan
- develop a communication strategy
- provide a budget as the basis for funding.

Core parts of the implementation plan

Below are the core parts needed for the implementation plan. Some have references to Sections within this document where there is information to assist with preparation.

Core part	Detail	References
Executive summary	• High-level summary of main points including: • current situation • goals and objectives • scope • resources • budget.	Section 1
Current situation	Specify: • whether the study will determine a baseline of sodium intake or assess change in intake; • if to assess change in intake, reference the baseline study; • if a risk factor survey has already been conducted • if there is an existing infrastructure (human capacity, equipment, other studies) on which the 24-hour urine sample collection could be built.	
Goals and objectives	• Identify planned goals and use of the information collected to: • Describe the current level of dietary salt intake in populations (if available); • track the direction and magnitude of trends in salt consumption; • plan and evaluate a health promotion or preventive campaign; • collect data from which to predict likely future demands for health services; • specify objectives that support gathering 'essential' information only; and • describe broad time frames.	
Scope	Specify: • the scope of surveillance to be conducted (coverage of core and expanded data); and • if future sodium determination surveillance can be assured.	Section 2
Sampling method	• Identify the sample size and sample frame that will be used. • Identify the geographical coverage. • Describe sample design.	Section 2
Resources	• Specify the resources in terms of all personnel and equipment required for sodium determination in 24-hour urine sampling study. • Describe resources that have been committed or expected, including support from WHO Regional Office for the Eastern Mediterranean. • Specify resources from other organisations.	

Core part	Detail	References
Action plan	Prepare a chart of the main tasks with estimated start date and time frame for completion of each.	Section 2
Communication strategy	Specify the methods for informing and involving all stakeholders relevant to the sodium determination project, including community leaders, members of the public, and media.	
Budget	Provide a detailed budget that includes: • total funds required for each year planned to implement all sodium determination activities as identified in the scope (including future surveys); • sources of funding; and • funding gaps.	

Applying for ethical approval

Studies that are to use the regional protocol on how to obtain measures of population-level sodium intake in 24-hour urine samples must undergo technical and ethical review and approval.

This is to ensure that the study:

- is conducted in a technically and ethically sound manner
- recognises and protects the rights of participants
- ensures wide access to the information collected in the study.

Process

Usually, ethical approval should be sought by submission of a proposal and application to a national ethics review committee or other equivalent body. However, if such a body is not institutionalized, it is recommended that an application for ethical review be prepared and submitted through an ad hoc local mechanism within the ministry of health.

Informed consent

An informed consent (preferably in writing) must be obtained from every survey participant before conducting any interviews or collection of any samples.

Making a submission

Use the existing templates for proposals supplied by the appropriate ethics committee or equivalent body. If such a template does not exist, identify and contact the relevant bodies, seek guidance on rules, the submission process and any procedures to follow.

Time frames and data collection considerations

Data collection should be carefully planned to take place over a defined period of time and during appropriate seasons.

General time frames

The following table shows the recommended phases of a sodium determination study. Time frames are situation specific.

Phase	Time frames
Planning and scoping	
Recruiting and training	
Data collection	
Data analysis and reporting	

Data collection

Some key factors to consider when identifying an appropriate time to conduct the study including the following.

Factors to consider	Guidelines
Seasons	• Confine the study period to one season to avoid dietary changes. • Avoid festive seasons (e.g. Ramadan, Christmas, Holy Week, and other national or religious holidays). • Avoid seasons when food is in unusually short supply.
Calendar year	• Confine the study to one calendar year.
Major events	• Avoid data collection during periods prior to local, regional, or national elections to avoid confusion with political campaigns.
Civil unrest, turmoil, famine, etc.	Avoid conducting a study at any time when pressing matters occupy the minds and lives of the population.
Collection time frame	Keep the time frame as close as possible (within reason) to the recommended time frame.

Data collection locations

It is recommended that all components of the study be conducted/ administered in the household setting. Ideally participants/respondents are to collect all their urine samples at home or, otherwise, they are to bring home any urine passed away from home. The total urine passed in the 24-hour period is to be picked up at the household within one day of the 24-hour collection period. It is recommended that if food consumption information is collected, this is done during the second visit to the household.

Adapting the regional protocol on how to obtain measures of population-level sodium in 24-hour urine samples

Using a standardized protocol for sodium determination in 24-hour urine samples enables comparisons between countries. However, some adaptations may be required to account for differences in cultures or settings.

When to adapt the protocol

Adaptations may be needed to provide valid data from the surveillance. The following adaptations are often required: adapting terminology; providing additional information; and/or deleting questions on behaviours that do not apply.

Process

The process of adapting the protocol may involve the following:

- identifying the instructions or questions that require local adaptation
- adding or deleting questions
- adding other forms as appropriate
- seeking feedback and advice
- translating and back-translating the adapted instructions or questionnaires
- pilot testing the questionnaires.

Documents to translate

Below are some of the documents that may need translating, as well as where they can be found:

Documents	References
Component 1 questionnaire	WHO STEPS
Component 2 questionnaire	WHO STEPS
Guidelines for fieldwork	Section 2 of this manual
Consent forms	WHO STEPS
Knowledge, attitudes and behaviour questionnaire	Section 3 of this manual
Instructions for participants	Section 4 of this manual

Pilot testing

A pilot test of the entire data collection process must be conducted among a limited number of people with a broad range of backgrounds prior to implementing the actual full study. Pilots should involve all aspects of the survey including:

- approaching potential participants

- seeking and obtaining informed consents
- making arrangements/appointments for second visits after the participant-led 24-hour urine sample collection
- site preparation and set-up
- collecting all data needed
- identifying participants who may need a follow-up
- basic analysis.

Test group

Identify and approach willing participants to be part of the pilot test. The test group should include the following:

- both men and women
- cover the age range 25–64
- more than one ethnic group (if appropriate)
- participants with different levels of education
- participants from a range of socioeconomic groups
- participants from distinctly different regions in the same country.

Test environment

Where possible, conduct the pilot test under the field conditions expected for the final full study, that is, the household setting.

Time frame

When planning the pilot test, allow sufficient time for adjustments to be made prior to starting full data collection.

3. Data collection guide

Guidelines for data collection for components 1 to 3 of the protocol can be obtained from the WHO STEPS Manual, Part 3, Sections 1 to 4, except for the core questions on knowledge, attitudes and behaviour towards dietary salt.

The information below serves the field staff/survey teams involved in components 4 and 5 of the protocol for 24-hour urine sample collection.

Instructions for field staff, equipment and analytical methods

Instructing participants

Field staff must explain the collection protocol, obtain informed consent and provide the record sheet on which participants note the start and finish times of their 24-hour urine collection, any missed urine collections, and any medication taken during the collection.

In the morning of the start of the 24-hour period, the participant must void the bladder and note the time. **This "first-pass urine" is discarded.** All urine passed thereafter is collected in the container provided, including the first urine of the following morning, with the final time recorded. Respondents are given detailed written instructions (see Section 4 of this manual).

