

THL Finnish Mobile Clinic Health Examination Survey and the Mini-Finland Health Survey

Information for researchers interested in using stored samples and data

Introduction

The Finnish Mobile Clinic Health Examination Survey (FMC) and the Mini-Finland Health Survey (MFS) were carried out in 1965-1980 by the Social Insurance Institution (Kela). As its name indicates, the mobile clinic unit was a clinic built on top of 4 buses/trucks that travelled around the country, performing health examinations and collecting samples and questionnaire data from about 60 000 participants. Follow-up data has since been collected from national health registers for all individuals who participated in these surveys and the follow-up is still ongoing. Blood samples have been collected from each participant and serum and plasma samples are still available for research use. In addition to samples, a wide range of phenotypes are available for the participants.

These national population health surveys provide reliable, broad and up to date information on the health status, functional ability and health care needs of the general population. They also provide long term information on the development of these aspects and allow forecasting future developments and needs. Monitoring and forecasting the population's health and health determinants are prerequisites of knowledge-based health policy, and development of health care and social security both at national, regional and local level.

Ethical considerations

The FMC and MFS health surveys precede current legislation on ethics in medical research. All participants were fully informed about the study, they participated in the study voluntarily and the use of the information for medical research was explained to them. Agreeing to participate in the baseline health examination was taken to indicate informed consent. The follow-up study using record linkage to the Register of Primary Health Care Visits was approved by the Ethical Committee of the National Institute for Health and Welfare on 8 June 2011.

The FMC and MFS sample collection have 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 FMC or MFS health surveys, and who have not prohibited the transfer of their samples and data to THL Biobank. The transfer of the FMC and MFS sample collections 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.

Finnish Mobile Clinic Survey (FMC)

The FMC had two stages, (1) the Finnish Mobile Clinic Health Examination Survey (FMC, *in Finnish: Autoklinikan Moniseulontatutkimus*) and the (2) Finnish Mobile Clinic Follow-up Survey (FMCF, *in Finnish: Autoklinikan Uusintatutkimus*).

- (1) Health examination, aimed at early detection of chronic diseases, at providing advice for preventive treatment, and at achieving data for epidemiological research

- (2) Follow-up, aimed at studying the incidence of certain chronic diseases, their determinants, changes in the determinants, the effect of early disease detection, and more generally provide data for health research

The survey was also used for monitoring disease prevalence across the country, and for testing and developing new methods for health surveys.

Stage 1, The Health Examination Survey, carried out during 1966-1972, was a non-representative sample from 31 municipalities across Finland and included individuals aged 15 years or older. Out of the 62 440 individuals invited to survey, 51 522 (83.2%) participated in the health examination. The study originally focused on the following diseases: respiratory diseases, heart diseases including coronary artery disease, anemia and iron deficiency, diabetes mellitus, renal and urinary tract diseases, thyroid gland diseases, and disturbances of calcium metabolism. Additional diseases were later included in the study.

Stage 2, the Follow-up Survey, carried out during 1973-1976, was an approximate 40% subsample of the Health Examination Survey. A total of 24 833 individuals from 12 municipalities were invited to participate, of which 19 518 individuals (78.6%) participated. The diseases monitored in this study were coronary artery disease, hypertension and a few other cardiovascular diseases, diabetes mellitus, hyperlipidemia, diseases of the kidneys and the urinary tract, thyroid gland diseases, lung tuberculosis and other lung diseases, anemia and polycythemia. As in the Health Examination Survey, additional diseases were later included in the study.

The field surveys of FMC comprised three phases:

- (1) Baseline data collection by a pre-mailed questionnaire of 100 questions on background, lifestyle, disease history and treatments
- (2) Health examination
 - Electrocardiogram, anthropometric measurements, glucose tolerance test, blood pressure, thyroid gland examination, chest X-ray,
 - Interview about diet and disease symptoms
 - Laboratory measurements: blood and urine samples (serum and plasma samples still usable, stored at -20°C)
- (3) Re-examination if baseline results called for it. About one in four was invited.

Mini-Finland Health Survey (MFS)

The Mini-Finland Health Survey (MFS, *in Finnish: Mini-Suomi terveystutkimus*) was the first nationwide study giving a representative and comprehensive picture of health, functioning, need for care and its satisfaction. The study originally focused on cardiovascular, respiratory, and musculoskeletal diseases, mental disorders and functional limitations. Its baseline fieldwork was carried out by the Mobile Clinic Unit during 1978-1980. Totally 8000 adults, aged 30 years and older from 40 municipalities, were invited in a two-phase cluster sample to the Mini-Finland Health Survey. A total of 7703 persons (96.3 % of the sample) participated in a home visit interview and 7217 persons (90.2 % of the sample) in a health examination. The survey was used as a base for building the Finnish national health monitoring system.

