TRAINING STATISTICIANS FOR WORKING IN PUBLIC AFFAIRS

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Statistics play a critical part in public affairs, for example through official statistics, evaluating scientific research, validating evidence in courts, weather forecasting and audit selection. The immediacy of the internet, the all pervasiveness of the news media, and an increasing capacity for measurement have brought a dramatic shift in the capacity to record, access transfer and challenge information and experiences. This can often place the statistician in the hot seat. Are statisticians being equipped for managing the public or political consequences when they judge the limits to measurability? Has the increased specialisation of statistical work diminished the flexibility of practising statisticians? This presentation considers these and other questions, to provide some basis for finding ways to better develop statisticians for these developing challenges, and so retain both our relevance and the trust of the public. Many of these concerns make the task of official statisticians more difficult, but there is much to gain from sharing the experiences that are also faced by other groups of statisticians.

STATISTICAL PRACTICE AS A MAJOR INFLUENCE IN PUBLIC AFFAIRS

In the United Kingdom of the 19th century, there was a significant shift in the extent to which statistics were used to challenge received wisdom. Some 200 years ago, Quetelet noted that the task of the statistician was "*to study humanity and report when things are not as they should be*." Somewhat later, Florence Nightingale said of statistics, that it was "*the most important science in the whole world because upon it depends the practical application of every other science*." By the last quarter of the 20th century, decades of government led initiatives in all fields were supported by a rich array of social and economic statistics, and growth continued in the private, academic and community organisations involved in statistics in public life. Keynes noted that "*There is nothing a politician likes so little as to be well informed; it makes decision-making so complex and difficult*."

A good century after Florence Nightingale, Lionel Jospin, and a recent Prime Minister of France said in 1989, of professional statisticians, "*The right to information has become one of the fundamental rights of the twentieth century citizen. In a society where information and the media play a considerable part, your (professional statisticians) action helps safeguard a fundamental human liberty. The working methods you use are complex, the data you deal with difficult to evaluate. An effort to explain (to the public) is necessary. This effort is required by democracy. All citizens must be in a position where they can understand and assess the policies followed by governments."*

Alongside this, statisticians now have a huge capacity to obtain, store, analyse and communicate results, at high speed, in many highly visible fields of endeavour (meteorology, finance and commodity markets, communications and transport, environment). This shift in capacity to obtain, store, analyse and communicate results, at high speed, will be for the 21st century statistician as significant as the shift from RADAR to GPS has been for the navigator, and all who are involved in recording and analysing spatial information, and making decisions about location. Perhaps it is even more so, because the capacity for statistical analysis magnifies the capacity for decision-making and progress in all other fields of science, as well as law, medicine and politics.

All in all, perhaps these perspectives reflect a dilemma we see in other fields as well, about the nature of statistics as a science. For all citizens to need to understand elements of the scientific basis behind complex decisions made on their behalf, by government, business and other citizens, we perhaps need more extensive training than for the situation where we need to ensure that leaders and decision-makers in all fields remain statistically competent. If all citizens need to understand elements of statistics, then we need to train statisticians not only in statistics, but also to be educators and communicators to large audiences. We also need a strong collective *sense* of ethics and standards, and a means of continually ensuring the relevance of the

competence of specialist practitioners, and our collective ethics and standards. Also, scientists, policy analysts and experts in all fields that think quantitatively need to accept and believe in these standards. Our task in statistical education is not one of developing statisticians alone, but of advancing the statistical literacy of the community and statistical thinking of professionals in other fields from science, the law and medicine, through to politics.

SOME FEATURES OF THE TIMES WE ARE IN

We see around us reducing trust in governments alongside a greater demand for the statistics most often produced by government. There is a high expectation of the capacity to explain statistical results and practice in ordinary terms, and to relate statistical results to anecdote and experience – tying together the information people have from quite diverse origins. A high speed is wanted rather than waiting for results, with conclusions provided with a precision that is rarely likely to ever exist given the budgets available for statistical work.

In the UK in particular, there has been a desire to quantify political goals and to direct the measurement of them through performance targets. This has generated a quest for comparison at richly detailed levels, e.g., school results, hospitals, doctors, without the scientific basis for measurement being established in advance.

