

Health 2000 and Health 2011 Health Examination Surveys

Information for researchers interested in using stored samples and data



Introduction

Health 2000 Survey (*in Finnish: Terveys 2000*), a comprehensive health interview and health examination survey, was carried out in 2000-2001. The study was based on a nationally representative sample of 8028 persons aged 30 years and over living in the mainland Finland. The study was carried out by the Finnish Institute for Health and Welfare (THL, formerly National Public Health Institute) in co-operation with researchers and experts from several different organizations. The main aim of the Health 2000 Survey was to obtain information on the most important public health problems in the population aged 30 and over, their determinants, health service needs and utilization as well as on the population's functional capacity and working capacity. As a part of the study blood samples were collected and stored frozen at -70°C. In addition a sample of 1894 persons aged 18-29 years participated in the study via interviews and/or questionnaires. The cohort is continuously followed-up by linkage to nationwide health registers.

A follow-up study of the Health 2000 survey sample was conducted in 2011-2012, in which extensive data was collected from all persons aged 29 years and over, using health examinations, interviews and questionnaires, and a new set of persons aged 18-28 years participated mostly by answering questionnaires.

The Health 2000/2011 surveys included also participants of the Mini-Finland Health Examination Survey (www.thl.fi/mini-suomi and <https://thl.fi/en/web/thl-biobank/for-researchers/sample-collections/finnish-mobile-clinic-collections-1966-1980-autoklinikka->), a representative study of the Finnish population carried out in 1978-1980 by The Social Insurance Institution (Kela).

Health 2000/2011 is an important study both nationally and internationally. It is of major importance for the planning and development of Finnish health policy, health care and social security at large. Combined with the findings from the Mini-Finland Health Examination Survey, this unique data source provides an in-depth picture of the development of health in Finland in the last 40 years.

Ethical considerations

Ethical approval for the study was obtained from the Coordinating Ethical Committee of the Helsinki and Uusimaa Hospital Region: for Health 2000 approval was obtained at 31 May 2000 and for Health 2011 approval was obtained at 17 June 2011. Written informed consent was obtained separately for the health interview and the health examination. All participants who donated samples signed informed consent for the use of their samples and data in research about risk factors and preventive measures for common diseases, disabilities and emerging health problems (Health 2000 consent); or for use in medical and public health research and in the study of genetic risk factors of common diseases (Health 2011 consent).

The Health 2000/2011 sample collection has been transferred to THL Biobank in June 2015, following a public announcement that appeared in the Official Newspaper on 25 March 2015. THL Biobank hosts samples and data only from individuals who have donated samples in the health examinations of 2000 or 2011 and signed informed consent, and who have not prohibited the transfer of their samples and data to THL Biobank. The transfer of the Health 2000/2011 sample collection to THL Biobank has been approved by the Coordinating Ethics Committee of Helsinki University Hospital on 10 October 2014 and by the Ministry of Social Affairs and Health on 9 March 2015.

Implementation of the Health 2000 study

A total of 130 researchers and experts from different organizations were involved in planning and coordinating the project, headquartered at the National Public Health Institute KTL (currently THL). About 160 interviewers from Statistics Finland and five KTL field teams comprising 80 nurses, dentists and physicians, carried out the field survey.

Selection of the Health 2000 participants was done via two-stage stratified cluster sampling design, planned by Statistics Finland and KTL. The sampling frame comprised adults aged 30 years and over living in mainland Finland. This frame was regionally stratified according to the five university hospital regions, each containing roughly one million inhabitants. From each university hospital region 16 health care districts were sampled as clusters (altogether 80 health care districts in the whole country). The ultimate sampling units were persons who were selected by systematic sampling from the health center districts using the national population register. Persons aged 80 years and over were oversampled by doubling the sampling fraction.

In addition, there were two other health studies linked to the main study described:

1. A sample of 1894 persons aged 18 to 29 years was drawn using the sampling design described above. Their study protocol was a modified and condensed version of the one used for those aged 30 or over (no samples were taken).
2. In order to obtain good follow-up data for the previous corresponding large health examination survey, seven municipalities were selected where all survivors from the Mini-Finland Health Examination Survey in 1978 to 1980 were invited to take part in the study (N = 1 260, aged 50 years or over).

A total of 8028 persons aged 30 years or over were invited to the study (not including Mini-Finland participants) and 6701 participated and donated (See Table 4).

