

An overview of National Health Measurement Surveys

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ABSTRACT

The purpose of this paper is to provide a brief overview of a number of national health surveys that incorporate physical and biochemical measures, and to identify their features and the differences in approaches taken by various countries. These types of health surveys are generally referred to as health measurement (HMSs) or health examination surveys (HESs).

These sample surveys are able to provide important information on the prevalence of various health conditions and distributions of physical, mental and biochemical characteristics of the population, as well as providing data on the relationship between risk factors and selected conditions, and social and environmental determinants of health. In Australia, a program of national health measurement surveys has been proposed: the Australian Health Measurement Survey (AHMS) program, and its features are outlined.

1. INTRODUCTION

Monitoring and forecasting the population's health and its health determinants are prerequisites for knowledge-based health policy and the development of health care at national, regional and local levels. National population health surveys containing a component of measurement have been used both in Australia and overseas to add to the information about the state of health of a population and to complement research into particular issues, diseases or directions in health policy. Such an approach has been proposed recently for Australia, the Australian Health Measurement Survey (AHMS) program.

National health surveys are characterised by the collection of subjective information through questionnaires (often referred to as Health Interview Surveys or HISs), and the gathering of more objective information via measurement of height, weight and body mass; factors in saliva, blood and/or urine; lung function; mental health and cognitive state; or childhood development. These latter methods are referred to as health measurement surveys (HMSs) or health examination surveys (HESs).

From an examination of the use of HMSs that have been undertaken around the world, the following purposes can be identified:

- the monitoring within a population of certain high priority health goals and targets relating to the prevention of various diseases or conditions at one point in time, and over time as surveys are repeated regularly;
- the provision of baseline data related to particular health issues or policies;
- the contribution to particular research questions about health and related conditions and their treatment or eradication;
- the surveillance of infective agents or other factors that impact negatively on the population's health or may do so in the future; and
- the collection of information at a population level - to assist in the development of policy and planning of services or determining need, to assess the degree of success of health promotion or illness prevention strategies and to contribute to a greater understanding of health and illness.

Survey programs of this nature are now being conducted in many countries around the world, and the information that is collected is an important resource to support policy development and health planning.

This paper will identify the main features of these surveys around the world and will outline some of the similarities and differences of the approaches adopted. The characteristics of the surveys will be described, including issues such as response rates, population coverage, methodologies, content and the policy impact of the data collected. A number of different models will be described, including those that are collaborative, multinational survey programs. The paper will attempt to outline those national surveys that have been undertaken relatively recently or that are being piloted or planned. It is not intended to be a comprehensive review, and is reliant solely upon the availability of descriptive information about the surveys in English.

2. AN OVERVIEW OF HEALTH MEASUREMENT SURVEYS

The overall aim of a health survey is to obtain a set of population estimates through an interview, and/or measurement and/or examination of a biochemical sample from a representative sub-group of a population. A health interview survey (HIS) with a health measurement survey or component provides data to describe the health of the total population, some of the determinants of health and the use of health care services (Van Ouyen 2001). Data from health surveys may be presented as estimates for a total population or for particular subgroups, or by specific characteristics or measures. The strength of these health surveys over and above other methods of health data collection is that data are gathered on different health-related domains at the same time (or over a period of time, for those surveys that have a longitudinal component), from the same person (Koponen & Aromaa 2001).

National health interview surveys are being conducted regularly in many countries around the world, including Australia. They provide valuable information on self-reported health and related topics, and interviews and questionnaires are the only way to obtain these data. However, physical, mental and biochemical measurement are required to gather information on many chronic health conditions and their determinants, disabilities, risk and protective factors and functional limitations. These more objective measures also provide an opportunity to assess the validity of and areas of potential bias in self-reported data from interviews or questionnaires. Such information can only be obtained from HMSs or by supplementing HISs with HMS methods.

2.1 Definition of a 'health measurement survey'

For the purposes of this paper, the term 'health measurement survey' is defined as a population-based health survey that combines results from both interview and physical examination and measurement to provide a national health profile (Fisher et al. 1996). HMSs involve physical examinations, measurements, clinical and laboratory tests and various other assessments. They may include anthropometric measurements, assessments of function and disability, laboratory assay of samples collected and other tests such as electrocardiography, ultrasonography and spirometry.

While an HMS is often complicated in design and relatively expensive to conduct, it is the only way of measuring the prevalence of selected diseases, health conditions and certain aspects of health status for a population (Koponen & Aromaa 2001). The HMS contains or is linked to a substantial interview component, and many health conditions require both interview and measurement data in order to define them and estimate their prevalence in a population.