At the time of the first visit to the household, field staff must inform the participant of the second visit.

The second visit must be made within one day of the completion of the 24-hour collection period. A sample of household salt is taken during the second visit.

If food consumption information is required, it is collected during the second visit.

Equipment supplied to participants

Urine-collecting equipment for the home:

- a 5-litre capacity screw cap container to store the collected urine;
- a 1-litre container with a wide opening into which urine is voided, with or without the use of a funnel;

- an optional 2-litre capacity screw cap container for temporal collections of urine made away from the home;
- a funnel for women to be used during urine collection, kept inside a resealable plastic bag when not being used;
- plastic carrier bags for transporting the equipment away from home; and
- an aide-memoire to help participants remember to collect their urine, for example, a safety pin to pin the under- and outer garments together during the period of the collection as a reminder that the urine about to be passed should be collected.

The use of para-aminobenzoic acid to assess completeness of the urine collection is *not* recommended. It requires that each participant take a para-aminobenzoic acid pill three days prior to the start of collection, thereby increasing the risks of noncompliance and attrition. In addition, laboratory facilities for the testing of para-aminobenzoic acid in the urine are limited and, where they exist, will increase the costs of the study.

At the completion of the collection

- Field staff measure the total volume of urine, mix it thoroughly in its container and withdraw three 10-ml aliquots into separate labelled tubes for storage and shipping for analysis. The rest of the urine is discarded.
- Sodium, potassium, iodine and creatinine content in the urine are to be measured in certified laboratories, as is the iodine content of the household salt.

Analytic methods

- Sodium and potassium content in the urine may be determined through Ion Selective Electrode (indirect) with a Beckman Coulter Synchron CX5PRO System.
- Creatinine content may be determined through the Creatinine (urinary) Jaffe kinetic method, standardized, also to be measured by Beck Coulter synchron CX5PRO System.
- Iodine in urine may be determined with the traditional kinetic Sandell-Kolthoff method (37) or by Inductively Coupled Plasma (ICP) Spectrometry.
- Iodine content of household salt can be determined quantitatively with the titration method. In addition to the titration method, there are possibilities of using potentiometry or spectrophotometry can also be used (37).

Guide to physical measurements

Component 3 of the regional protocol on how to obtain measures of population-level sodium intake in 24-hour urine samples requires that

selected physical measurements be taken to determine the proportion of participants in the study who:

- have raised blood pressure
- are overweight and/or obese.

Below is a description of:

- the physical measures and what they mean
- the equipment needed
- how to assemble and use the equipment
- how to take the measurements and accurately record the results.

Physical measurements

Blood pressure is measured to determine the proportion of participants with raised blood pressure. Heart rate, measured at the same time as blood pressure with automated devices, is a common independent cardiovascular risk factor. Height and weight measurements are taken to calculate the body mass index, needed to determine the prevalence of overweight and obesity in the population. Waist circumference measurements provide additional information on overweight and obesity. Hip circumference is an expanded data option to measure overweight and obesity.

Units of measurement

The table below shows the standard units for the physical measurements in component 3 of the protocol, including their upper and lower limits for data entry purposes.

Physical measure	Unit	Minimum	Maximum
Systolic blood pressure	mmHg	40	300
Diastolic blood pressure	mmHg	30	200
Height	cm	100	270
Weight	kg	20	350
Body Mass Index (BMI)	kg/m2	11	75
Waist circumference	cm	30	200
Hip circumference	cm	45	300
Heart rate	beats/minute	30	200

Sequence of questions and measurement

As is the case with many risk factor studies, physical measurements are to be taken immediately after the personal medical history. Physical measurement results are to be recorded on the same participant record sheet as personal medical history.

Participant instructions

Prior to taking physical measurements, explain to the participant that the following measurements will be taken.

For core:

- blood pressure
- heart rate
- height
- weight
- waist circumference.

For expanded, additional:

- hip circumference.

Measuring blood pressure and heart rate

Equipment needed

Field staff will need:

- a validated digital automatic blood pressure monitor, for example, OMRON. For the choice of validated blood pressure measuring devices see http://www.bhsoc.org/bp-monitors/bp-monitors/; and
- appropriate size cuffs.

Preparing the participant

Prior to measuring blood pressure, ask the participant to sit in a quiet comfortable place for at least 5 minutes with back support and his/her legs uncrossed. If the questions in components 1 and 2, on behaviour and personal medical history, have been asked just before the physical measurements are to be taken, the participant should rest for at least 5 minutes before blood pressure measurement is started. Do not talk to the participant while blood pressure is being taken.

Three measurements

WHO recommends taking three blood pressure measurements. During the data analysis, the mean of the second and third readings is calculated. The participant must rest for one minute between each of the readings. The measurement and recording of heart rate should be done three times along with the measurement and recording of blood pressure. Heart rate and blood pressure results are displayed simultaneously with automated equipment.

Recording the blood pressure measurements

The following steps are required:

- after each of the three measurements, record the result on the participant's record sheet
- after all three readings are taken, double-check that all three results are correctly recorded on the record sheet
- inform the participant of their blood pressure readings only after the whole process is completed.

The protocol does not endorse any particular device, so long as it is a validated one (see list at http://www.bhsoc.org/bp-monitors/bp-monitors/).

Procedure

The instructions below apply to the use of an OMRON blood pressure monitor, as an example. However, more detailed operating instructions are included with the device and should be reviewed before taking any blood pressure measurements.

Note that if a different digital automatic blood pressure monitor is used, instructions should be read carefully.

Applying the cuff

Follow the steps below to select an appropriate size of cuff and apply it.

Step	Action	
1	Place the left arm[a] of the participant on the table with the palm facing upward.	
2	Remove or roll up clothing on the arm.	
3	Select the appropriate cuff size for the participant using the following table:	
	Mid arm circumference (cm)	**Cuff size**
	17–22	Small (S)
	22–32	Medium (M)
	>32	Large (L)
	If the cuff is the correct size, the marker at the end the cuff will fit between two other markers in the midsection of the cuff. The cuff is the wrong size if the end is outside the markers. It is advisable to select	

	the larger size cuff if there is a question of which size is best. Some cuffs are not marked, in which case they must be labeled with markers. [b] Otherwise, use the mid arm circumference of each arm to select the correct cuff size.
4	Position the cuff above the elbow and align the mark on the cuff with the brachial artery.
5	Wrap the cuff snugly onto the arm and securely fasten with the Velcro.
	Note: The lower edge of the cuff should be placed 1.2 to 2.5 cm above the inside of the elbow joint.
6	Keep the level of the cuff at the same level as the heart during measurement.

[a]If the right arm is used, indicate this in the right-hand side margin of the participant's record sheet.