The Health 2000 survey was divided into two phases:

1. Home health interview, conducted by Statistics Finland.
The interview was used to gather basic background and sociodemographic information, information about health and illnesses as well as use of medicines, use of health services, living habits, environment, functional capacity, work and work capacity as well as need for help and rehabilitation. See Table 1 for detailed information.
2. Health examination, carried out by five field teams of the National Public Health Institute
The health examination was comprised of the following phases
 - Standard symptom interviews, venous blood samples, measurements of height, weight, bioimpedance, blood pressures, joint functions, hand grip strength, psychometric tests, resting ECG, spirometry, orthopantomography, and detailed dental status
 - Clinical examination by field physician: medical history, symptom history, assessment of drug prescriptions and other documents, cardiovascular and pulmonary status, detailed status of

back and joints, setting diagnoses according to preset criteria, assessment of functional abilities and disabilities, met and unmet needs for care. See Table 2 for detailed information.

In addition to these, the participants filled out three questionnaires and a dietary questionnaire (FFQ) (see Table 3 for additional information).

In order to get information from as many selected individuals as possible, an abbreviated health examination was carried out when possible for non-respondents at home or in hospital; a telephone survey was conducted for other non-responders; and finally, a questionnaire was sent to persons not otherwise contacted.

A comprehensive methodology report on the Health 2000 survey can be found at:

<http://urn.fi/URN:NBN:fi-fe201204193320>

Health 2011 Follow-up Study

The aim of the Health 2011 survey was to produce new reliable data and predict the future development of the health, functional capacity and wellbeing of the Finnish adult population, as well as record the changes that have occurred since 2000. At this study, information was collected mainly from the same individuals who have participated in the Health 2000 study. Also non-respondents in the Health 2000 survey were invited.

A total of 8135 individuals aged 29 years and over were invited to participate. A new sample of 1994 young adults aged 18-28 years was invited, of which 415 were invited also to the health examination. Finally, 950 participants of the Mini-Finland Health Examination Survey were invited to participate. The primary fieldwork of Health 2011 Study began on 8 August 2011 and lasted until 21 December 2011. The complementary data collection continued until June 2012 by means of phone interviews, home-visit health examinations, mail questionnaires and contracted health examinations.

The health examination included the following tests (Table 2): visual acuity, anthropometrics, body composition analysis by means of bioelectrical impedance analysis, ECG measurement, balance test for participants aged >70 years, blood pressure x2, heart rate, oral examination (Helsinki and Oulu study fields) and radiographic examination (Helsinki), spirometry, blood sampling following 4 hour fasting, cognitive functioning tests, physical ability tests, hand grip strength test, and walking speed test. Interviews included a mental health interview (CIDI), and an extensive health interview (Table 1). The participants also filled out four questionnaires, including a food frequency questionnaire (Table 3).

A comprehensive methodology report on the Health 2011 survey can be found at:

<http://urn.fi/URN:ISBN:978-952-302-669-8>

Interview, questionnaire and physical examination data collected in Health 2000 and Health 2011 surveys

A vast amount of questionnaire and interview data as well as physical examination data is available for Health 2000 and Health 2011 participants. The tables below provide detailed information.

Table 1. Home (2000) and Health examination (2011) interview data categories

Home/Health examination interview	H2000	H2011
A. Background information		
AA. Mother tongue, marital status	yes	yes
AB. Household	yes	yes
AC. Education	yes	yes
AD. Main activity, occupation	yes	yes
AE. Current/previous work	yes	yes
AF. Working hours (and income in 2000)	yes	yes
AH. Unemployment	yes	yes
AI. Spouse information	yes	yes
B. Health status and diseases		
BA. Current health and chronic diseases	yes	yes
Lung diseases	yes	yes
Heart diseases	yes	yes
Other cardiovascular diseases	yes	yes
Musculoskeletal symptoms	yes	yes
Accidents	yes	yes
Mental health problems	yes	yes
Vision and hearing defects	yes	yes
Diabetes	yes	yes
Cancer	yes	yes
Other diagnosed diseases	yes	yes
BB. Treatment of diseases	yes	yes
Hospitalizations	yes	yes
Surgical operations	yes	yes
BC. Men's questions	yes	yes
Infertility	yes	yes
Contraception	yes	yes
BD. Women's questions	yes	yes
Menstrual period	yes	yes
Pregnancy and delivery	yes	yes
infertility and infertility treatment	yes	yes
Contraception	yes	yes
Hormone replacement therapy	yes	yes
C. Questions regarding parents and siblings		
Diseases of parents and siblings	yes	no
Childhood living conditions	yes	no
D. Health services		
DA. Access to health services	yes	yes