2.2 Strengths and limitations of the HIS and the HMS models

In a national health interview survey (HIS), a proportion of the population is selected as a random sample of individuals or households (Armitage 1976). Trained interviewers administer standardised questionnaires, and there may also be some

self-completed questionnaires. HISs generally cover topics such as health status (as perceived by the individual), life style and health behaviours, use of services, living and working conditions, health protection and demographic and other social factors (Hupkens 1998). HISs are generally less expensive to run and are logistically less complex. They therefore allow a greater number of sampling units and a subsequent reduction in the variance (Fisher et al. 1996).

There are a number of limitations to the HIS. The first is the necessary use of language, and the different understandings of the questions asked and of the concepts (such as self-perceived health status or kin or time) contained therein. These issues are particularly significant for indigenous peoples, recent immigrant populations, people from developing countries (Sadana et al. 2000) and people with certain disabilities, communication difficulties or poor literacy. Unfortunately, it is often the case that the HIS is developed by a dominant culture that fails to explore alternative cultural or spiritual meanings of the questions or concepts being asked (Inhorn 1995; Gifford 1992), or to recognise the cultural sensitivity of certain topics, and does not seek to involve these groups adequately in survey design or questionnaire development.

Another weakness of the HIS is the fact that it cannot ascertain the prevalence of diseases or health conditions. Respondents may not know that they have a certain condition (which may be symptomless in the early stages, and therefore cannot be determined by interview). Some of these conditions require measurement or biochemical analyses in order to make a diagnosis. Examples of such conditions are hypertension, type 2 diabetes and anaemia. Other respondents may suffer from poor recall (for example, for minor illnesses or current immunisation status), or may over- or under-estimate (height, weight, tobacco or alcohol use) when completing a questionnaire or at interview. Other diseases may have symptoms but be difficult to quantify accurately through responses to questions (for example, visual or auditory acuity) (Fisher et al. 1996; Sadana et al. 2000).

There are also limitations to the HMS approach. While it is the most reliable vehicle for determining the prevalence of certain health conditions in a population, it is unlikely to identify adequately all relevant risk and protective factors. Therefore, the data gained from cross-sectional HMSs should not be expected to investigate causality (Fisher et al. 1996). Its scope and content are also limited by the substantial costs of testing and the feasibility of transporting testing equipment and samples in the field.

2.3 Development of HMS methodologies

One of the earliest models of an HMS was developed to assess the growth of newborns, and involved the weighing and measuring of new infants over the first months after birth to assess growth and weight gain. This data eventually formed the basis for the reference height, weight and head circumference percentile charts that are widely used today for monitoring the growth and development of young children (for example, Tanner et al. 1966 a & b). Traditional anthropometric surveys were also carried out on adults from the mid-1940s, often to assist with the design of

military and other equipment. In the 1940s and 1950s, HMSs were initiated to monitor the increasing prevalence of cardiovascular and other chronic diseases, and their epidemiological uses were then recognised (Koponen & Aromaa 2001). In the 1950s and 1960s, HMSs developed further as laboratory automation and portable measuring devices were introduced. By the 1970s and 1980s, issues of standardisation of measurements and quality control became significant and allowed additional measures to be included in the HMSs (Koponen & Aromaa 2001). Today, there are many examples of HMSs that address a wide range of health conditions and aspects of health status, including nutritional state, cognitive and mental health status, prevalence and extent of disability, prevalence of selected infectious diseases and immunisation status, in addition to monitoring chronic diseases (for example, Roberts & Dallal 2001).

However, HMSs have developed over time in response to local population needs, and now represent a diverse range of methodologies, content and approaches. Recently, there has been an increasing interest in standardising methodologies and measurement protocols in order to achieve greater comparability among surveys and between different countries. To this end in the European Community, there is ongoing work to identify the possibilities for collaborative action in conducting various forms of health surveys (Koponen & Aromaa 2001; Tolonen et al. 2001) and standardising HMS approaches. There is also a WHO-sponsored project being undertaken to design and test a number of different HIS/HMS methods across 20 populations in nationally representative surveys, some of which will involve the measurement of certain health domains (Sadana et al. 2000).

Several international studies, such as the CINDI (Country-wide Integrated Non-Communicable Disease Intervention) program and the MONICA (Multinational Monitoring of Trends and Determination in Cardiovascular Disease) cardiovascular risk factor surveys, have contributed to the development of standardised measurement methods and quality protocols for some diseases. In specific health areas, there has been collaborative work towards the trialling and development of standardised methods, for example in diabetes, mental health assessment and oral/dental health, but more effort is needed in other areas, such as musculoskeletal diseases and the assessment of function (Koponen & Aromaa 2001).