[b]Even if cuffs are marked by the manufacturer to indicate the acceptable range of arm circumference for the size of cuff, the markings may not agree with the current recommended range and need to be checked and possibly remarked. (*38*) Marking can be performed easily using a ruler and permanent marker. The ideal arm circumference for a cuff is 2.5 times the cuff's bladder width. Cuffs can be used on arms that have a circumference ±4 cm of 'ideal'. To mark or remark the cuff, start the measurement at the end that contains the bladder. Permanently mark the cuff at the ideal arm circumference then draw a line across the cuff at 4 cm on either side of the ideal (that is, draw two lines). The cuff is the right size if when wrapped around the mid arm, the end is between the two marked lines.

Taking the blood pressure measurement

Follow the instructions below to take the blood pressure measurements:

Step	Action
1	Switch the monitor on (dark purple button) and press START (light purple button).
2	The monitor will start measuring when it detects the pulse and the 'heart' symbol will begin to flash. The systolic and diastolic blood pressure readings should be displayed within a few moments (systolic above and diastolic below). The heart rate will also be displayed.
3	Record the reading in the participant's instrument.
4	Switch the monitor off, but leave the cuff in place.
5	Wait one minute, then repeat steps 1–4 twice more.
6	Inform the participant of the blood pressure readings only after the whole process is completed.

When to use a sphygmomanometer

The sphygmomanometer is generally not recommended, but may be used in the following circumstances.

- the automated device is not functioning
- the device display shows multiple errors
- to cross-check automatic blood pressure readings in various clinical states such as irregular pulse, peripheral circulatory disturbance, extreme hypotension
- when systolic blood pressure is >200 mmHg (appropriate measurement of systolic blood pressure requires inflating the cuff to a pressure of 40 mmHg above the systolic blood pressure; usually, the maximum inflation pressure of a device seldom exceeds 240 mmHg)
- for calibration of the automated device monitor

Procedure for sphygmomanometer

Follow the steps below and refer to the operating instructions included with the device to measure the blood pressure of a participant using the sphygmomanometer.

Step	Action
1	Apply the cuff (as detailed above).
2	Put stethoscope earpieces in ear and set to bell.
3	Palpate pulse at either brachial or radial artery. Take a pulse on count for one full minute.
4	Pump up pressure and inflate cuff until unable to feel pulse.
5	Continue to inflate cuff 40 mmHg beyond this point.
6	Apply the bell of the stethoscope to the right ante-cubital fossa.
7	Listen for pulse sounds while deflating the cuff slowly.
8	Record the systolic blood pressure when a pulse is first audible.
9	Record the diastolic blood pressure when the pulse sound disappears.
10	Deflate the cuff fully and let the arm rest for one minute (between each reading).
11	Repeat Steps 2–10 twice to obtain three readings. Record the readings to the nearest 2 mmHg.a
12	Check that all readings are correctly filled in on the record sheet.
13	Inform the participant of the blood pressure readings only after the whole process is completed.

[a] Analyse blood pressure readings by 2 mmHg to test for terminal digit preference as a quality assurance method. (Terminal digit preference is the tendency to record to 10 mmHg rather than 2 mmHg.)

Measuring height

Equipment needed

Portable height/length measuring board (stadiometer).

Assembling the measuring board

Follow the steps below to assemble the measuring board.

Step	Action
1	Separate the pieces of board (usually three pieces) by unscrewing the knot at the back.
2	Assemble the pieces by attaching each one on top of the other in the correct order.
3	Lock the latches at the back.
4	Position the board on a firm surface against a wall.

Measuring height

Follow the steps below to measure the height of a participant.

Step	Action
1	Ask the participant to remove their: • footwear (shoes, slippers, sandals, etc.) • head gear (hat, cap, hair bows, comb, ribbons, etc.) Note: If it would be insensitive to seek removal of a scarf or veil, the measurement may be taken over light fabric.
2	Ask the participant to stand on the board facing you.

3	Ask the participant to stand with: • feet together • heels against the back board • knees straight.
4	Ask the participant to look straight ahead and not tilt their head up.
5	Make sure eyes are the same level as the ears.
6	Move the measuring arm gently down onto the head of the participant and ask the participant to breathe in and stand tall.
7	Read the height in centimetres at the exact point.
8	Ask the participant to step away from the measuring board.
9	Record the height measurement in centimetres on the participant's record sheet.

Measuring weight

Equipment needed

Field staff will need:

- a portable weighing scale;
- a stiff wooden board to place under the scales, if you are likely to have problems with uneven surfaces (such as dirt or mud floors or carpet); and
- a generator, if electronic scales are being used and electricity is not guaranteed in all survey areas (check if scale can work with batteries).

Set-up requirements

Make sure the scales are placed on a firm, flat surface.

Do not place the scales on:

- carpet
- a sloping surface
- a rough, uneven surface.

Electronic scales

Follow the steps below to put electronic scales into operation.

Step	Action
1	Put the scale on a firm, flat surface.
2	Connect the adaptor to the main power line or generator.
3	Turn on the scale.
4	Switch the scale on and wait until the display shows 0.0.

Measuring weight

Follow the steps below to measure the weight of a participant.

Step	Action
1	Ask the participant to remove their footwear (shoes, slippers, sandals, etc.) and socks.
2	Ask the participant to step onto scale with on foot on each side of the scale.
3	Ask the participant to: • stand still • face forward • place arms by their sides and wait until asked to step off.
4	Record the weight in kilograms on the participant's record sheet. If the participant wants to know his/her weight in pounds, convert by multiplying the measured weight by 2.2.

Measuring waist circumference

Equipment needed

- constant tension tape (for example, Figure Finder Tape Measure)
- pen
- chair or coat stand on which the participant will place their clothes

Privacy

A private area is necessary for this measurement. This could be a separate room, or an area that has been screened off from other people within the household.

Preparing the participant

This measurement should be taken without clothing, that is, directly over the skin.

If this is not possible, the measurement maybe taken over light clothing. It must not be taken over thick or bulky clothing. This type of clothing must be removed.

How to take the measurement

This measurement should be taken:

- at the end of a normal expiration
- with the arms relaxed at the sides
- at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest (hip bone).

Measuring waist circumference

Follow the steps below to measure the waist circumference of a participant.

Step	Action
1	Standing to the side of the participant, locate the last palpable rib and the top to the hip bone. You may ask the participant to assist you in locating these points on their body.
2	Ask the participant to wrap the tension tape around themselves and then position the tape at the midpoint of the last palpable rib and the top of the hip bone, making sure to wrap the tape over the same spot on the opposite side. Note: Check that the tape is horizontal across the back and front of the participant and as parallel with the floor as possible.
3	Ask the participant to: • stand with their feet together with weight evenly distributed across both feet; • hold the arms in a relaxed position at the sides; • breathe normally for a few breaths, then make a normal expiration.
4	Measure waist circumference and read the measurement at the level of the tape to the nearest 0.1 cm, making sure to keep the measuring tape snug but not tight enough to cause compression of the skin.
5	Record the measurement on the participant's record sheet.

Measuring hip circumference

Equipment needed

Field staff will need:

- a constant tension tape (for example, Figure Finder Tape Measure)
- a pen
- a chair or coat stand on which the participant will place their clothes.