DB. Ambulatory visits	yes	yes
DC. Mental health services	yes	yes
DD. Health examinations and preventive health services	yes	yes
DE. Physiotherapy	yes	yes
Other treatments	yes	yes
DF. Medication	yes	yes
E. Oral health		
EA. Oral health status	yes	yes
EB. Oral self-care	yes	yes
EC. Use of dental services	yes	yes
ED. Dental treatments	yes	yes
F. Lifestyle		
FA. Eating habits	yes	yes
FB. Smoking	yes	yes
G. Living environment		
GB. Residential environment	yes	yes
Hindrances in residential environment	yes	yes
GC. Neighbourhood services	yes	yes
H. Functional capacity		
HA. Activities of daily living (ADL and IADL)	yes	yes
HB. Mobility	yes	yes
HC. Sensory functions (vision, hearing)	yes	yes
HD. Need and receipt of assistance and help	yes	yes
HG. Assistive devices	yes	yes
HF. Cognitive capacity (Abbreviated MMSE 55+)	yes	yes
I. Work and work capacity		
IA. Working conditions	yes	yes
IB. Work ability	yes	yes
IC. Skills	yes	yes
ID. Retirement attitudes	yes	yes
IE. Work history	yes	yes
J. Rehabilitation		
JA. Use of services	yes	yes
JB. Need for rehabilitation	yes	yes
K. Interviewer's assessments		
KA. Use of a proxy or an assistant in the interview	yes	yes
KB. Assessment of participant's functional ability	yes	yes

Table 2. Physical examination data categories in Health 2000 and Health 2011

Physical examination	H2000	H2011
Blood pressure x2 and pulse	yes	yes
Anthropometrics	yes	yes
Electrocardiography	yes	yes
Spirometry	yes	yes
Heel bone ultrasound	yes	no
Body composition (bioimpedance)	yes	yes
Vision test	yes	yes
Auditory test	yes	no
Cognitive tests	yes	yes
Hand grip strength test	yes	yes
Balance tests	yes	yes
Reaction time test	yes	no
Other functional capacity tests	yes	yes
Mental health interview (CIDI)	yes	yes
Clinical examination by field physician	yes	no
Dental status by dentist	yes	yes
Dental X-ray	yes	yes

Table 3. Questionnaire data categories in Health 2000 and Health 2011

Questionnaire information	H2000	H2011
Living habits, work, living environment, health and well-being		
Weight and height questions	yes	yes
Time management and hobbies	yes	yes
Use of computer	yes	no
Information retrieval related to health and diseases	yes	no
Functional ability	yes	yes
Exercise	yes	yes
Use of alcohol	yes	yes
Treatment of drinking problems	yes	yes
Nutrition	yes	yes
Sweets and sweetened drinks	no	yes
Health promotion	yes	yes
Quality of life	yes	yes
Vitality	yes	yes
Loneliness	no	yes
Household income and expenditure	no	yes
Safety of the surroundings and neighbourhood	yes	yes
Social environment	yes	yes
Perception and strain of work	yes	yes
Working conditions	yes	yes
Psychological well-being	yes	yes
Mood and feelings (Beck Depression Index modified)	yes	yes

Health status	yes	yes
Sleep and sleeping	yes	yes
Disadvantages in housing conditions	yes	no
Pets and domestic animals	yes	no
Attitudes regarding your health	yes	no
Oral health and quality of life	yes	yes
Experiencing everyday life	yes	yes
Seasonal variations	yes	yes
Health related quality of life	yes	yes
Emotions and feelings	yes	yes
Experiences of the influence of alcohol	yes	no
Emotional experience	yes	yes
Orientation to life	no	yes
Financing home aid and health care	no	yes
Infections or diseases of the genital area (men and women)	yes	no
Visits to gynecologist, breast self-examination (women)	yes	yes
Testicles self examination (men)	yes	no
Driving	yes	no
Recent infections and vaccinations		
Recent gastrointestinal diseases	yes	no
Recent respiratory diseases	yes	no
Vaccinations	yes	no
Symptom interview/questionnaire		
Respiratory organs' symptoms	yes	no
Shortness of breath	yes	yes
Chest pain	yes	yes
Possible infarction	yes	no
Problems in arterial circulation of lower extremities	yes	yes
Allergic symptoms	yes	yes
Hand rashes	yes	no
Musculoskeletal symptoms	yes	yes
Joints of extremities	yes	yes
Hand problems	yes	no
Balance difficulties	yes	no
Walking difficulties and fallings	no	yes
Overall hindrance	yes	yes
Dietary questionnaire (FFQ)	yes	yes

Registry data

Data from Finnish National Registers (such as National Social Welfare and Health Care registers e.g. Care Register for Health Care, Cancer Registry, Statistics Finland's registers, Kela's registers e.g. Drug Reimbursement Registers) can be linked to all sample donors by separate application process.

