

**GETTING BETTER VALUE FROM OFFICIAL STATISTICS
BY INCREASING AND IMPROVING THEIR USE**

Sharleen Forbes*

Working Paper No. 3

June 2010

Professor of Statistics, the School of Government, Victoria University and general manager in Statistics New Zealand, Wellington, New Zealand.

The opinions expressed in this paper are those of the author(s) and do not necessarily reflect the views of the IDSC.

ABSTRACT

Like most other countries, the Arab Republic of Egypt has a national statistics office called the Central Agency for Public Mobilization and Statistics (CAPMAS) that produces the usual range of key national economic indicators, population estimates and a range of social and cultural statistics. This paper suggests a number of approaches for providing better access to, and use of, these official statistics. The approaches include the provision of different levels of access to official data by different methods and ways of increasing statistical literacy. A particular focus of this paper is enabling, through education, the various groups in Egyptian society, from the general public through to expert Government advisors, to interpret and use official statistics. Specific suggestions include the promotion of statistics learning at schools, informal and formal training for targeted groups, such as businesses and local or national government advisors. Ways of maintaining the skills of national statistics office staff, including providing academic training, are also discussed. Increasing the statistical literacy skills of society in general will both increase the value that can be obtained from official statistics and extend their use in decision-making at all levels.

ملخص

يوجد لدى جمهورية مصر العربية—مثل معظم البلدان الأخرى—مكتب إحصاء قومي هو الجهاز المركزي للتعبيئة العامة والإحصاء (CAPMAS)، والمختص بإصدار مجموعة من المؤشرات الاقتصادية القومية الرئيسية لمصر، وتقديرات تعداد السكان، والإحصاءات الاجتماعية والثقافية. تقترح الورقة عددا من المناهج لتسهيل طرق الوصول إلى تلك الإحصاءات الرسمية، ولتحقيق الاستخدام الأفضل لها، من خلال وسائل وسبل مختلفة تعتمد على زيادة المعرفة الإحصائية. كما تركز الورقة على التعليم بشكل خاص لتمكين مختلف فئات المجتمع المصري—من عامة الناس إلى الخبراء ومستشاري الحكومة—من تفسير واستخدام الإحصاءات الرسمية. تحديدا، تشمل الاقتراحات تعزيز تعليم الإحصاء في المدارس، وتوفير التدريب بصفة رسمية وغير رسمية للفئات المستهدفة؛ مثل: قطاع الأعمال، ومستشاري الحكومة على المستويين المحلي والقومي. وأخيرا، تستعرض الورقة طرق الاستمرارية في دعم مهارات موظفي مكتب الإحصاء القومي، بما في ذلك توفير التدريب الأكاديمي، حيث أن زيادة مهارات المعرفة الإحصائية للمجتمع بصفة عامة، من شأنها زيادة القيمة التي يمكن الحصول عليها من الإحصاءات الرسمية، فضلا عن توسيع نطاق استخدامها في عملية صنع القرار على كافة المستويات.

1. INTRODUCTION

Egypt has been involved in the collection of data about its people since the very first censuses were conducted, usually to either forecast tax revenue or evaluate the level of manpower available for war (Desrosieres 1998). There are now well defined and internationally agreed standards and methods for many official statistics. The analyses and use of official statistics have changed significantly from that of the simple presentation of tables of results.

As stated by the New Zealand Government Statistician, Geoff Bascand, “it is only in the last few hundred years that there has been significant movement in terms of the development of sophisticated analytical methods for the purposes of interpreting data, while the burst of creative advancement in presentation and dissemination is truly a very modern phenomenon” (Bascand 2009b).

There is an increasing demand for official statistics to be better used by, and more useful for community and government decision-makers. In all countries, these statistics are seen as an integral part of the policy-making and evaluation process having a special role to provide decision makers—at all levels of society—with independent, impartial, trusted, high-quality and relevant data on which to base their decisions. For example, the home page of the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS) states that it is “the official source for provision of data, statistics, and reports to assist all the state agencies and authorities, universities, research centers, and international organizations in planning, developing, assessing, and making policies and decisions” (CAPMAS 2009a).