Privacy

A private area is necessary for this measurement. This could be a separate room, or an area that has been screened off from other people within the household. Hip measurements are taken immediately after waist circumferences.

Preparing the participant

This measurement should be taken without clothing, that is, directly over the skin.

If this is not possible, the measurement maybe taken over light clothing. It must not be taken over thick or bulky clothing. This type of clothing must be removed.

How to take the measurement

This measurement should be taken:

- with the arms relaxed at the sides
- at the maximum circumference over the buttocks.

Measuring hip circumference

Follow the steps below to measure the hip circumference of a participant.

Step	Action
1	Stand to the side of the participant, and ask them to help wrap the tape around themselves.
2	Position the measuring tape around the maximum circumference of the buttocks.
3	Ask the participant to: • stand with their feet together with weight evenly distributed over both feet; • hold their arms relaxed at the sides.
4	Check that the tape position is horizontal all around the body and snug without constricting.
5	Record the measurement on the participant's record sheet. Note: measure only once and record.

4. Detailed instructions for participants in 24-hour urine collection

We are interested in measuring the dietary intake of certain nutrients – sodium, potassium and iodine. The best way to get this information is by analysing the urine sample you collect during a 24-hour period.

We are not testing for drugs or viruses!

We cannot get this essential information in any other way!

Why 24 hours?

The content of some nutrients in urine fluctuates according to what we last ate, how much fluid we drink, how much we exercise and also on the weather. Collecting urine over 24 hours gives much more reliable information than a single casual sample about the typical intakes of these nutrients in a person's diet.

Equipment provided

You have the following equipment provided for making your collections.

1. A sheet to record the essential information about the collection.
2. Urine-collecting equipment for the home:
   a) A 5-litre screw cap plastic collection bottle to store the collected urine during the day. This bottle may contain a small amount of white crystals (Thymol) that is a preservative for keeping the urine at room temperature;
   b) a 1-litre plastic jug and funnel for temporal reception of the urine samples;
   c) a funnel to help women collect urine, which may also help participants in transferring urine samples from the 1-litre plastic jug to the 5-litre plastic bottle; and
   d) a safety pin (to attach to your underclothes or nightwear simply as a reminder for you to make your collection).

3. Urine-collecting equipment for outside the home:
   a) a 2-litre screw cap plastic collection bottle (without preservative)
   b) two plastic bags for carrying the equipment outside the home.

Don't forget to take the jug and 2-litre bottle with you if you leave your home during the day.

Before making the urine collection

The health professional will help you choose the day on which you would like to make the 24-hour urine collection. You may prefer to choose a day when you will be mostly at home or only going out for a short time.

If you are female, you should not make your collection during menstruation.

How to make your collection for the whole day (24 hours)

You have been asked to collect all the urine you pass in one day into the container you have been given. **It is not difficult; here is how you do it.**

- On the day that you start your collection, you will pass urine – **DISCARD** this urine, DO NOT put it into the container. Record the date and time on the record sheet as follows:

Date collection began	dd/mm/yyyy -- --/-- --/-- -- -- --
	(for example: 07/10/2013)
Time collection started	hh:mm -- -- :-- --
	(for example: 07:35)

From then onwards until the next day, ALL urine you pass in the next 24 hours, both during the day and night, must be collected.

- The last collection is the urine you pass on the second day at approximately the same time you started the day before.

- This completes the 24-hour collection. Record the following on the record sheet:

Date collection finished	dd/mm/yyyy -- --/-- --/-- -- -- --
	(for example: 08/10/2013)
Time collection finished	hh:mm -- -- :-- --
	(for example: 07:50)

Note: do not worry if you have not collected for *exactly* 24 hours, as long as you record exact time of start and finish.

You should pass all urine directly into the 1-litre plastic jug, then pour the urine into the large container, using the funnel if necessary. If you need to open your bowels, always remember to pass urine first before you pass a stool.

Each time you add a new urine specimen to the large container, screw the lid tight and swirl the urine around a few times, to mix it with the preservative.

Any urine collected in the small bottle must be transferred to the large bottle as soon as possible, for example, after returning home.

If you miss a sample

If during the 24-hour collection period a sample is missed for any reason, such as because of a bowel movement, record this on the record sheet.

Once you have completed your collection

As soon as possible after you have completed your 24-hour urine collection, the health professional will arrange a time for him/her to pick up the large container with the total volume of collected urine. In the meantime, store your complete collection in a cool, dark place.

Alternatively, you can arrange a suitable time when you can deliver it to the team.

If you have any other questions

We hope this leaflet answers the questions you may have. If you have any other questions, contact the health professional. You are free to withdraw from this study at any point.

5. Household salt collection and iodine determination

This protocol requires assessments of the iodine content of table and cooking salt. It is therefore important to ask participants for samples of both types of salt (at least 50 g) where both are used in the household. Because the amount of salt might represent the whole supply in the household, field staff should bring sufficient amounts of both types of salt to replace the samples taken.

In the laboratory, both salt samples should be thoroughly mixed using the same procedure of dry samples to ensure homogeneity. Then the presence of iodate in the salt should be first identified using a qualitative test kit. For samples that produce a positive reaction (usually a change in colour), the quantity of iodine in the samples should then be determined by titration, solubilizing not less than 10 g for refined and small crystal-size salt, and not less than 50 g for raw or large crystal-size salt. Samples that produce a negative reaction should be analysed for the quantitative content of iodide using an appropriate method with the same amounts of salt as specified above for the positive samples.

6. Use of spot urine to estimate 24-hour excretion of sodium, potassium and iodine

Some researchers have used spot urine samples to determine the daily excreted amounts of sodium, potassium or iodine. The sample is only one urine pass collected during the day, frequently not the first pass of the morning made just after awakening (*39–45*). However, the content of sodium, potassium or iodine would depend on the volume of urine, which may be very variable among individuals of the same population, and highly affected by age, sex, ethnic background, weather and body mass index and physical activity *(30).* Some "correction" has been proposed by dividing the analyte concentration by the creatinine concentration, based on the fact that creatinine excretion is more constant during the day within an individual, as it mainly depends on lean body mass *(42,43).* However, this correction has been found to be even less precise than expressing the absolute content by volume, especially in populations with undernutrition *(31–35,40).*

Although the use of spot urine is discouraged as a method to determine sodium, potassium or iodine intake because of the limitations and uncertainty inherent in the method, for some populations it may be used to approximate 24-hour excretion of these analytes if a "calibration" is carried out *(33).* This "calibration" could be made based on the expected 24-hour volume of urine or the 24-hour total excretion of creatinine.

The "correction factors" should be calculated in a subsample of individuals from the same population under the same environmental conditions and studied in a 24-hour period. Although equations associated with general parameters, such as body weight and height, age and gender, have been published (31–34, 41–44), they are specific to certain populations and cannot be extrapolated from one site/population group to another. Thus, in many instances the calculation of these "correction factors" is as difficult as determining directly the 24-hour total excretion of the analytes of interest. Finally, it has been suggested that a spot urine sample collected in the afternoon/early evening could provide advantages when compared to a morning one (45). Here, it is important to point out that even if the above conditions are met, the results are likely to be unreliable, especially for population subgroups or time trends, given the presence of bias. Until more studies are carried out to assess simpler but reliable methods of urine collection for the purpose of estimating daily excretions of these analytes, 24-hour urine collections are recommended.