3. EXAMPLES OF NATIONAL HEALTH MEASUREMENT SURVEYS

3.1 Criteria for inclusion of surveys

For the purposes of this paper, the following criteria were used to assess a particular survey. Thus, a survey was included if:

- the survey involved measurements or clinical examination to describe the health of the participants;
- the survey used a national population sample (not local or regional samples, not a narrow age range, and not studies specific to a single disease or risk factor);
- the survey was identified as a part of an ongoing system of population health monitoring, with data collection that has been repeated or is planned to be repeated;
- the survey program was conducted during the period from 1980 to 2002.

Other sources of information about these surveys are more comprehensive than this overview. Recent extensive reviews of HMSs in Europe have been carried out (Koponen & Aromaa 2001; Tolonen et al. 2001). There is also an ongoing project conducted by the US National Centre for Health Statistics, which collates summary information on health surveys from 39 countries (NCHS 2000).

Many developing nations are involved in population health surveys that collect data to support issues of national economic and social development; specifically, female reproductive health and fertility, contraceptive use and infant and child growth and development, nutrition and mortality (e.g. the DHS+ series in Africa, Asia, the Near East, Latin America, and the Caribbean). Some of these have been conducted on an ongoing basis for over thirty years (USAID 2002), but this form of HMS has not been included in this brief overview.

3.2 Experience in countries other than Australia

Over the last two decades, numerous countries (such as Korea, Latvia, Pakistan, Greenland and Canada) have conducted single health measurement surveys. The majority of these focused on cardiovascular health or nutrition and included measures of body dimensions, blood pressure and analyses of blood samples. These single surveys are not included in this overview.

A number of international, collaborative measurement surveys have also been established. Examples of these include CINDI (Country-wide Integrated Non-Communicable Disease Intervention) and MONICA (Multinational Monitoring of Trends and Determination in Cardiovascular Disease). The current WHO initiative, Stepwise Approach to Surveillance (STEPS) of non-communicable disease risk factors, also uses standardised questions and measurement protocols at three levels of monitoring, depending on available resources across developing and more developed countries worldwide (Bonita et al. 2001).

However, some countries have now established, or are developing, ongoing programs of HMSs. The key design features of these programs are summarised below. Of these, the programs in the USA and the UK are the most sophisticated, and analyses of survey results have been highly valued by policy-makers and researchers. Each of these survey programs is now conducted on an annual, rolling basis and includes a wide range of physical, biochemical and other measures. Both of these programs survey children, offer interview and measurement in respondents' homes (or in special mobile clinics), have a longitudinal component for follow-up of some participants, have linkage to administrative data and store collected samples for further research.

A number of countries are now also favouring the survey design used by the UK Health Survey for England (HSE), which has a core content component (measured at every survey), and special interest modules (measured less frequently or opportunistically). The core content is designed to monitor general health, common risk factors and the socioeconomic determinants of health over time. Special interest modules examine particular health-related questions on an occasional or rotating basis in order to examine certain issues in greater depth. The Scottish, New Zealand, and the US NHANES (National Health and Nutrition Examination Survey program) have adopted aspects of this model.

3.3 Features of HMSs conducted overseas

A range of HMSs is described in Tables 3.1 and 3.2. Some surveys are annual, ongoing surveys such as those in the UK and USA. Others are periodic or are part of a serial program of surveys. Frequency of surveying, the populations covered, components of health status measurement, location of the measurement phase, linkage to other data sources and the storage of samples for possible later research are included.

3.3.1 Survey content

All surveys have contained a focus on cardiovascular diseases and their risk factors. Most have also included diabetes, respiratory diseases, nutrition and a component of risk factors/health behaviours. Dental/oral health and mental health are often the subject of separate surveys, or components on these topics have been included as part of the HMSs. As discussed earlier, separate surveys with one focus have not been included here.

Anthropometric and blood pressure measurements, and blood samples have been used in all surveys to date. Assessments of function and disability have included muscle and handgrip strength; vision and hearing tests; tests of coordination and balance; joint mobility etc. (see Table 3.3). Only a few survey programs have extended their analyses to include environmental toxins and pollutants.

There is considerable variation in the methodologies adopted for measurement of aspects of health status in the HMSs described. Different approaches have been used for blood pressure measurement, but anthropometric measures have been more consistent. Fasting has been a part of some surveys, with the time of fasting varying from four to twelve hours (see Table 3.4). Some surveys have not used fasting samples apart from occasional surveys (UK Health Survey for England), while others

accept both fasting and non-fasting samples (e.g. NHANES). Urine samples have been collected in a number of surveys, and urine spot samples are also tested in others for a range of substances. Other surveys have included the sampling of saliva and hair.

3.3.2 Populations sampled

There is considerable variation in the scope of the populations sampled. Some survey programs sample the whole population, including those who are institutionalised, and others involve all age ranges, from infants and children to the aged (see Table 3.1). Others have focused primarily on households and working-aged and older adults.