In some respects, official statistics are the backbone of social and economic policy development. Economic statistics such as the Consumer Price Index (CPI), Gross Domestic Product (GDP) and Balance of Payment (BOP) have a major impact on governments' spending, on budget projections and on the allocation of public funds. In addition to these macroeconomic statistics, most nations of the world routinely produce demographic and other social statistics together with a range of business and agricultural statistics. In addition, many countries are currently developing indicators that will help inform critical global issues, such as economic crises, sustainable development and the impact of population growth and climate change on world food resources.

Government advisors are currently facing a wide range of statistics, but some are demanding still more. Examples of new statistics that are being created from longitudinal surveys and integrated administrative data sets are given in the following section. But, it is not only government advisors who are being faced with a plethora of statistical information, official statistics are used by community, business and special interest groups such as ethnic or religious collectives to inform their decisions. The general public is also being increasingly exposed to official statistics via the media in general and the internet in particular, and this information helps shape their understanding and perception of society, not only affecting the views that individuals form but also the decisions that they make. “Imagine a world without official statistics. How would we know how many roads and schools to build, how much we need to tighten our belt and how to do many other things that affect our lives? Official

statistics, like other summaries produced from carefully collected data, are the thermometers we use to measure our world and to know how to plan ahead” (Townsend et al. 2008).

The basic premise of this paper is that no matter how important official statistics are perceived to be, for these to be really useful, there must be informed users at all levels of society who can interpret and evaluate them. The President of the Egyptian National Statistics Office (NSO), Abo Bakr El Gendy, stated that in Egypt “interaction between the users and the producers of official statistics is being strengthened” (El Gendy 2007). However, it is universally debatable whether all current users of official statistics have sufficient statistical literacy skills to use them appropriately. This is even more likely to be the situation for new users. In this paper, it is suggested that the NSO, as the major provider of these statistics, needs to play some part in the statistical literacy training of its users. The benefits to the national agency are an increase in the value of their statistics through greater use, greater numbers of willing respondents to its surveys, as people see their usefulness, and increased trust and confidence in the statistics it produces.

Some examples of educational initiatives that have been successfully implemented by various NSO's are given below. Many of the given examples are from the author's home country, New Zealand.

2. OFFICIAL STATISTICS – WHAT ARE THEY?

Official statistics are simply those collected on behalf of, originating from and being of key importance to, a national government. They are often defined in legislation as, for example, in New Zealand, where they are described as being “collected to provide information required by...Government..., Government Departments, local authorities, and businesses for the purpose of making policy decisions...and to facilitate the appreciation of economic, social, demographic, and other matters of interest” (Statistics Act: New Zealand Government 1975).

These statistics include, but are not limited to, those collected by the NSO. In some countries, such as in Scandinavia, official statistics are centralized within the NSO, but in others, such as New Zealand and Egypt, other government agencies also produce official statistics through surveys or from their administrative data sets; such as education, health and social services registers. In some countries, the size of surveys is a critical factor. In New Zealand, the NSO must be advised of all surveys of more than 2,500 members of the public, whether done or contracted by other government agencies.

At one level, official statistics are a branch of statistics; an inter-disciplinary science with its basis in the mathematics of probability theory. The science of statistics covers the methods and approaches to collecting data (survey and experimental design techniques), summarizing and analyzing data, and interpreting and communicating inferences and statistical conclusions made from the data. This applies to official statistics as well. But, there are also some subtle differences between official and other statistics. Key differences, from the author's point of view, are given in table 1.

TABLE 1. Differences between Official and Other Types of Summary Statistics

Official Statistics	Other Summary Statistics and Research
Have underlying international principles	Usually governed by national or local ethics committees.
Participation often mandatory (high response rates)	Voluntary participation (lower response rates – potential bias)
Often based on complex survey designs	Often simple surveys or designed experiments
Broad coverage (many variables – often high-level measures)	In-depth studies
Large-scale (provide comparisons between groups)	Usually relatively small scale (experiments or surveys)
Usually repeated regularly (provide long time series)	Mainly cross-sectional (single point of time)
Often internationally comparable (agreed standards and classifications)	Relevant to population studied (focused on research or policy question)
Simple analysis provided by collectors (Univariate or bivariate)	Sophisticated analysis (often multivariate)
Usually provide primary data	Can involve secondary analysis (of other data sources)
Higher cost	Generally involve lower costs
Multi-purpose (collected once–used often)	Single focus (on research or policy question)

Source: Author's findings.