Questionnaire on how to obtain measures of population-level sodium intake in 24-hour urine samples

Questionnaire information

Location and Date	**Response**	
1 Center/City name		
2 Interviewer ID		
3 Date of completion of the instrument (dd/mm/yyyy)		
Consent, Interview Language and Name	**Response**	
4 Consent has been read and obtained	Yes	❑
	No	❑ If NO,END
5 Interview Language *[insert language]*	English	❑
	[add others]	❑
	[add others]	❑
	[add others]	❑
6 Time of Interview (24 hour clock) Contact phone number where possible	Hrs: mins	
7 Family Surname		
8 First Name		
Additional Information that may be helpful		
9		

1 Demographic information

CORE: Demographic Information			
Question		**Response**	
10	Sex *(Record Male/Female as observed)*	Male ❑	Female ❑
11	What is your date of birth? *Don't know (leave blank)*	/ / dd/mm/yyyy	
12	How old are you?	years	
EXPANDED: Demographic Information			
Question		**Response**	
13	What is the highest level of education you have completed	Not formal schooling	❑
		Less than primary school	❑
		Primary school completed	❑
		Secondary school completed	❑
		High school completed	❑
		College/university completed	❑
		Post graduate degree	❑
		Refused	❑
14	What is your *[insert relevant ethnic group /racial group/cultural subgroup /others]* background?	*[locally defined]*	❑
		[locally defined]	❑
		[locally defined]	❑
		[locally defined]	❑
		[locally defined]	❑
		Refused	❑

15	What is your marital status?	Never married	❑
		Currently married	❑
		Separated	❑
		Divorced	❑
		Widowed	❑
		Cohabitating	❑
		Refused	❑
16	Which of the following best describes your main work status over the past 12 months? *[insert country-specific categories]*	Government employee	❑
		Non-government employee	❑
		Self-employed	❑
		Non-paid	❑
		Student	❑
		Homemaker	❑
		Retired	❑
		Unemployed (able to work)	❑
		Unemployed (unable to work)	❑
		Refused	❑
17	Taking the past year, can you tell me what the average earnings of the household have been? *[record only one, not all three]*	Per week	❑❑❑❑❑❑❑
		OR per month	❑❑❑❑❑❑❑
		OR per year	❑❑❑❑❑❑❑
		Refused	❑❑❑❑❑❑❑

2 Behavioural measurements

CORE: Tobacco Use

Now you will be asked some questions about various health behaviours. This includes things like smoking, drinking alcohol, eating fruits, and vegetables and physical activity. Let's start with tobacco.

	Question	**Response**			
18	Do you currently smoke any tobacco product, such as cigarettes, cigars or pipes?	Yes	❑	No	❑
19	Do you currently smoke tobacco products daily?	Yes	❑	No	❑
20	How old were you when you first started smoking daily?	Age (years)			
		Don't know	❑		
21	On average, how many of the following do you smoke each day? *[record for each type; if don't know leave blank]*	Manufactured cigarettes			❑❑
		Hand-rolled cigarettes			❑❑
		Pipes full of tobacco			❑❑
		Cigars, cheroots, cigarillos			❑❑
		Other			❑❑

EXPANDED: Tobacco Use

	Question	**Response**			
22	In the past, did you ever smoke daily?	Yes	❑	No	❑
23	How old were you when you stopped smoking daily?	Age (years)			
		Don't know	❑		
24	Do you currently use any smokeless tobacco such as *[snuff, chewing tobacco, betel]*?	Yes	❑	No	❑
25	On average, how many times a day do you use .... *[record for each type; if don't know leave blank]*	Snuff, by mouth			❑❑
		Snuff, by nose			❑❑
		Chewing of tobacco			❑❑
		Betel, quid			❑❑
		Other			❑❑
26	In the past, did you ever use smokeless tobacco such as *[snuff, chewing tobacco, or betel]* daily?	Yes	❑	No	❑

CORE: Alcohol Consumption
[IF CULTURALLY INAPPROPRIATE,THIS SECTION COULD BE REMOVED]

The next questions are about the consumption of alcohol.

	Question	Response
27	Have you ever consumed any alcoholic drinks such as beer, wine, spirits, fermented cider, or *[add other local examples]*?	Yes ❑ No ❑ *If NO, go to Diet Core Questions page 5*
28	Have you consumed an alcoholic drink within the past 12 months?	Yes ❑ No ❑
29	During the past 12 months, how frequently have you had at least one alcoholic drink?	Daily ☐ 5-6 days per week ☐ 1-4 days per week ☐ 1-3 days per month ☐ Less than once a month ☐
30	Have you consumed an alcoholic drink within the past 30 days?	Yes ❑ No ❑ *If NO, go to Diet Core Questions page 5*
31	During the past 30 days, on how many occasions did you have at least one alcoholic drink?	Number Don't know ☐
32	During the past 30 days, when you drank alcohol, on average, how many standard alcoholic drinks did you have during one drinking occasion?	Number Don't know ☐
33	During the past 30 days, what was the largest number of standard alcoholic drinks you had on a single occasion, counting all types of alcoholic drinks together?	Largest number Don't know ☐
34	During the past 30 days, how many times did you have for men: five or more women: four or more Standard alcoholic drinks in a single drinking occasion?	Number of times Don't know ☐

EXPANDED: Alcohol Consumption [AS ABOVE]

	Question	Response
35	During the past 30 days, when you consumed an alcoholic drink, how often was it with meals? Please do not count snacks	Usually with meals ☐ Sometimes with meals ☐ Rarely with meals ☐ Never with meals ☐
36	During each of the past 7 days, how many standard alcoholic drinks did you have each day?	Monday ☐☐ Tuesday ☐☐ Wednesday ☐☐ Thursday ☐☐ Friday ☐☐ Saturday ☐☐ Sunday ☐☐ Don't know ☐

CORE: Diet

The next questions ask about the fruits and vegetables that you usually eat.

	Question	Response
37	In a typical week, on how many days do you eat fruit?	Number of days ☐☐ Don't know ☐
38	How many servings of fruit do you eat on one of those days?	Number of days ☐☐ Don't know ☐
39	On a typical week, on how many days do you eat vegetables?	Number of days ☐☐ Don't know ☐
40	How many servings of vegetables do you eat on one of those days?	Number of days ☐☐ Don't know ☐

EXPANDED: Diet

Question	Response	
41 What type of oil or fat is most often used for meal preparation in your household? *[select only one]*	Vegetable oil	❑
	Lard or suet	❑
	Butter or ghee	❑
	Margarine	❑
	Other	❑
	None in particular	❑
	None used	❑
	Don't know	❑
	Other	
42 On average, how many meals per week do you eat that were not prepared at a home? By meal, I mean breakfast, lunch and dinner.	Number	❑❑
	Don't know	❑

Diet: Knowledge, Attitudes, and Behaviour towards dietary salt

The next set of questions concern your knowledge, attitudes and behaviour towards dietary salt. Please answer the following even if you consider yourself to eat a low sodium diet.

