

Malta's Statistical Institution within a Historical Perspective

Michael Pace Ross
Director General NSO

Introduction

Statistics can be as dry as they can be fascinating. As a science, statistics may be defined as the collection, organisation, and interpretation of data. It involves many aspects, including the planning of data collection in terms of the design of surveys and experiments. As a topic, statistics relate closely to probability theory and indeed, the two are often grouped together.

On World Statistics Day, before briefly tracing Malta's statistical history, which is interlaced with that of NSO, it would be important to understand the development of statistics *per se*.

Definition of statistics

The term *statistics* is derived from the Latin *statisticum collegium* ("council of state") and the Italian word *statista* ("statesman" or "politician"). The German *Statistik*, first introduced by Gottfried Achenwall (1749), originally designated the analysis of data about the state, signifying the "science of state" (then called *political arithmetic* in English). It acquired its general meaning of the collection and classification of data in the early 19th century. It was introduced into English in 1791 by Sir John Sinclair when he published the first of 21 volumes titled *Statistical Account of Scotland*.

Thus, the original principal purpose of *Statistik* was data to be used by governmental and (often centralised) administrative bodies. The collection of data about states and localities continues, largely through national and international statistical services. In particular, censuses provide regular information about the population.

Shakespeare used the word *Statist* in his drama *Hamlet* in 1602. In the past, statistics were used by rulers. The application of statistics was very limited, but rulers and kings needed information about lands, agriculture, commerce, the population of their states in order to assess their military potential, their wealth, taxation and other aspects of government.

In 1771, W. Hooper, an Englishman, used the word *statistics* in his translation of *Elements of Universal Erudition*, written by Baron B.F. Bieford. In his book he defined statistics as the science that teaches us what the political arrangement of all the modern states of the known world is.

Origin of statistics

Some scholars pinpoint the origin of statistics to 1663, with the publication of *Natural and Political Observations upon the Bills of Mortality* by John Graunt. Early applications of statistical thinking revolved around the needs of states to base policy on demographic and economic data. The scope of the discipline of statistics broadened in the early 19th century to include the collection and analysis of data in general.

The mathematical foundations of this discipline were laid in the 17th century with the development of probability theory by Blaise Pascal and Pierre de

Fermat. Probability theory arose from the study of games of chance. The method of least squares was first described by Carl Friedrich Gauss around 1794.

Yet we find that in 1532, almost 500 years ago, Sir W. Petty collected weekly data on deaths in London. 1539 marked the start of data collection on baptisms, marriages and deaths in France. In 1608 there was the beginning of a parish registry in Sweden.

History of statistics

By the 18th century, the term "statistics" designated the systematic collection of demographic and economic data by states. In the early 19th century, the meaning of "statistics" broadened to include the discipline concerned with the collection, summary, and analysis of data. Today, statistics are widely employed in government, business, and the natural and social sciences. Electronic computers have expedited statistical computation, and have allowed statisticians to develop "computer-intensive" methods.

Mathematical statistics designate the mathematical theories of probability and statistical inference, which are used in statistical practice. However, the relation between statistics and probability theory developed rather late. In the 19th century, statistics increasingly used probability theory, whose initial results were found in the 17th and 18th centuries, particularly in the analysis of games of chance (gambling). By 1800, astronomy used probability models and statistical theories, particularly the method of least squares, which was invented by Legendre and Gauss. Early probability theory and

statistics were systemised and extended by Laplace; following Laplace, probability and statistics have been in continual development.

In the 19th century, social scientists used statistical reasoning and probability models to advance the new sciences of experimental psychology and sociology, while physical scientists used them to further thermodynamics and statistical mechanics. The development of statistical reasoning was closely associated with the development of inductive logic and the scientific method.

Some argue that statistics do not constitute a field of mathematics but an autonomous mathematical science, like computer science or operations research. Unlike mathematics, the discipline of statistics had its origins in public administration and maintains a special concern with demography and economics. Being concerned with the scientific method and inductive logic, statistical theory has a close association with the philosophy of science; with its emphasis on learning from data and making best predictions, statistical theory overlaps greatly with the decision science and microeconomics. On the other hand, from the point of view of data, there is considerable overlap with information science and computer science.