Health 2000/2011 samples, laboratory measurements and omics data available for research use

Table 4 provides information on the number of sample donors in the Health 2000/2011 surveys. For most sample donors, the following samples are available: DNA, serum, and plasma (urine samples are also available for Health 2000 participants, but they have not been transferred to THL Biobank). Most of the samples are still available for research use.

Table 4. The number of sample donors in the Health 2000 and Health 2011 surveys

Survey participation	Number of sample donors
Main collection (H2000 + H2011)	3679
Main collection (H2000 only)	3021
Main collection (H2011 only)	764
Young adults (H2011)	113
Mini Finland (H2000 + H2011)	553
Mini Finland (H2000 only)	452
Mini Finland (H2011 only)	29
TOTAL	8611

Table 5 lists the laboratory measurements available for most of the sample donors.

Table 5. Laboratory measurement data available in the Health 2000 and Health 2011 Surveys

Laboratory measurements	H2000	H2011
Fasting serum lipids	yes	yes
Fasting glucose	yes	yes
Fasting insulin	yes	no
Serum cotinine	yes	no
C reactive protein	yes	yes
Vitamin D	yes	yes
Homocysteine	yes	no
Rheumatoid factor	yes	no
Serum GGT-level	yes	yes
Serum uric acid	yes	yes
Alanine aminotransferase	no	yes
Calcium	yes	yes
Creatinine	yes	yes
Transglutaminase and endomysial autoantibodies (EMA)	yes	yes

Omics data

- The DNA samples have been used for **genome-wide association analysis, exome sequencing and whole genome sequencing**. For availability of genome-wide genotypes and sequencing data, see more information in the 'THL Biobank Omics data availability table' at the THL Biobank sample collection page.
- Serum samples have been used for **nuclear magnetic resonance (NMR) metabolomics analysis**. NMR based biomarker analysis assay has been done by Nightingale Health during 2018-2019. High

quality NMR metabolomics data of >200 biomarkers is available for both Health 2000 and Health 2011 Surveys.

- **Telomere length** has been determined from genomic DNA extracted from peripheral blood by a quantitative real-time PCR (RT-qPCR) based method from Health 2000 Survey participants. If you use this data in your research, please acknowledge Iiris Hovatta and Laura Kananen in your publication. References: Kananen et al. Childhood Adversities Are Associated with Shorter Telomere Length at Adult Age both in Individuals with an Anxiety Disorder and Controls. PLoS One. 2010 May 25;5(5), Ahola et al. Work-Related Exhaustion and Telomere Length: A Population-Based Study. PLoS One. 2012;7(7).

Research group

Principal Investigator

Seppo Koskinen

The analysis and reporting utilizing Health 2000/2011 collections is very active, and includes the following research topics: Living conditions, allergies, respiratory diseases, infections, reproductive health, mental health, use of health services, oral health, cardiovascular diseases and diabetes, life style and obesity, functional capacity, musculoskeletal diseases, cancer, food and nutrients, etc. For an updated list of publications see: <https://thl.fi/en/web/thlfi-en/research-and-expertwork/projects-and-programmes/health-2000-2011/publications>

For more information about the ongoing studies in Health 2000/2011, please visit:

<http://www.terveys2011.info/js.html> (currently webpage available only in Finnish)

Key references

Aromaa A, Koskinen S (eds.). Health and functional capacity in Finland: Baseline results of the Health 2000 health examination survey. Kansanterveyslaitoksen julkaisuja B12/2004. Helsinki 2004.

Heistaro S (eds.). Methodology report: Health 2000 survey. Kansanterveyslaitoksen julkaisuja B26/2008. Helsinki 2008.

Koskinen S, Lundqvist A, Ristiluoma N (toim.). Terveys, toimintakyky ja hyvinvointi Suomessa 2011. Terveysten ja hyvinvoinnin laitos, Raportti 68/2012. Helsinki 2012.

Lundqvist A, Mäki-Opas T (eds.). Health 2011 Survey - Methods. Terveysten ja hyvinvoinnin laitos, Report 8/2016. Helsinki 2016.