Question	Response	
43 Do you add salt to food at the table? *[select only one]*	Never	❑
	Rarely	❑
	Sometimes	❑
	Often	❑
	Always	❑
44 In the food you eat at home salt is added in cooking...	Never	❑
	Rarely	❑
	Sometimes	❑
	Often	❑
	Always	❑
45 How much salt do you think you consume? *[select only one]*	Far too much	❑
	Too much	❑
	Just the right amount	❑
	Too little	❑
	Far too little	❑
	Don't know	❑
	Refuse	❑
46 Do you think that a high salt diet could cause a serious health problem?	Yes	❑
	No	❑
	Don't know	❑
	Refused	❑
	If NO, DON'T KNOW or REFUSED, go to Q48	
47 What sort of serious health problems do you think a high salt diet could cause? *[mark as many as it applies]*	High blood pressure	❑
	Osteoporosis	❑
	Stomach cancer	❑
	Kidney stones	❑
	None of the above	❑
	All of the above	❑
	Don't know	❑
	Refused	❑
48 How important to you is lowering the salt/sodium in your diet?	Not at all important	❑
	Somewhat important	❑
	Very Important	❑
49 Do you anything on a regular basis to control your salt or sodium intake?	Yes	❑
	No	❑
	Don't know	❑
	Refused	❑
	If NO, DON'T KNOW or REFUSED, go to Q51	
50 What do you do on a regular basis to control your salt or sodium	Avoid/minimize consumption	

	intake? *[mark as many as it applies]*	of processed foods Look at the salt or sodium labels on food Do not add salt at the table Buy low salt alternatives Buy low sodium alternatives Do not add salt when cooking Use spices other than salt when cooking Avoid eating out Other (specify)	❑ ❑ ❑ ❑ ❑ ❑ ❑ ❑

CORE: Physical Activity

The next questions ask about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you don't consider yourself to be a physically active person.

Think about the time you spend doing work. This includes paid and unpaid work, like study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment, etc.

Remember that when answering the following questions:

- Vigorous-intensity activities require hard physical effort and cause large increases in breathing or heart rate
- Moderate-intensity activities require moderate physical effort and cause small increases in breathing or heart rate.

	Question	**Response**	
	Work		
51	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like *[carrying or lifting heavy loads, digging or construction work]* for at least 10 minutes continuously?	Yes No	❑ ❑
52	In a typical week, on how many days do you do vigorous- intensity activities as part of your work?	Number of days	❑❑
53	How much time do you spend doing vigorous-intensity activities at work on a typical day?	Hours: minutes	
54	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking *[or carrying light loads]* for at least 10 minutes continuously? *[insert examples]*	Yes No	❑ ❑
55	In a typical week, on how many days do you do moderate- intensity activities as part of your work?	Number of days	❑❑
56	How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours: minutes	
	Travel to and from places		
	The next questions exclude the physical activities at work that you have already mentioned. These questions are about the usual way you travel to and from places. For example to work, for shopping, to the market, to place of worship, etc.		
57	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	Yes No	❑ ❑
58	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Number of days	❑❑
59	How much time do you spend walking or bicycling for travel on a typical day?	Hours: minutes	
	Leisure activity		
	The next questions exclude the work and transport activities that you have already mentioned. They focus on sports, fitness, and recreational activities (leisure), etc.		
60	Do you do any vigorous-intensity sport, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like *[running or football]* for at least 10 minutes continuously?	Yes No	❑ ❑
61	In a typical week, on how many days do you do vigorous- intensity sports, fitness or recreational (leisure) activities?	Number of days	❑❑
62	How much time do you spend doing vigorous-intensity sports, fitness or recreational (leisure) activities on a typical day?	Hours: minutes	
63	Do you do any moderate-intensity sports, fitness or recreational (leisure) activity that causes small increases in breathing or heart rate such as brisk walking *[cycling, swimming, or volleyball]* for at least 10 minutes continuously?	Yes No	☐ ☐

[insert examples]

64	In a typical week, on how many days do you do moderate- intensity activities as part of your work?	Number of days ☐☐
65	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	Hours: minutes

EXPANDED: Physical Activity

Sedentary Behaviour

These questions are about the amount of time you spend sitting or reclining at work, at home, getting to and from places, or with friends including time spend sitting at the desk, sitting with friends, traveling in car, bus, train, reading, playing cards or watching television, but do not include time spent sleeping.

	Question	**Response**
66	How much time do you usually spend sitting or reclining on a typical day	Hours: minutes

3 Personal medical history

CORE: Personal medical History

	Question	**Response**
67	Have you ever been told by a medical doctor that you have, or have had, **heart failure**?	Yes ☐ No ☐
68	Have you ever been told by a medical doctor that you have, or have had, **heart attack**?	Yes ☐ No ☐
69	Have you ever been told by a medical doctor that you have, or have had, **other heart trouble**?	Yes ☐ No ☐ If yes, please specify
70.	Have you ever been told by a medical doctor that you have had a **stroke**?	
71	Have you ever been told by a medical doctor that you have, or have had, **kidney trouble**?	Yes ☐ No ☐
72	Have you ever been told by a medical doctor that you have, or have had, **peptic ulcer**?	Yes ☐ No ☐
73	Have you ever been told by a medical doctor that you have, or have had, **liver disease**?	Yes ☐ No ☐
74	Have you ever been told by a medical doctor that you have a **cancer or malignant tumor**?	Yes ☐ No ☐

CORE: History of Raised Blood Pressure

	Question	**Response**
75	Have you ever had your blood pressure measured by a doctor or other health workers?	Yes ❑ No ❑ *If NO, go to Q 67*
76	Have you ever been told by a doctor or other health worker that you have raised blood pressure or hypertension?	Yes ❑ No ❑ *If NO, go to Q 67*
77	Have you been told in the past 12 months?	Yes ❑ No ❑
78	Are you currently receiving any of the following treatments/advice for high blood pressure prescribed by a doctor or other health worker?	
	Drugs (medication) that you have taken in the past 2 weeks?	Yes ❑ No ❑
	Advice to reduce salt intake?	Yes ❑ No ❑
	Advice or treatment to lose weight?	Yes ❑ No ❑
	Advice or treatment to stop smoking?	Yes ❑ No ❑
	Advice to start or do more exercise?	Yes ❑ No ❑
79	Have you ever seen a traditional healer for raised blood pressure or hypertension?	Yes ❑ No ❑
80	Are you currently taking any herbal or traditional remedy for your raised blood pressure?	Yes ❑ No ❑