The inclusion of children in an HMS often indicates an interest in the early onset in life of risk factors for many of the non-communicable diseases that affect the health of the adult population. While some believe that the inclusion of children adds to the cost and complexity of conducting an HMS and may reduce survey response rates, the experience of countries that have included children supports the premise that the information can be effectively gathered from this population without compromising the HMS overall. In those countries that survey children, it is also evident that the data is used effectively for policy development, early intervention and future health program planning.

For example, researchers in the UK found that response rates were higher in children than in adults in the Health Survey for England (HSE). In 1997 when there was a major focus in the survey on children and young adults, the response rate for adults interviewed in eligible households was 71%, but it was 85% for children aged 2-15 years. As expected, the response rates were lower for the nurse visit, but still higher for children than for adults. In the 1997 survey, 79% of children saw a nurse compared with only 63% of adults. The experience in the HSE is that in cooperating households, the children's response is always very high. It was 99% in 1997 (vs. 93% in adults). The same pattern applies to other survey years (Primatesta 2000).

Similar results were also obtained for the 1997 UK 'National Diet and Nutrition Survey: young people aged 4 to 18 years', where just under 70% of the eligible sample of 2,700 young people aged between 4 and 18 years, and 87% of those who were interviewed provided a spot urine sample for analysis. Consent to attempt to obtain a blood sample was given for just under half the young people in the eligible sample, corresponding to nearly two-thirds of those who were interviewed (Gregory et al. 2000).

3.3.3 Other features

Many survey programs have incorporated a number of other aspects. These include the storage of samples, mainly blood, to serve as a repository for access by other researchers at a later time. Such initiatives require significant resources for long-term freezing, ethical and legal safeguards and specialised procedures for consent from individuals. There are also generally strict guidelines that have been established governing access to the sample repository by *bona fide* researchers.

Some survey programs contain within them, smaller research projects on sub-samples of the survey population. Longitudinal components to follow respondents for varying periods of time, and linkage to administrative data, mortality information and disease-based registries are also incorporated, and add additional value to the survey program.

Table 3.1: Overview of population HMS programs – National examples from countries other than Australia

Country and survey program	Freqcy.	Chldrn yes/no	Survey design, population & sample type	Target popln	Sample size invited (per survey)	Response rate	Non response % (for exam. overall)	Locatn.	Physical and biochemical measures	Data link'ge	Storage of samples
ENGLAND UK Health Survey for England (HSE)	Yearly since 1991	✓ 2 yrs. + (from 1995)	Cross sectional, multistage sample of households, persons aged 2-74yrs. (Hseholds)	Non-Instit n.	20 000 (16 000 adults & 4 000 children 1998)	74%	26% (hseholds.)	Home	Core measures: Blood pressure, height, weight, body dimensions Measures related to individual topics: Cardiovascular disease (blood) Asthma/accidents/disability (blood, saliva, spirometry)	✓	✓
FINLAND Health 2000	Five-yearly (from 2000) Previous survey 1978/9	×	Cross sectional with followup, stratified cluster sample of population aged 30yrs.+ (Indivs.)	All	8 000 adults 30yrs.+	80% (for 2000/01 not known yet)	20% (for first 3 months of survey)	Home or mobile clinics	Height, weight, body dimensions, bio-impedance, blood pressure, tests of physical and mental functioning, vision and hearing, oral and dental health, ECG, spirometry, blood, saliva, urine, and faecal analyses.	n.a*.	✓
FRANCE Enquete sante Planned for 2002	-	-	Random sample of households stratified by geographic area	-	12 000 (All in hsehold)	-	-	-	Weight, height, blood pressure, audiometry, visual acuity, oral health, blood samples. Functional capacity and mental health under consideration.		

Country and survey program	Freqcy.	Chldrn yes/no	Survey design, population & sample type	Target popln	Sample size invited (per survey)	Response rate	Non response % (for exam. overall)	Locatn.	Physical and biochemical measures	Data link'ge	Storage of samples
GERMANY National Health Examination & Interview Survey (Bundes-Gesundheits-survey)	6-8 years [1984/5, 1987/8, 1990/1, 1997/9]	x	Cross sectional, stratified random sample of those 18-79 yrs. (Indiv.)	Non-Institn.	11 600 adults aged 18-79 yrs.	61%	39%	Health clinic or home	Core measures: Blood pressure, height, weight, body dimensions, blood and urine analyses, mental health exam, tests of function, nutritional status	n.a.	n.a.
IRELAND Pilot only - part of Survey of Lifestyle, Attitudes and Nutrition (SLAN)	1998 (1990 National Nutrition Survey)	x	Cross sectional, multistage probability sample of persons 18yrs.+ (Indiv.)	Non-Institn.	1 035 adults (10% of SLAN survey of 10 515)	55%	45%	Clinic	Height, weight, blood pressure, blood sample, mental health exam.	n.a.	n.a.
ITALY Planned - pilot in Florence	Pilot 2000	x	Random sample of population aged 35-74yrs. (Indiv.)	All	500-600 adults, 35-74 yrs.	n.a.	n.a.	Clinic	Height, weight, BMI, blood pressure, blood samples, ECG, spirometry.	n.a.	n.a.

