There are many Finnish survey datasets, but according to Kati Kristiansson of the Finnish Institute for Health and Welfare (THL), FINRISK contains exceptionally rich and diverse data on the health of the Finnish population. The participants are randomly selected from populations in different regions of the country. They are asked about their lifestyle, family history of illness, mood and other factors related to health and well-being. Registry and survey data can be combined with genetic samples.

“When all these laboratory measurements and questionnaire data are combined with health registry data, we can learn about people's medical histories, what medications they have taken and all the causes of death in the population.”

In 2015, the FINRISK data collections were transferred to the THL Biobank. Two years later, the FINRISK and Health 2000 surveys were combined into a new FinHealth population survey. Naturally, there are also other biobank datasets containing genomic data and data from health examinations. What makes the FINRISK data of exceptional quality is its time span.

“Various values are measured at the person’s first health examination. When this baseline has been established, the same person can be tracked in the registers for up to 30 years to see the developments over time regarding their health. You can see what kind of risk factors were present at the beginning, what kind of illnesses occur over the years, or the cause of death.”

According to Kristiansson, what is particularly valuable in the FINRISK population data is the monitoring over time after the initial measurements have been taken. “This kind of analysis helps in determining the factors that increase the risk of future illness. Hereditary and lifestyle factors are a very useful aid in this regard.”

FINRISK data is stored in the THL Biobank. New data from different research projects is being added all the time. Kristiansson’s research relies heavily on biobank data. She leads the Public Health Research team in the Population Health Unit at THL and is involved in collecting data for the Terve Suomi (Healthy Finland) research project, which began in 2022 and will provide up-to-date information on
the health and wellbeing of adults living in Finland.

Kati Kristiansson has used the FINRISK data throughout her research career. "In my early days as a researcher, I studied the genetic determinants of diseases affecting broad segments of the population, with a particular focus on risk factors for cardiovascular disease. This is what I have been doing ever since – I have always had a keen interest in identifying risk factors for public health diseases and assessing possible preventive measures."

In the FINRISK study, 10,000 people are asked to participate in health examinations every five years. The most recent examination also involved taking a stool sample, and sampling the person’s microbiome – the population of microorganisms inhabiting their body. In addition, a blood sample was taken to study each research participant’s metabolome, which is the full range of hundreds of metabolites that are present within the body.

"We also obtain data on obesity in the population, through body mass index measurements and a lot of other information that is not otherwise in the registers."

Genomic data to identify risk factors
Kristiansson has studied risk factors for type 2 diabetes and coronary heart disease. She is particularly interested in the use of genomic data for the prevention of diseases affecting broad segments of the population.

"Finland has excellent registers, and combining them with different data makes for a very high standard of research. But surveys, health examinations or registers alone are not enough. To identify hereditary risk factors for common diseases, in addition to registries it’s essential to have genomic data."

Blood samples are also taken at health examinations, in addition to the aforementioned comprehensive measurements. This allows the isolation and storage of the person’s DNA and the measurement of various lipid values, lipid cholesterol and blood sugar.

In Finland, DNA has been isolated from samples taken at FINRISK health examinations since 1992. The samples have now been subjected to whole genome genotyping, which uses DNA microarray technology to determine the genetic information contained in the DNA. Genotyping involves reading hundreds of thousands of chromosomal loci, and then extrapolating the information to millions more using statistical methods. These sites contain many genetic variants associated with different diseases.

FINRISK data has also been combined with data collected in other countries. International research projects often collect as many samples as possible in order to conduct comprehensive genome-wide association studies (GWAS). The purpose of these is to examine the genetic loci associated with various diseases and traits. The FINRISK database contains a wealth of research data on cardiovascular disease and its risk factors, including obesity, diabetes, blood cholesterol level, blood sugar and genetics.

Kristiansson is interested in the biomarkers found in the data that indicate changes in biological status. One focus area in analyses of the FINRISK data is peptides, the relatively short proteins that each consist of a sequence of less than 50 amino acids. Natriuretic peptides are peptides that induce natriuresis, which is the excretion of sodium ions and water by the kidneys. The effect of this is to reduce blood pressure.

Two of these small proteins, atrial natriuretic peptide (ANP) and (atrial peptide) and brain natriuretic peptide, also known as B-type natriuretic peptide (BNP), are secreted from the heart into the bloodstream and function as hormones.

The secretion of these peptides is regulated by the pressure load on the muscular layer of the heart wall. Heart failure involves an increase in the concentrations of these peptides in the blood plasma. This makes them effective clinical biomarkers of cardiac stress.

The study in which Kristiansson was involved found interesting differences in the amount of peptides in the blood of different
people. The research team investigated the effect of gene variants on peptide levels and compared the effect of these variants on blood pressure. The studies took into account place of residence, age, gender, whether the person smoked and how heavily, blood pressure, and the glomular filtration rate (GFR), the filtration rate of capillaries in the kidneys. Deteriorating kidney function is manifested as a drop in the GFR. Genetic research can shed further light on the specific factors and gene regions that affect peptide levels and cause changes in blood pressure.

According to Kristiansson, such findings from analysis of the FINRISK data provide an indication of which gene regions could be targeted for further research and drug development.

“Once we know these regions of the genome that affect biomarkers of disease, further research can be done to try to find a good drug protein.”

According to Kristiansson, cholesterol-lowering drugs such as these are good examples of these innovations. Drug development is carried out through several projects, including the FinnGen research project coordinated by the University of Helsinki. The data generated in the course of the project will be made available to other researchers and companies, both in Finland and internationally.

According to Kristiansson, the FINRISK data is particularly useful for studies of disease prevention.

“One aim of the project is to gather information which can be used to help people adopt a healthier lifestyle.”

Ari Turunen

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**MORE INFORMATION:**

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<th>Finnish institute for health and welfare THL</th>
<th>CSC – IT Center for Science</th>
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<td><a href="http://www.thl.fi/en">www.thl.fi/en</a></td>
<td>is a non-profit, state-owned company administered by the Ministry of Education and Culture. CSC maintains and develops the state-owned, centralised IT infrastructure.</td>
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**FINRISK Calculator**

https://thl.fi/web/chronic-diseases/cardiovascular-diseases/finrisk-calculator

**EGA**

FINRISK data are even partly (faeces samples) stored in the European Genome-phenome Archive EGA already. The Finnish ELIXIR node CSC is developing the Finnish FEGA service and it will be available for users in 2022. Finnish FEGA is a national service based on EGA. Data, as well as the public metadata, can be uploaded to the FEGA. FEGA is a service for storing and sharing all types of biomedical data consented for research but not for fully public dissemination. In the future, FINRISK data and genomic information should be stored on the CSC’s FEGA service. FEGA allows to store sensitive data in Finland in a way that fulfils all the requirements of the General Data Protection Regulation (GDPR). The metadata will be made internationally available in the central EGA.