CORE: History of Diabetes

81	Have you ever had your blood sugar measured by a doctor or other health workers?	Yes ❑ No ❑
82	Have you ever been told by a doctor or other health worker that you have raised blood sugar or diabetes?	Yes ❑ No ❑

83	Have you been told in the past 12 months?	Yes	❑	No	❑
84	Are you currently receiving any of the following treatments/ad-vice for diabetes prescribed by a doctor or other health worker?				
	Insulin	Yes	❑	No	❑
	Drugs (medication) that you have taken in the past 2 weeks?	Yes	❑	No	❑
	Special prescribed diet?	Yes	❑	No	❑
	Advice or treatment to lose weight?	Yes	❑	No	❑
	Advice or treatment to stop smoking?	Yes	❑	No	❑
	Advice to start or do more exercise?	Yes	❑	No	❑
85	Have you ever seen a traditional healer for raised blood glucose or diabetes?	Yes	❑	No	❑
86	Are you currently taking any herbal or traditional remedy for your raised blood glucose or diabetes?	Yes	❑	No	❑

4 Physical measurements

CORE: Height and Weight

Question		**Response**	
87	Device ID for height and weight	Height device	-- --
		Weight device	-- --
88	Height	In Centimetres (cm)	-- -- -- . --
89	Weight *If too large for scale, write 666.6*	In Kilograms (kg)	-- -- -- . --
90	For women: Are you pregnant?	No Yes	□□

CORE: Waist

91	Device ID for waist	Device	-- --
92	Waist circumference	In Centimetres (cm)	-- -- -- . --

CORE: Blood Pressure

93	Device ID for blood pressure	Device	-- --
94	Cuff size used		--
95	Reading 1	Systolic (mmHg)	---- --
		Diastolic (mmHg)	-- -- --
96	Reading 2	Systolic (mmHg)	-- -- --
		Diastolic (mmHg)	-- -- --
97	Reading 3	Systolic (mmHg)	-- -- --
		Diastolic (mmHg)	-- -- --

EXPANDED: Physical Measurements

Question		**Response**	
98	Hip circumference	In Centimetres (cm)	-- -- -- . --
99	Heart rate		
	Reading 1	Beats per minute)	-- -- --
	Reading 2	Beats per minute)	-- -- --
	Reading 3	Beats per minute)	-- -- --

5 24-hour urine sample

24-Hour Urine Samples Collection

[At this point, the participant will be given the "Participant's Guide for the 24-Hour Urine Samples Collection. The participant will be guided through the guide and choose a day to begin the collection. The Interviewer will then make an appointment to pick up the samples within 24 hours of then end of collection. These questions will be questions obtained from the log sheet given to the participant, after the 24-hour urine sample collection. It's recommended that it be filled in with the participant present.]

Question		**Response**
100	Device ID for 24–hour urine sample collection *[each equipment set must be labeled with participant's ID; therefore, the Participant ID and Device ID are the same]*	
101	Date collection began	dd/mm/yyyy -- --/-- --/-- -- -

		- --
102	Time collection started	hh:mm -- -- :-- --
103	Date collection finished	dd/mm/yyyy -- --/-- --/-- -- - - --
104	Time collection finished	hh:mm -- -- :-- --
105	Total volume of urine collected	In millilitres (ml) -- -- -- --

References

1. Plan of action for the prevention and control of noncommunicable diseases in the Eastern Mediterranean Region. Cairo: World Health Organization Regional Office for the Eastern Mediterranean; 2011:1–28.

2. Maziak W, Critchley J, Zaman S, Unwin N, Capewell S, Bennett K, et al. Mediterranean studies of cardiovascular disease and hyperglycemia: analytical modeling of population socioeconomic transitions (MedCHAMPS) – rationale and methods. Int J Public Health. 2013. doi:10.1007/s00038-012-0423-4.

3. Law M. Salt, blood pressure and cardiovascular diseases. J Cardiovasc Risk. 2000;7:5–8.

4. Aburto NJ, Ziolkovska A, Hooper L, Elliott P, Cappuccio FP, Meerpohl J. Effect of lower sodium intake on health outcomes: systematic review and meta-analysis. Br Med J. 2013;346:f1326.

5. He FJ, Li J, MacGregor GA. Effect of longer term modest salt reduction on blood pressure: Cochrane systematic review and meta-analysis of randomized trials. Br Med J. 2013;346:f1325.

6. Strazzullo P, D'Elia L, Kandala N-B, Cappuccio FP. Salt intake, stroke and cardiovascular disease: a meta-analysis of prospective studies. Br Med J. 2009;339:b4567.

7. Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, HArsha D, et al. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. New Engl J Med. 2001;344:3–10.

8. Kumanyika SK, Cook NR, Cutler JA, Belden L, Brewer A, Cohen JD, et al. Sodium reduction for hypertension prevention in overweight adults: further results from the Trials of Hypertension Prevention Phase II. J Hum Hypertens. 2005;19:33–45.

9. Asaria P, Chisholm D, Mathers C, Ezzati M, Beaglehole R. Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. Lancet. 2007;370:2044–53.

10. Murray CJ, Lauer JA, Hutubessy RC, Niessen L, Tomijima N, Rodgers A, et al. Effectiveness and costs of interventions to lower systolic blood pressure

and cholesterol: a global and regional analysis on reduction of cardiovascular disease risk. Lancet. 2003;361:717–25.

11. Bibbins-Domingo K, Chertow GM, Coxson PG, Moran A, Lightwood JM, Pletcher MJ, et al. Projected effect of dietary salt reductions on future cardiovascular disease. N Eng J Med. 2010;362:590–99.

12. Reducing salt intake in populations: report of a WHO forum and technical meeting. Geneva: World Health Organization; 2007;1–60.

13. Guideline: Sodium intake for adults and children. Geneva: World Health Organization; 2012:1–56.

14. Political declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases A/66/L.1. In: General Assembly 66th session, agenda item 117..Geneva: United Nations; 2011:1–13.

15. Medical Research Council, Human Nutrition Research, National Centre for Social Research. An assessment of dietary sodium levels among adults (aged 19–64) in the UK general population in 2008, based on analysis of dietary sodium in 24 hour urinary sodium samples. June 2008 (http://www.food.gov.uk/multimedia/pdfs/08sodiumreport.pdf, accessed 18 August 2016).

16. Anderson CAM, Appel LJ, Okuda N, Brown IJ, Chan Q, Zhao L, et al. Dietary Sources of Sodium in China, Japan, the United Kingdom, and the United States, Women and Men Aged 40 to 59 Years: The INTERMAP Study. J Am Diet Assoc. 2010;110:736–45.

17. EU Framework for National Salt Initiatives. In: European Comission/ [website]. Brussels: European Commission; 2016 (http://ec.europa.eu/health/ nutrition_physical_activity/high_level_group/nutrition_salt_en.htm)..

18. The Choices Programme. In: Choices International Foundation [website]. Brussels: Choices International Foundation; 2014 (http://choicesprogramme.org/ en/about_the_choices_programme/product_criteria, accessed 18 August 2016).