It is the role of official statisticians to accurately report on their country's social and economic position, and they often have statutory powers for data collection. With such powers come responsibilities. The United Nations Statistics Commission developed Fundamental Principles for Official Statistics that were ratified in 1994 (United Nations 2003). Most countries adhere to these principles, which provide 10 guidelines that can be summarized as: provision of equal access to all to official statistics; use of professional and scientific processes; robust analyses and provision of metadata; official advice on the misinterpretation or misuse of data; use of appropriate sources of data to maintain quality but minimize respondent burden; ensuring the confidentiality of individuals' information; transparency of policies and procedures; national coordination of official statistics; international comparability of official statistics and international cooperation. Having these principles as a basis for official statistics helps assure the public that these statistics are not influenced by political concerns.

The ability of official statistics to accurately measure the real world depends on the translation of the real world into statistical frameworks using meaningful units of measurement and classification structures, together with robust data collection and analysis processes. At one level, these statistics record the history of a country's development, and at

another, they provide a set of measures that can be used to increase the transparency and accountability of a government. In the past, official statistics provided a simple overview of a country at a very high level of aggregation, for example nationally. Currently, there is an increasing demand for more analysis to help identify correlated variables and thereby potential causal factors, or to evaluate the specific impact of government programs and to have greater access to microdata, i.e., unit record files, for general research purposes. Increased use of official statistics is dependent on the provision of useful and high quality statistics. This can only be achieved by both maintaining the statistical skills of staff employed in the NSO and by meeting the demand for new official statistics.

3. DEMAND FOR NEW OFFICIAL STATISTICS

There is often a direct link between the development of new statistics and the needs of policy makers. For example, in New Zealand, the NSO has worked collaboratively with other government agencies to build new datasets constructed with evidence-based policy purposes in mind. These new datasets take two forms: longitudinal household surveys, such as the Longitudinal Immigration Survey: New Zealand (LisNZ); the Survey of Family Income and Employment (SoFIE) and datasets that have been created by integrating administrative data. These datasets are usually both longitudinal and census in nature. Examples include the student loans dataset; the New Zealand census-mortality study; the linked employer-employee dataset; the Longitudinal Business Dataset (LBD) and the Linked Employer-Employee Dataset (LEED). A number of policy uses have been made of these datasets, and examples are given in Bascand (2009a). These include:

- The use of LisNZ to show that skilled migrants have the highest employment rates of all migrant groups; that employment rates are highest for migrants who were proficient in English and that migrants with relatives already living in New Zealand have better settlement outcomes than other migrants.
- Over 50 studies using census-mortality study data to address a wide range of questions, such as the relationship between individual socio-economic factors and mortality in New Zealand; the association between unemployment and suicide; the contribution of smoking to health inequalities and whether or not social and economic reforms change socio-economic inequalities in mortality.
- The use of the LBD to analyze business practices; performance; productivity; hedging behaviour; merchandise trade and finance.
- The use of LEED data to research the effect of injuries on employment and benefit rates, and to examine benefit-to-work transitions for different demographic groups.

The development of new statistics incurs significant costs and all national statistics agencies struggle to maintain sufficient resources and capability to meet these demands. While the coverage of current official statistics is extensive, there are still major gaps, particularly with respect to global concerns. At the recent International Statistics Institute (ISI) Conference, papers presented included the following topics:

- How official statistics could contribute to the analysis of the impact of climate change (Trewin 2009).

- The role of official statistics for Africa in a global food crisis (Gutu 2009).
- The lack of non-banking sector financial data that, if available, could have helped predict the current economic crisis in the Western world (Keuning 2009).

Currently accepted official statistics are also increasingly under scrutiny as is the way that they are used. The recent report by the Commission on the Measurement of Economic Performance and Social Progress stated that “the way in which statistical figures are reported or used may provide a distorted view of the trends of economic phenomena. For example, much emphasis is put on GDP, although net national product (that takes into account the effect of depreciation), or real household income may be more relevant. These numbers may differ markedly. Then GDP is not wrong as such, but wrongly used. What is needed is a better understanding of the appropriate use of each measure” (Stiglitz, Sen, and Fitoussi 2009).