Country and survey program	Freqcy.	Chldrn yes/no	Survey design, population & sample type	Target popln	Sample size invited (per survey)	Response rate	Non response % (for exam. overall)	Locatn.	Physical and biochemical measures	Data link'ge	Storage of samples
NETHERLNDS : Risk Factors and Health in the Netherlands (Regenboog Project) 1998/99/00	Annual (Since 1993)	✓ 12 yrs.+	Cross sectional, multistage probability sample, population 12 yrs.+ (Indiv.)	Non-Institn.	1550 invited to exam.	51%	49%	Clinic	Height, weight, blood pressure, blood lipids, serology, joint function & musculoskeletal problems.	n.a.	✓
NEW ZEALAND NZ Health Monitor program (secured funding – to be run from 2002)	Contin uous (10 year cycle progra m)	✓	Component surveys over a 10 year cycle, Hsehlds. (followup for 24 months)	Will vary (Hsehlds, schools & some institns.)	7 500 (5 000 for nutritio n and mental health surveys)	-	-	Home	Core measures: Height, weight, bio-impedance, blood pressure, blood analyses, function and mobility. Measures for each survey: Child nutrition (2002) Mental health (2003)	✓	To be deter- mined
National Nutrition Survey	1996/97	×	Indiv.		4 636 (15yrs.+)	50.1%	49.9%	Home	Height, weight, body dimensions, blood pressure, iron, cholesterol, environmental chemicals.	✓	✓

Country and survey program	Freqcy.	Chldrn yes/no	Survey design, population & sample type	Target popln	Sample size invited (per survey)	Response rate	Non response % (for exam. overall)	Locatn.	Physical and biochemical measures	Data link'ge	Storage of samples
SCOTLAND UK Scottish Health Survey	Triennial (1995, 1998)	✓ 2 yrs.+	Cross sectional, multistage probability sample of households, persons aged 2-74 yrs. (Hsehlds.)	Non-Institn.	7932 (1998)	71%	29%	Home	Core measures: Blood pressure, height, weight, body dimensions, lung function, blood analyses Measures related to individual survey topics: Cardiovascular disease (blood)	✓	✓
SINGAPORE National Health Survey	1992, 1998	×	Cross sectional, stratified sample of those 18-69 yrs., with over-sampling of Malay and Indian ethnic gps.	Non-Institn.	7 325 adults 18-69 yrs. (1998)	64.5%	35.5%	Clubs/ cmty. centres	Core measures: Blood pressure, height, weight, body dimensions, blood analyses Both surveys focused on: Diabetes and cardiovascular disease	n.a.	n.a.

Country and survey program	Freqcy.	Chldrn yes/no	Survey design, population & sample type	Target popln	Sample size invited (per survey)	Response rate	Non response % (for exam. overall)	Locatn.	Physical and biochemical measures	Data link'ge	Storage of samples
USA National Health and Nutrition Examination Survey (NHANES)	Annual continuous (from 1999); previously a series of 8 multi-year surveys (from 1960)	✓ from 2 months old (from 1988)	Cross sectional, multistage sample of non-institnlisd. population aged 2 months+ Over-sampling of some minorities. (Indiv.)	Non-Institn.	40 600 (7 000 per annum)	73%	n.a.	Mobile centre or in the home	Core measures: Blood pressure, height, weight, body dimensions, analyses of blood and urine Measures on sub samples: include ECG, audiometry, balance testing, bioelectrical impedance, cardiovascular fitness, body composition, bone densitometry, dermatology exam, lower extremity disease exam, muscular strength testing, oral health, vision testing, TB skin test, spirometry, allergy testing	✓	✓

Sources: Koponen & Aromaa 2001; NCHS 2001; NCHS 2000; Quigley & Watts 1997.

n.a. = Details not available to author

Table 3.2: Details of health status components – National HMS examples from countries other than Australia