The mathematical methods of statistics emerged from probability theory, which can be dated to the correspondence of Pierre de Fermat and Blaise Pascal (1654). Christiaan Huygens (1657) gave the earliest known scientific treatment of the subject. Jakob Bernoulli's *Ars Conjectandi* (posthumous, 1713) and Abraham de Moivre's *The Doctrine of Chances* (1718) treated the subject as a branch of mathematics. In the modern era, the work of

Kolmogorov has been instrumental in formulating the fundamental model of Probability Theory, which is used throughout statistics.

The theory of errors may be traced back to Roger Cotes' *Opera Miscellanea* (posthumous, 1722), but a memoir prepared by Thomas Simpson in 1755 (printed 1756) first applied the theory to the discussion of errors of observation. The reprint (1757) of this memoir lays down the axioms that positive and negative errors are equally probable, and that there are certain assignable limits within which all errors may be supposed to fall; continuous errors are discussed and a probability curve is given.

Pierre-Simon Laplace (1774) made the first attempt to deduce a rule for the combination of observations from the principles of the theory of probabilities. He represented the law of probability of errors by a curve. He deduced a formula for the mean of three observations. He also gave (1781) a formula for the law of facility of error (a term due to Joseph Louis Lagrange, 1774), but one which led to unmanageable equations. Daniel Bernoulli (1778) introduced the principle of the maximum product of the probabilities of a system of concurrent errors.

The method of least squares, which was used to minimise errors in data measurement, was published independently by Adrien-Marie Legendre (1805), Robert Adrain (1808), and Carl Friedrich Gauss (1809). Gauss had used the method in his famous 1801 prediction of the location of the dwarf planet Ceres.

Over the centuries, many were the distinguished contributors and authors on statistical theory, but maybe I can single out Adolphe Quetelet (1796–1874),

an important founder of statistics who introduced the notion of the "average man" (*l'homme moyen*) as a means of understanding complex social phenomena such as crime rates, marriage rates, or suicide rates.

During the 20th century, the creation of precise instruments for agricultural research, public health concerns (epidemiology, biostatistics, etc.), industrial quality control, and economic and social purposes (unemployment rate, econometrics, etc.), brought about a substantial acceleration in statistical practices.

The National Statistics Office

In Malta, the National Statistics Office came into being in March 1947. However, official statistics had been compiled and published for a long time before. In 1872, an official publication called *The Malta Blue Book* featured a statistical view of Malta and its dependencies for a decade – 1863 to 1872 - covering the relevant time series for population, education, finance, sale of public sites, imports, exports and shipping. One of the first volumes of *The Blue Book of the Colony of Malta* was published in 1851. Among other statistics, it comprised a statistical abstract on population emanating from the 1842 Census.

The origin of the Colonial Blue Books can be traced to a request from the Common Select Committee in 1817 for returns of offices in the colonies. The Malta Blue Books include statistical information on various areas: population, marriages, births and deaths; imports and exports; taxes, duties and other sources of revenue; as well as other historical data. Over the past

years the NSO, in cooperation with the National Archives of Malta, embarked on a project to scan and digitise these documents, some of which are already available on our highly accessed website.

Back to 1947 - the founder of the Central Office of Statistics is considered to be Captain George Stivala, who held the top post for five years, when he was succeeded by Mr Oscar Paris, who in turn was succeeded by Mr Alfred Wirth. The latter was the Chief Electoral Commissioner in addition to being the Principal Government Statistician. At this point, it is interesting to recall that at the time, the statistical institute and the electoral office were one.

Today, the National Statistics Office (NSO) is the executive arm of the Malta Statistics Authority. It is responsible for the collection, compilation, analysis and publication of a wide range of statistical information and related matters. A tribute is due here to Mr Alfred Camilleri, now Permanent Secretary at the Ministry of Finance, the Economy and Investment, who steered statistical services into the modern age. Mr Camilleri was the longest-serving head of Malta's statistical institute to date, guiding the office for almost 11 years from 1995 to 2006, and transforming the Central Office of Statistics from a government department into the National Statistics Office, a modern quality-service office at arm's length from the government of the day and fully geared to meet new European statistical requirements in the 21st century. Credit is also due to Mr Reno Camilleri, the Chairman of the Malta Statistics Authority since its inception in 2001, who was instrumental in overseeing the NSO's functions and output.