Over the past three decades, in many places there has been a huge shift in what we want to measure. In public policy we have seen a shift from universal to targeted social programmes and a change in the political assessment of the performance of the government of the day. Globalisation has led to an economic and finance policy more based on managing inflationary expectations, rather than income stabilisation and industry protection. We have much lower fertility and are now living longer, while many complex patterns of immigration have led to national populations having multiple residences and forms

Technological innovation has brought a new emphasis on risk assessment in biotechnology, DNA testing, isotope tests, environment and genetics. Even in cricket we have the Duckworth Lewis rule for working out who wins an abandoned game. If the experiences of official statistics in the United Kingdom are a forerunner of trends elsewhere, then statisticians in the future will have a larger role in explaining the limits of measurability. In official statistics, being able to convey the limits to measurability is as critical as having good measures.

INFLUENCING THE PLACE OF THE STATISTICIAN WITHIN INSTITUTIONS

There has been a substantial decline in capacity of separate departments of statistics in universities to recover from the loss of place that has occurred over the past two decades. There are some exceptions such as Southampton and Auckland Universities, which have maintained strong broad based statistics courses with less consequential fragmentation of statistical staff.

In many other places, the teaching of statistics has been generally associated with a mushrooming of courses in quantitative studies quite explicitly tied to specific fields including health, geography, psychology, business, economics and finance. These sub disciplines of statistics speak the language of their field rather than that of the community or politics. We need to question whether with this fragmentation, we risk reducing the capacity of statistics as a science, for it to be able to generalise the solutions that work in particular fields, at a time when quantification of experiences is critical to the effective use of new knowledge. Alongside this shift in how statistics is taught and organised in universities, within government we are increasingly seeing statistics in a role as technical support rather than partner in decisions. As university departments of statistics diminish in size, it may well be that the balance of teaching is shifting from applied statistics to mathematical statistics. Employers now have a greater need to teach about sample survey design, and other methodology. This reduces the part that university departments can play in the wider community and professional education of statistical literacy and thinking. Where statistical training is contained within a discipline, it may well be that the received wisdom of the day of the discipline also influences not only the depth and breadth of statistical teaching, but also the extent to which ethics and standards of statistical practice and method are advanced.

DEVELOPMENT NEEDS THAT COULD INFLUENCE THE PLACE AND IMPACT OF STATISTICIANS

Both to counter the fragmentation of statistical teaching, and to provide a strengthened capacity to advance national competence in statistical thinking, we need to find ways to build up some collective professional standing and authority as the fields of statistics mushroom. In other fields, food, environment, housing, the community has become used to having standard setting bodies. Certainly, the British experience with a Statistics Commission in the field of official statistics suggests that this may not be a relevant model for statistics generally.

Advancing the statistical competence and confidence of the general community will be dependent on the capacity of all professional statisticians to be able to communicate not only their results, but their methods. Teaching these skills will require a major shift in emphasis in what is valued, whilst retaining the weight given to scientific excellence in thinking and analysis. We need to empower and enable statisticians of all fields to be able to advocate the place of statistics, through understanding the value we bring in decision-making and managing uncertainty and risk.

We need an advanced capacity for continual regeneration of skills not only as a result of the ageing of significant cohorts of statisticians recruited in the peak decades of the 1960s and 1970s, but in response to the huge shifts of last decade in the use of statistics in all fields. Alongside this, it continues to be necessary to get statisticians at the top tables.

LOOKING AHEAD TO THE TIME OF ICOTS-10

ICOTS-10 will in form and content reflect the capacity of the statistical community to respond to current needs. We might expect a fully web based international conference, that makes it possible for electronic attendance everywhere, either simultaneously or later. We might expect a strong sense of action oriented innovation, readily application quite quickly.

We may have created more effective processes for the ongoing cross fertilisation of quantitative professions that are based on statistical theory, to draw on the best presentation practices.

The obligation to publish statistical results in such away that their objectivity can be assured may well need to be placed in regulation or law, for field of scientific or other endeavour that draw on quantitative analysis for decisions that affect the community. This would mean that not only statisticians, but scientists, judges, medical experts and politicians in government would be called to account. This will perhaps be easier to achieve where certification processes such as for drugs and foodstuffs are involved. It may be more difficult, but not impossible to periodically test how far the election manifesto of an elected government was delivered on.

We will want to recognise that the massive shifts in the basis of decision-making in all fields, and the huge shift in the accessibility of information of all forms has created for statisticians, perhaps more than all other professions, a new place in decision making, in public life, and their capacity to contribute to a better world. It is so important to adapt, that if we do not, it will done for us by others.