The study had multiple aims:

- Monitoring the population's health, chronic diseases, functional limitations and their risk and protective factors (social, environmental, behavioral, and biological)
- Assessing the use of health services, including rehabilitation services
- Assessing the need and unmet need for care and help
- Developing methods for health monitoring
- Building a comprehensive health examination protocol for future surveys

- Studying associations between risk factors and the occurrence of diseases both in cross-sectional and longitudinal designs
- Produce reference data for health care services and research

The field survey of MFS was carried out in three main phases:

- (1) Health interview at home or in an institution
 - 120 questions on e.g. health status, medical history, medication, functional limitations and disabilities
 - motivation to participate in the health examinations
- (2) Baseline or screening phase of the health examination
 - e.g. basic questionnaire, standard symptom interviews, venous blood samples, measurements of height, weight, blood pressures, joint functions, hand grip strength, psychometric tests, resting ECG, spirometry, chest radiography, and detailed dental status
 - screening to the clinical health examination
- (3) Clinical re-examination phase of the health examination
 - all the screening-positive persons and a random subsample were invited
 - complementary and repeated examinations to study repeatability and validity of the measurements
 - present state examination (PSE) to diagnose mental disorders
 - all oral mucosal findings were evaluated by a dentist
 - 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

The MFS used the concepts developed in the FMC survey.

Two follow-up stages of the MFS were done as part of the Health 2000 and Health 2011 surveys. Of 1 270 individuals invited, in Health 2000, 1 130 individuals participated and 1 000 donated a DNA sample, and in Health 2011 750 individuals participated. A total of 723 individuals participated in all 3 stages.

FMC and MFS samples available for biobank research

Table 1 provides information on the samples collected in each of the FMC and MFS stages and which are available through THL Biobank.

Table 1. Samples collected in the Finnish Mobile Clinic Health Examination Survey (FMC) and the Mini-Finland Health Survey (MFS)

Survey	Stage	Collection year/s	# Study areas	# Sample donors	Collected samples	Stored samples
FMC	Baseline	1966-1972	31	51480	blood, urine	serum, plasma
	Follow-up	1973-1976	12	19517	blood, urine	serum, plasma
MFS	Baseline	1978-1980	40	7213	blood, urine	serum, plasma
	Follow-up 1	2001	7	1000	blood	serum, plasma, DNA
	Follow-up 2	2011-2012	60	580	blood	serum, plasma, DNA

Participants in FMC were asked to fast for at least 12 hours and not to urinate for at least 4 hours before the examination. In MFS, the fasting time was at least 11 hours. To get more information about the sample collection and processing details, please visit THL's [Finnish Mobile Clinic Health Survey websites](#).

FMC and MFS phenotype data available for biobank research

Table 2 provides details on the baseline data that is available for research use for Finnish Mobile Clinic Health Examination Survey (FMC), Finnish Mobile Clinic Follow-up Survey (FMCF), Mini-Finland Health Survey (MFS) and two follow-up stages of the Mini-Finland Health Survey (MFSF₁, MFSF₂). For more detailed information about data categories available in FMC and MFS, please see '**Finnish Mobile Clinic and Mini-Finland Surveys' data categories table** at THL Biobank Finnish Mobile Clinic Survey sample collection page.

Table 2. Overview of measurements made (+ yes, – no) at FMC and MFS, available for research use

Method	Study			
	FMC	FMCF	MFS	MFSF ₁ /MFSF ₂
Questionnaires and interviews				
Sociodemographic factors	+	+	+	+
Lifestyle	+	+	+	+
Work- and functional ability	+	+	+	+
Medical history	+	+	+	+
Reproduction health	+	+	+	+
Symptoms	+	+	+	+
Relatives and friends	+	+	+	+
Personality	-	-	+	+
Dental care and status of teeth	-	-	+	+
Additional disease specific interviews ¹	+	+	+	+
Physical measurements				
Anthropometric measures	+	+	+	+
Blood pressure, pulse rate, resting ECG	+	+	+	+
X-ray	+	+	+	-
Spirometry	-	-	+	+
Thyroid gland examination	+	-	-	-
Joint function examination	-	-	+	+
Muscle strength	-	-	+	+
Oral health examination	-	-	+	+
Psychometric tests	-	-	+	+
Urine determinations	+	+	+	+
Blood, serum and plasma determinations	+	+	+	+
Clinical examination and diagnoses				
Chronic somatic diseases	+	+	+	+
Dental diseases	-	-	+	+
Mental disorders	-	-	+	+
Biological sample bank				
Chest X-ray films	+	+	+	-
Hand X-ray films	-	-	+	-
ECG strips ²	+	+	+	+
Serum/plasma samples	+	+	+	+
Spirometry graph results	-	-	+	+

¹Cardiovascular diseases, hypertension, digitalis, diabetes, asthma, musculoskeletal system, urine tract infection, fat

²The digital electrocardiographic (ECG) data was created as a joint project by the Finnish Institute for Health and Welfare, Cardiology Research Group, University of Oulu, and the Center of Machine Vision and Signal Analysis, University of Oulu. The process included scanning old paper electrocardiograms, tracing the ECG signals with a custom software that included smoothing of the signal, and finally making both automated digital and manual ECG measurements with another custom software. The method has been described in detail elsewhere (Holkeri et al., J

Electrocardiol. 2018 Jan-Feb; 51(1): 74-81). Thorough understanding of the method, and its few limitations, is essential for the interpretation of the data. Therefore, the use of digital ECG data in biobank projects is done in collaboration with researchers from the Cardiology Research Group, led by professor Juhani Junttila.

Registry data

Information from the Finnish national health registries, such as Care Register for Health Care (HILMO), Cancer Register, Cause-of-Death Register and Drug Imbursement Registers, can be linked to sample donors by a separate application process.

Research group

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