<i>Health Status components</i>	England	Finland	Germany	Ireland	Italy (pilot)	Netherlands	New Zealand	Scotland	Singapore	USA
Cardiovascular	1991-94, 1998, 1999 2000	1978/80, 2000/01	All surveys since 1984/85	1998	2000	1998/99	1997, planned for 2005	1995, 1998	1992, 1998	1976-80, 1988-94, 1999-
Respiratory	1995-97 1999	1978/80, 2000/01			2000			1995, 1998		1976-80, 1988-94, 1999-
Diabetes/metabolic	1991-94, 1998, 1999 2000	1978/80, 2000/01	1997/99		2000	1998/99			1992, 1998	1976-80, 1988-94, 1999-
Musculoskeletal		1978/80, 2000/01			2000	1998/99				1976-80, 1988-94, 1999-
Allergy	1995-96, 1998, 1999		1997/99							1976-80, 1988-94, 1999-
Kidney and urinary tract		1978/80, 2000/01	1997/99							1976-80, 1988-94, 1999-
Thyroid		1978/80	1997/99							1976-80, 1988-94, 1999-
Infectious diseases & immunisation		2000/01	1997/99		2000	1998/99				1976-80, 1988-94, 1999-
Liver and GIT		1978/80, 2000/01	1997/99							1976-80, 1988-94, 1999-
Blood disorders	1997, 1998 1999, 2000	1978/80, 2000/01	1997/99		2000		1997	1995		1976-80, 1988-94, 1999-
Function/Disability	2000	1978/80, 2000/01				1998/99				1976-80, 1988-94, 1999-

Health Status components	England	Finland	Germany	Ireland	Italy (pilot)	Netherlands	New Zealand	Scotland	Singapore	USA
Mental health	Separate survey	1978/80, 2000/01	1997/99	1998		Separate survey	Planned for 2004			1976-80, 1988-94, 1999-
Dental health	Separate survey	1978/80, 2000/01			2000	Separate survey				1976-80, 1988-94, 1999-
Risk factors/ Health behaviours	1994, 1997, 1998, 1999 2000	1978/80, 2000/01	1997/99	1998				1995	1992, 1998	1976-80, 1988-94, 1999-
Women's health									1992, 1998	1976-80, 1988-94, 1999-
Environmental toxins/exposure	1997, 1998, 2000						1997			1988-94, 1999-
Skin conditions										1999-
Nutrition/ Food habits	2000	1978/80, 2000/01	1997/99		2000		1989, 1997 (adults), 2002 (children)	1998		1976-80, 1988-94, 1999-

n.a.* = Details not available to the author

Sources: Koponen & Aromaa 2001; NCHS 2001; NCHS 2000; Quigley & Watts 1997.

Table 3.3: Measurements and methods used in HMSs – National examples from countries other than Australia

<i>Measures</i>	England	Finland	Germany	Ireland	Italy (pilot)	Netherlands	New Zealand ¹	Scotland	Singapore	USA
Anthropometric measurements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Blood samples	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Urine samples		✓	✓							✓
Saliva samples	✓							✓		
Blood pressure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ECG	✓	✓			✓					✓
Spirometry	✓	✓			✓		✓	✓		
Functional status		✓				✓	✓			✓
Vision		✓					✓			✓
Hearing (audiometry)		✓					✓			✓
Cognitive tests		✓					✓			✓
Diagnostic mental health assessment		✓	✓	✓						✓
Dental examination		✓								✓
Bone density		✓			✓					✓
Clinical physical exam.			✓							✓
Other (bioimpedance; breast exam etc.)		✓					✓		✓	✓

Note: some components are covered in specific sub-populations or years only.

Sources: Koponen & Aromaa 2001; NCHS 2001; NCHS 2000; Quigley & Watts 1997.

¹ These refer to the planned NZ Health Monitor Survey program.

Table 3.4: Anthropometric measurements and blood sampling in HMSs – Examples from countries other than Australia

	England	Finland	Germany	Ireland	Italy (pilot)	Netherlands	New Zealand ²	Scotland	Singapore	USA
Anthropometric measurements:										
Height	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Weight	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Skinfold	no	no	no	no	no	no	yes	no	no	yes
Waist-hip circumference	yes	yes	yes	no	yes	yes	yes	yes	yes	yes
Bioimpedance	no	yes	no	no	no	no	yes	no	no	yes
Demi-span	yes (for 65y+)	no	no	no	no	no	no	no	no	no
Blood samples:										
Fasting	no (yes, for a sample 35 yrs+ in 1999)	yes	yes	no	yes	yes/no*	no	no	yes	yes/no*
Field analysis	no	no	yes	no	yes	no	no	no	no	yes
Samples sent to laboratory	yes	yes	yes	yes	no	yes	yes	yes	yes	yes
Storage of samples	yes	yes	yes	no	n.a.	yes	yes	yes	n.a.	yes

Note: *indicates non-fasting for persons who attend in the afternoon.

n.a. = Details not available to the author

Sources: Koponen & Aromaa 2001; NCHS 2001; NCHS 2000; Quigley & Watts 1997; MOH Singapore 1999.

