

Statistical Methods and Standards

The general aim of methodological statistical research is to improve the quality in collection, production and analysis of statistics. The research encompasses the following areas:

- **General survey design and estimation in survey sampling**
- **Nonresponse and imputation**
- **Variance estimation**
- **Small area estimation and registers**
- **Time series and seasonal adjustment**
- **Disclosure control**
- **Statistical standards and metadata**

Nonresponse and imputation

Research in the area of statistical adjustment to reduce nonresponse bias is a continuing activity. The emphasis is mainly on model-based methods using weighting adjustment for unit nonresponse and imputation for item nonresponse. Useful insights are gained when combining data collected in a survey with auxiliary information that exists in the administrative registers. It is important to differentiate between the bias that is due to nonresponse and that which may be caused by other non-sampling errors such as misclassification. We are currently participating in the EU 7th framework project RISQ on representativity indicators, together with researchers from Netherlands, UK, Belgium and Slovenia.

Variance estimation

Statistics Norway is increasing its efforts in giving estimates of uncertainty in official statistics, taking into consideration sampling design, nonresponse and imputation method. The research aims at developing variance estimates and related confidence intervals, of different types, not only the usual estimated sample variance (s.v.) of the population total estimator. Other measures of uncertainty are estimated conditional s.v. for post stratified and calibrated estimators, estimated model variance and estimated method variance.

Small Area Estimation

Small area estimation has been the subject of a number of studies throughout the years. A wide range of methods has been investigated including synthetic estimation, empirical Bayes methods, model-based approach and neural network.

Use of Administrative Registers and combination of sources

Use of administrative registers as auxiliary information often improves surveys by reducing the sampling variance, reducing the bias caused by non-coverage and non-response, and imposing consistency between the various sources of data. This is one way of combining information available in different data sources. Another possibility is to construct a statistical register based on which statistics can be produced by direct tabulation. This is an important field of our current research.

We have initiated a research program for statistical methods for register-based statistics. The topics that are currently being studied include unit errors and their effects, uncertainty in detailed statistics based on statistical registers, multi-purpose prediction and imputation of statistical registers. It is intended that the methods shall be applicable in the coming register-based census 2011.

Time Series and Seasonal Adjustments

Statistics Norway uses the X-12 ARIMA seasonal adjustment program developed by the Time Series Staff of the Census Bureau 's Statistical Research Division to make seasonal adjustments of economic time series. It has been necessary to make add-ons to make correct adjustments for Norwegian holidays. Another area of research is population forecasting.

Documentation: NOT 2008/58

Disclosure Control

Disclosure control is relatively new as a research topic in Statistics Norway. Methods for rounding in high dimensional frequency count tables have been developed. These methods were in the 2001 census and are being used in the Web StatBank Norway. There has also been work on blurring of register data in surveys by rank matching. The works have been presented at joint Eurostat/ECE meetings on confidentiality. In 2008 and 2009 Statistics Norway participates in the ESSnet for confidentiality under EU 7th framework.

Survey Design

Statistics Norway continues to study the general theory of sample surveys. The research aims at providing sound theoretical foundations for a number of sampling techniques that have been found to be useful in practice. These include the common designs used in business surveys and the two-stage sampling designs for clustered populations, as well as stratified sampling design. A calculator for optimizing sampling allocation for model based inference in business surveys is being developed.

During a given period, such as a calendar year, many surveys are conducted at a national statistical office like Statistics Norway. An important issue is how the different surveys are coordinated in a system of survey sampling, based on basic principles that are easily explained and acceptable both to the producer and users of statistics.

Statistics Norway has got the responsibility for developing a standardized sampling design framework for European Health Examination Surveys (EHES).

Documentation (EHES)

http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2008/2008b21.pdf
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Statistical Standards and Metadata

General aspects

Work concerning statistical standards in Statistics Norway is decentralised so that each division is given the responsibility for classifications within their own statistical field. This concerns all aspects of the classifications unless otherwise decided by the Director General. For the purpose of coordination a Standards Committee is established. The committee acts as a catalyst and supervises statistical standard classifications. The Division for Statistical Methods and Standards serves as the secretariat of the Standard Committee and is responsible for the central work connected to standards.

Metadata

An important part of the standardization work is connected to metadata, and Statistics Norway has developed a specific strategy for development within this area. The goal is that all our metadata systems shall work together as one

comprehensive system. To achieve this goal, different metadata systems have been developed and linked.

A statistical metadata web-page was released in 2008 (<http://www.ssb.no/english/metadata>). This web-page makes Statistics Norway's metadata, e.g. our systems for documentation of variables and standard classifications, more accessible and easier to use. New metadata(systems) will be included when relevant.

Main findings in statistical methods

A random effects mixed-modeling approach has been developed for the sizing of irregular residents in Norway. The approach has the potential of being extended to other hard-to-access populations that can not be handled by standard survey sampling methods.

A paper on some common practices of systematic sampling was published in Journal of Official Statistics.

Ideas on a theoretical framework for register-based statistics was presented at the IAOS conference in Shanghai

Research on mass imputation by restricted neighbour imputation was presented at the IAOS conference

A study on the use of predictive likelihood methods in model-based sampling is finished. This research deals with two-stage sampling where the size of the primary units are unknown before sampling. It includes new optimality results and confidence intervals based on predictive variance. Published in Biometrika.

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