Today the NSO is fully integrated into the European Statistical System, and pioneered Malta's entry into the International Monetary Fund's Special Data Dissemination Standard. The NSO hosted a meeting for directors-general of EU national statistical institutes in Malta last year. The office is one of eight formally-certified organisations in Malta to be awarded an equality mark, a certification recognising organisations that demonstrate a commitment towards gender equality, certifying them as true equal opportunities employers. This week, one of our statisticians commenced his secondment at Eurostat in the Labour Market Unit. This is a first for the NSO.

Services offered by the NSO

The products and services offered by NSO are far-reaching and wide-ranging. Every year, the NSO publishes close on 250 news releases. These are available on the NSO website in full text and in real time. For our busy users, the NSO offers the E-Stats Service where users can subscribe to this service and receive all NSO news releases in their email boxes in real time.

The NSO also publishes a series of publications in various formats. Besides the annual publications, the NSO publishes thematic publications that present the results of surveys and compilations of statistical data covering particular themes. The formats used are various and include print, CD-ROM, in-house printing and electronic (online only). In cases where products are only published in electronic format, the NSO offers a print-on-demand Service where clients can order a printed copy of the electronic product.

Most NSO products are available for download free-of-charge on the NSO website. NSO products can also be purchased from the data shop housed

within the External Cooperation and Communication unit. The NSO also offers services to clients wishing to carry out surveys or any other form of research. The Methodology and Research unit at the NSO offers advice on methodologies and can also be commissioned to carry out a survey on behalf of the client. In such cases, clients will be required to meet with representatives of the Methodology and Research unit to discuss requirements and time-frames. All the data collected and the reports extracted for commissioned projects belong to the client and are not published by the NSO.

The NSO also offers training courses throughout the year on various topics related to statistical methodologies and related subjects.

The IT Systems unit offers bespoke software over a broad range of platforms for clients wishing to start collecting their own data for their organisation. Clients can discuss their requirements with the programmers at the IT Systems unit who will offer advice on the best solution.

e-Course in statistics

Although nowadays statistics are widely disseminated by means of the various media as well as through other modes, it is to be observed that quite a number of statistical users lack the skills to fully tap the potential of data, both by way of usage and for analytical purposes.

The National Statistics Office, in collaboration with the University of Hagen (Germany) and with Statistics Finland, prepared an eCourse in statistics,

with the clear objective of fostering statistical literacy among the local and international community of statistical users. This course is primarily intended for young adults attending post-secondary and the early stages of university courses. However, special care has been taken to write the chapters in plain language, so that the course may be understood by, and be of benefit to, a wider audience including general users.

Conclusion

Today the use of statistics has broadened far beyond its origins. Individuals and organisations use statistics to understand data and make informed decisions throughout the natural and social sciences, medicine, business, and other areas.

Unfortunately, statistics may be misused, thus producing subtle, but serious, errors in description and interpretation – subtle in the sense that even experienced professionals make such errors, and serious in the sense that they can lead to devastating decision errors. For instance, social policy, medical practice, and the reliability of structures like bridges all rely on the proper use of statistics. Even when statistics are properly applied, the correct interpretation of results calls for a degree of expertise. The statistical significance of a trend in the data – which measures the extent to which a trend could be caused by random variation in the sample – may or may not agree with an intuitive sense of its significance. The set of basic statistical skills (and scepticism) that people need to deal with information in their everyday lives properly is referred to as statistical literacy.

Statistics today are generally regarded not as a subfield of mathematics but rather as a distinct, albeit allied, field. Many universities abroad maintain separate mathematics and statistics departments. Statistics form part of the curriculum in departments as diverse as economics, psychology, education, and public health.

That is why the National Statistics Office, in the years ahead, will continue to employ statisticians with diverse educational backgrounds so that our mission can be fulfilled.

And our mission is to produce efficiently and with minimum burden on respondents high-quality statistics that are relevant, reliable and comparable, and to disseminate them in an impartial, independent and timely manner, making them available simultaneously to all users. That is what we are striving to do.

Thank you.