² This refers to the 1997 NZ National Nutrition Survey.

Table 3.5: Characteristics of survey phases and examinations in national HMSs

	England	Finland	Germany	Ireland	Italy (pilot)	Netherlands	New Zealand ³	Scotland	Singapore	USA
Average duration of HIS phase per person	70 min (for two people)	90 min	30 min	60 min	30 min	45 min	69 min	40 min	n.a.	30 to 90 min
Average duration of HMS phase	40 min	4 hr	45 min	20 min	40 min	30 min	n.a.	40 min	n.a.	1 to 4 hr
Response rate for HIS	69%	n.a.	61.4% (in 1998)	n.a.	n.a.	55%		81%	n.a.	82% (NHANES III)
Response rate for HMS	47%	n.a.	53.9%	n.a.	n.a.	30%		65%	n.a.	71%
Place of HMS	Home	Clinic/ Home	Clinic/ Home	Clinic	Clinic	Clinic	Home	Home	Clinic	Home/ Mobile clinic
HMS personnel	Nurses	Nurses, Physicians Lab techs. Dentists	Physicians Med-tech assistants	Nurses	Nurses Physicians	Nurses Med-tech assistants	Nurses	Nurses	Nurses Physicians	Nurses Physicians Dentists Medical techs.

Sources: Koponen & Aromaa 2001; EHRM 2001.

³ This refers to the 1997 NZ National Nutrition Survey.

Table 3.6: Features of previous HMSs in Australia and in some countries overseas

SURVEY	New Zealand National Nutrition Survey	NHANES III (USA)	Health Surveys of England	Canadian Heart Health Surveys	NHF Risk Factor Prevalence Surveys (AUS)	National Survey of Lead in Children (AUS)	ABS National Nutrition Survey (AUS)
Year, frequency	1997, single survey	1988-94, longitudinal Annual from 1999	Annual from 1991	1986-92, ten surveys, each in a different province	1980, 1983, 1989	1995, single survey	1995, single survey (piloting of blood samples)
Method	2 stage in home	1 stage in mobile clinic	2 stage in home	2 stage, home and clinic	1 stage in clinic	2 stage in home	2 stage in home
Sample size	4 636	39 695 (over 1988-94), then 7 000 per annum	23 300 in 1998	29 855 (over all surveys)	9 328 in 1989	3 452	13 858
Scope	15 years +	1 year +	2 years +	18-74 years	20-69 years	1-4 years	2 years+
Response rate to interview component	74%	86%	74% in 1998	78%	75%	79%	91%
Direct response rate to blood	68%	85%	62% in 1998	82%	76%	48%	61%
Final response rate to blood	50%	73% (respondents paid)	46%	64%	57%	38%	56%

Source: Rawson M. 2000 (personal communication)

3.3 Experiences in Australia

There have been several national population based studies conducted in Australia that have included the collection of physical and biochemical measurements. The key features of these surveys are outlined in Table 2.3. Many smaller surveys, usually focused on particular geographic areas or special populations of interest, have also included physical and biochemical measurements but only 'national' population based surveys are described below. The National Heart Foundation's Risk Factor Prevalence Study surveys of capital cities have been repeated over time and provide a time series of data on cardiovascular health.

With the development of several survey programs overseas that include physical and biochemical measurement, there has been an increasing interest in Australia for establishing a similar, coordinated national program. The first Australian proposal began as a single biochemical risk factor survey to repeat, and build on, the information obtained from the 1989 National Heart Foundation survey. The proposal has since developed to follow the model adopted by the UK and USA, that of a coordinated national program of periodic population health measurement surveys to cover a range of public health issues over time. An outline of the proposed Australian Health Measurement Survey (AHMS) program is described in Section 3.3.1.

Table 3.7: National population health surveys using physical and biochemical measurement in Australia

	Survey design	Sample size	Physical and biochemical measures
National Heart Foundation: Risk Factor Prevalence Study	Three cross-sectional surveys in all capital cities in 1980, 1983 and 1989	5 000 to 10 000 adults (aged 20-69 yrs)	Related to cardiovascular health: blood, blood pressure, fasting glucose (only first two) and body measurements
Aust. Council for Health, Physical Education and Recreation Inc.: Australian Health and Fitness Survey	Cross-sectional national survey of schoolchildren in 1985	8 500 students aged 7-15 years	Related to cardiovascular health: blood, blood pressure and body measurements
Environmental Protection Authority: National Survey of Lead in Australian Children	Cross-sectional national survey in 1995	3 000 children (aged 1-4)	Related to blood lead levels: blood
ABS: National Nutrition Survey	Cross-sectional national survey in 1995 (undertaken on a sub-sample of the ABS NHS)	13 800 children and adults (2yrs+)	Body measurements, and blood pressure (16+)
International Diabetes Institute: Australian Diabetes, Obesity and Lifestyle Study (AusDiab)	Cross-sectional national survey in 1999	10 000 adults (aged 25yrs+)	Related to cardiovascular disease and diabetes: blood, oral glucose tolerance test, body measurements, bioimpedance, spot urine and ECG; (foot screening, sensory tests and retinal photography in a sub-sample)

