

## **Anders Nicolai KIAER**

b. 15 September 1838 - d. 16 April 1919

**Summary.** Founding Director of the Central Bureau of Statistics in Norway, Kiaer contributed to sample survey and to international statistics.

Anders Nicolai Kiaer was born in the small town of Drammen in Norway. He graduated from the University of Oslo in Law in 1860. He began his career as a civil servant in 1861 and by 1867 he became head of the Statistical Division of the Ministry of the Interior. He soon realised the need for an independent, centralised body responsible for the collection and interpretation of data collected by the various ministries. He therefore became an active spokesman for the establishment of such a body, and in 1876 the Central Bureau of Statistics was established with him as its first Director, a position he held until his retirement in 1913.

As the first director he formulated the basic principles for the statistical agency and gave Norwegian official statistics a framework that still exists today: an independent, centralised statistical office, whose responsibility includes quantitative research in the fields of economy, social science and demography. During his time as Director, together with a very small staff he developed the Norwegian Statistical Office into an efficient and progressive institute. In 1876 the Statistical Office employed one professional and 13 clerks in addition to Kiaer. When he retired, the staff had increased to 33 civil servants. In addition to centralising statistics from various ministries, he was responsible for several censuses of population, agriculture and establishments around the turn of the century, measurement of vital events and several other official investigations. In his work he used a number of “modern” techniques and methods like combining sources at micro as well as at macro level. He performed a number of well designed sample surveys and introduced the use of the newly developed electronic punch cards tabulator as early as in 1894.

Besides founding and developing the Norwegian statistical office into an institute of high national, as well as international standards, Kiaer was promoting the use of statistics as an important tool in the economic and social development of the country. He performed statistical investigations within a number of fields ranging from demographic research, alcohol abuse, public pension schemes to distribution of income and poverty. He was an active member of a number of societies and governmental committees. Within the

field of demography he studied mortality and fertility patterns, and compared them with those of other countries. He was particularly interested in studying the fall in the birth rates generally observed around the turn of the century. A major study of fertility was published soon after his death in the *Journal of the American Statistical Association* in 1919. In that connection the editor noted: "... Hardly any writer anywhere and probably no American is more familiar than Kiaer with the abundant statistical literature dealing with the fall in the birth rate in most civilised countries."

Kiaer also did some pioneering investigations in economic statistics. He was in favour of a proposed system for income taxation, and based on sample survey data on income, occupation and place of residence, he calculated the effects of a number of alternative taxation rules on various population groups. He also calculated the total national income and compared it with similar calculations for other countries. He was, however, critical of these international comparisons as they did not include work done in the households, primarily by women. For Norway he estimated the total value of such activities, and found that it amounted to approximately 15% of the total income. Similar investigations were not repeated until very recent in Norway.

Probably Kiaer's most important contribution to statistics was his pioneering work in the design and use of several sample surveys. He was a pioneer in developing the practice of such surveys, and through his persistent, systematic and detailed defence of the method, vis a vis a sceptical, international audience of statisticians, he cleared the ground for the theoretical development that followed.

In an early survey a sample of forms was extracted from the population census of 1890. For this sample, information from the tax authorities concerning income and property was added to the census form for each person. This procedure made it possible to distribute income by age, sex, occupation and other characteristics. In addition to being a pioneering contribution to survey sampling this investigation is also an early example of combining survey data with administratively collected data at micro level. The sample for this survey was selected in several stages. First a sample of towns and rural communes was selected. Within each selected area males aged 17, 22, 27, 32, etc. and whose names began with certain letters were selected to be included in the sample. The sampling fraction in the towns was 3.1 per cent, while it was 1.54 per cent for the rural communes. In a survey in 1894, data was collected independently of the census. The survey was undertaken to collect data needed for planning and evaluating a proposed retirement

pension and sickness insurance scheme. This survey demonstrated the real potential of sample surveys as a collection method by which it is possible to meet ad hoc needs for detailed information. Often such information cannot be collected in a census either because it is needed between two censuses or because the amount of detail needed makes it practically impossible to collect for the whole population. For this survey Kiaer also first selected a sample of towns and rural communes, In the second stage he had to introduce a kind of area sampling, as the census lists were out-dated. In Oslo streets were chosen as second stage units, while the unit varied somewhat in the rest of the country depending on information available. In the last stage addresses were selected systematically by giving a start address and a selection interval for each "street". In the two surveys Kiaer used most of the design methods used today: stratification, selection in several stages, area sampling and unequal selection probabilities. The theory of all these techniques was not developed until many years after Kiaer did this work, but by using intuition and common sense, he managed to select samples which even today would be considered of good quality. Concepts like sampling error and confidence interval and their relationship with sample size were developed much later. However, as a result of his work with several surveys, Kiaer developed some good practical guidelines for evaluating the accuracy of the results from surveys. He was aware that the accuracy depends as much on the selection method applied as on the size of the sample. Furthermore, he knew that some statistical phenomena need a larger and more carefully selected sample than others.

Kiaer presented his results in a series of meetings in the newly established International Statistical Institute (ISI), of which he was a founding member. At his first presentation in Berne in 1895 there was a strong opposition to the use of surveys. This did not discourage Kiaer from continuing his work in the area, and he defended the method at the next ISI meeting, in St. Petersburg four years later. At this meeting there was still a great deal of scepticism about the method, but it was decided to nominate a subcommittee to further study the feasibility of the method. The committee presented its findings at the ISI meeting in Berlin in 1903. The conclusion was that if the sample is carefully selected the survey method could be recommended. It was not until the Rome meeting in 1925 the survey method was again discussed at an ISI meeting. Then the question was not whether to use the method, but rather how to use it.

Kiaer published a large number of articles in French, English and German

in addition to Norwegian. A complete bibliography is available from the library of Statistics Norway.

## References

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