19. Elliott P, Stamler J, Nichols R, Dyer AR, Stamler R, Kesteloot H, et al. Intersalt revisited: further analyses of 24 hour sodium excretion and blood pressure within and across populations. Br Med J. 1996;312:1249–53.

20. D'Elia L, Barba G, Cappuccio FP, Strazzullo P. Potassium intake, stroke and cardiovascular disease: a meta-analysis of prospective studies. J Am Coll Cardiol. 2011;57:1210–9.

21. Cappuccio FP, MacGregor GA. Does potassium supplementation lower blood pressure? A meta-analysis of published trials. J Hypertens. 1991;9:465–73.

22. Aburto NJ, Hanson S, Gutierrez H, Hooper L, Elliott P, Cappuccio FP. Effect of increased potassium intake on health: systematic review and meta-analysis. Br Med J. 2013;346:f1378.

23. Siani A, Strazzullo P. Giacco A, Pacioni D, Celentano E, Mancini M. Increasing the Dietary Potassium Intake Reduces the Need for Antihypertensive Medication. Ann Intern Med. 1991;115:753–9.

24. Guideline: Potassium intake for adults and children. Geneva: World Health Organization:, 2012:1–52.

25. Salt as a vehicle for fortification. Report of a WHO Expert Consultation. Geneva: World Health Organization; 2007:1–27.

26. Campbell N, Dary O, Cappuccio FP, Neufeld L, Harding K, Zimmermann MB. A call for action to coordinate programs to improve global health by optimizing salt and iodine intake. Bulletin of the World Health Organization. 2012;90:73–4.

27. Campbell NRC, Dary O, Cappuccio FP, Neufeld LM, Harding KB, Zimmermann MB. Need for coordinated programs to improve global health by optimizing salt and iodine intake. Pan Amer J Public Health. 2012;32(4):281–6.

28. Andersson M, de Benoist B, Rogers L. Epidemiology of iodine deficiency: Salt iodisation and iodine status. Best Pract Res Clin Endocrinol Metab. 2010;24:1–11.

29. Hawkes C, Webster J. National approaches to monitoring population salt intake: a trade-off between accuracy and practicality? PLoS ONE. 2012;7(10):e46727.

30. Ji C, Sykes L, Paul C, Dary O, Legetic B, Campbell NRC et al. Systematic review of studies comparing 24-h vs spot urine collections for estimating population salt intake. Pan Amer J Public Health. 2012;32(4):307–15.

31. Brown IJ, Dyer AR, Chan Q, Cogswell ME, Ueshima H, Stamler J, et al. Estimating 24-hour urinary sodium excretion from casual urinary sodium concentrations in Western populations. Am J Epidemiol. 2013;177:1180–92.

32. Cogswell ME, Elliott P, Wang C-Y, Rhodes DG, Pfeiffer CM, Loria CM. Assessing U.S. sodium intake through dietary data and urine biomarkers. Adv Nutr. 2013;4:560–2.

33. Cogswell ME, Wang C-Y, Chen T-C, Pfeiffer CM, Elliott P, Gillespie CD, et al. Validity of predictive equations for 24-h urinary sodium excretion in adults aged 18-39 y. Am J Clin Nutr. 2013. doi:10.3945/ajcn.113.059436.

34. Wang C-Y, Cogswell ME, Loria CM, Chen T-C, Pfeiffer CM, Swanson CA, et al. Urinary excretion of sodium, potassium, and chloride, but not iodine, varies by timing of collection in a 24-hour calibration study. J Nutrition. 2013. doi:10.3945/jn.113.175927.

35. Ji C, Miller MA, Venezia A, Strazzullo P, Cappuccio FP. Comparison of spot vs 24-h urine samples for estimating population salt intake: validation study in two independent samples of adults in Britain and Italy. Nutr Metab Cardiovasc Dis, 2013. doi:10.1016/j.numecd.2013.06.011.

36. WHO STEPwise approach for chronic disease in the Eastern Mediterranean Region. http://www.emro.who.int/ncd/media/excel/disease.xls

37. Assessment of iodine deficiency disorders and monitoring their elimination: a guide for programme managers. Third edition (updated 1st September 2008). Geneva: World Health Organization; 2007 (http://www.who. int/nutrition/publications/micronutrients/iodine_deficiency/9789241595827/en/index.html).

38. Campbell NRC, McKay DW, Chockalingam A, Fodor JG. Errors in Assessment of Blood Pressure: Sphygmomanometers and Blood Pressure Cuffs. Can J Public Health. 1994;Supplement 2:S22–S25.

39. Rasmussen LB, Ovesen L, Christiansen E. Day-to-day and within-day variation in urinary iodine excretion. Eur J Clin Nutr. 1999;53:401–7.

40. Furnée CA, van der Haar F, West CE, Hautvast JGAJ. A critical appraisal of goiter assessment and the ratio of urinary iodine to creatinine for evaluating iodine status. Am J Clin Nutr. 1994;59:1415–17.

41. IOM, National Academy of Sciences of the USA. Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc. A Report of the Panel on Micronutrients, Subcommittees on Upper Reference Levels of Nutrients and of Interpretation and Uses of Dietary Reference Intakes, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes. Washington, D.C.: National Academy Press; 2000:258–89

(http://www.nap.edu/openbook.php?record id=10026&page=258, accessed 18 August 2016).

42. Tanaka T, Okamura T, Miura K, Kadowaki T, Ueshima H, Nakagawa H, et al. A simple method to estimate population 24-h urinary sodium and potassium excretion using a casual urine specimen. J Hum Hypertens. 2002;16:97–103.

43. Kawano Y, Tsuchihashi T, Matsuura H, Ando K, Fujita T, Ueshima H. Report of the Working Group for dietary salt reduction of the Japanese Society of Hypertension: (2) Assessment of salt intake in the management of hypertension. Hypertens Res. 2007;30:887–93.

44. Knudsen N, Christiansen E, Brandt-Christensen M, Nygaard B, Perrild H. Age- and sex-adjusted iodine/creatinine ratio. A new standard in epidemiological surveys? Evaluation of three different estimates of iodine excretion based on casual urine samples and comparison to 24 h values. Eur J Clin Nutr. 2000;54:361–63.

45. Mann SJ, Gerber LM. Estimation of 24-hour sodium excretion from spot urine samples. J Clin Hypert. 2010;12:174–80.

There is compelling evidence of the direct relationship between salt consumption and blood pressure. WHO is coordinating initiatives globally to reduce dietary salt intake at the population level. Fundamental to this initiative is for countries to estimate a baseline of population-level dietary salt intake, and from there, to monitor trends in intake and the effectiveness of any interventions within and between populations. This document provides an essential salt intake measurement tool for countries in the Eastern Mediterranean Region that want to start, contribute to and share information on dietary salt reduction initiatives. The protocol is primarily intended for principle investigator(s) of studies of salt/sodium, potassium and iodine intake. Parts of the document are also intended for field staff who are conducting the surveys.