3.3.1 Outline of the proposed Australian Health Measurement Survey program

The proposed AHMS program has been developed as a program of cross-sectional surveys that include a component of physical and biochemical measurement, and will examine a range of disease outcomes and risks. The broad aim of the program is the collection of population health information at a national level – specifically designed to assist in the development of health policy and service planning, to assess the degree of success of health promotion or illness prevention strategies and to contribute to a greater understanding of health and illness in Australia via research.

The AHMS program will be nationally representative of people of different age, sex, geographic area and socioeconomic circumstances. It will combine questionnaire responses and physical and biochemical measures (such as measurement of height and weight; analyses of samples of blood, urine, and saliva; and tests of function). The program of surveys allows for the inclusion of a wider range of content areas than a single 'stand-alone' survey. The design contains a 'core' of measures, which is repeated at each survey, with one or more modules on subjects of special interest undertaken opportunistically, and utilises a similar model to that which has been implemented successfully in the UK and the USA.

A number of national health policy areas have been identified as important for inclusion in the AHMS program, such as chronic disease comorbidities, onset of risk factors in childhood, overweight and obesity, mental health, lack of physical activity and nutrition, in addition to cardiovascular disease and diabetes mellitus. The survey will provide national prevalence estimates for a range of chronic diseases and conditions across relevant age groups.

Two frameworks, *The National Health Performance Framework* (devised by the National Health Performance Committee (NHPC 2001) and AHMAC endorsed) and *Preventing Chronic Disease: A Strategic Framework*, (devised by the National Public Health Partnership (NPHP) (2001) and AHMAC endorsed) provide a mechanism to ensure national data collection develops in a coordinated way to fill information gaps in Australia. The AHMS program offers an important opportunity to collect information to fill some gaps highlighted by these frameworks.

The AHMS program is recommended to commence in association with the Australian Bureau of Statistics' (ABS) National Health Survey (NHS), which collects health information by personal interview. The first survey of the AHMS program would be conducted in association with the NHS in 2004/5, preceded by a dress rehearsal in 2003/4. The program is, in effect, in two parts. The first of these comprises the subjective measures undertaken in the NHS. The second includes the physical and biochemical measurement undertaken in the AHMS. It is proposed that the survey be repeated after six years, with the possibility of more frequent (e.g. three yearly) surveys once the initial results have been analysed and their contribution to policy development, program planning and research assessed.

The proposed objectives of the AHMS program are:

- to determine the prevalence of selected disease outcomes and risk factors/determinants in the Australian population and selected population groups, as a basis for policy and strategy development;
- to monitor trends in the prevalence of identified disease outcomes and risk factors/determinants in the Australian population and selected sub-population groups;
- to examine the relationships among selected diseases and risk factors/determinants; and,
- to validate self-report of selected risk factors/determinants using biological measures, in order to assess the validity of time trends in health indices obtained using self-report.

Information from the surveys will be used:

- to generate reliable evidence over time to be used for population health planning and the evaluation of several major disease prevention and control activities, including the National Health Priority Area (NHPA) strategies;
- to examine the relationships among selected diseases and risk factors/determinants to assist in focusing research efforts and policy developments;
- to provide the infrastructure for “opportunistic” testing of issues of concern (for example, lead or other pollutants) that may arise in the future; and,
- to validate the self-report measures that are collected in face-to-face health surveys and potentially provide weights for adjustment of those surveys.

Future opportunities for consideration within the AHMS program exist for administrative data linkage to cancer and death registries, possible sample storage and for the inclusion of a longitudinal component to allow follow-up of some participants over time, all subject to participant consent. These issues have been considered for the initial AHMS, but require considerable community consultation and ethical debate, and have been excluded from the proposed first AHMS at this time.

4. CONCLUSION

Population health surveys take a variety of forms - the HIS/HMS may include an interview with single measurements and/or blood samples or a comprehensive health examination over several hours. It may also involve an assessment of cognitive ability or mental state or a full dental examination to determine oral health, all of which must be undertaken by a skilled professional assessor.

A combination of HIS and HMS builds on the strengths of both and allows an assessment of the validity of self-reported information and to determine weightings or adjustment factors for interpreting future data.

Survey programs of this nature are now being conducted in many countries around the world, including Australia, and the information that is collected is an important resource to support policy development and health planning.

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