How can users with limited understanding and experience be expected to use official statistics correctly? In order to explore why it is important that users do so, the role of official statistics needs examination. These statistics have traditionally been used to look at the past, examine current trends and predict major issues that will arise in the future. All governments have critical issues to address, and these are likely to be different in different countries. However, most of these problems are of such magnitude that it is unlikely they can be solved by government interventions alone. Businesses, community groups and even the attitudes and actions of individual members of society will influence future outcomes. It is important that the decisions they make are well informed. Official statistics provide a quantitative base for these decisions, and it is important that decision-makers at all levels can access and understand the statistical information they require. This is demonstrated with regard to the particular challenges facing Egypt.

4. ADDRESSING THE CHALLENGES CURRENTLY FACING EGYPT

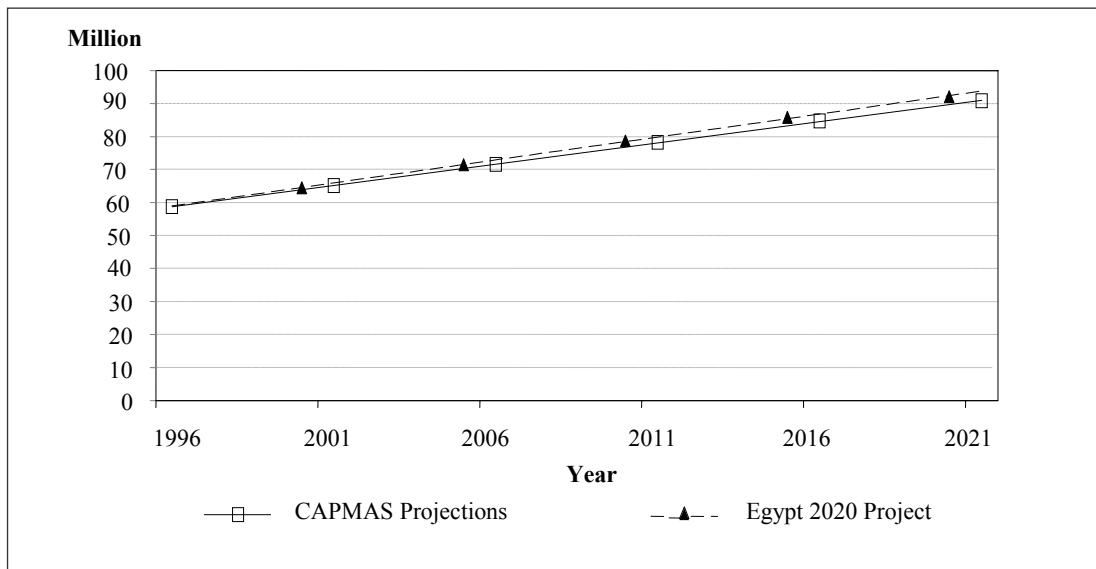
The Arab Republic of Egypt has an NSO called the Central Agency for Public Mobilization and Statistics (CAPMAS). This agency produces the key national economic indicators of Egypt, such as GDP, CPI, population counts, and projections together with a range of social and cultural statistics, such as unemployment rates and counts of newspapers and sports facilities. Demands for new statistics, such as those given in the previous section, are to some extent global, and Egypt will not be exempt from them. NSOs need to balance meeting demands for new types of data, such as longitudinal information, while ensuring that the currently available statistics are well-used.

According to the official statistics for Egypt, wherever possible obtained from the CAPMAS website, Egypt currently has a large population; about 77.7 million, and high population density (number of people per square kilometer) compared to the rest of the world (CAPMAS 2009).¹ About 42 percent of people live in urban areas, and it was estimated that about 20 percent in 2005 lived below the poverty line. The Egyptian population is also *young* with 31.7 percent being under 15 years old (Central Intelligence Agency 2009). Population

1. It should be noted that data that come from easily accessible websites has the caveat that it may not be of the same quality standard as that of CAPMAS.

growth is affected by a number of factors including fertility and mortality rates, migration and even changing attitudes to family size. It is generally accepted that the fertility rate necessary for population replacement is between nearly 2.1 for developed countries and 2.3 for less developed countries with lower life expectancy. In Egypt, the total fertility rate has steadily decreased in recent years from 7.2 children born in early 1960s to 3.4 in 1998 (Khalifa, DaVanzo, and Adamson 2000), then 3.2 in 2003 (United Nations 2007a) and 2.77 in 2007 (Central Intelligence Agency 2009). However, Egypt's population size is still growing, as shown in figure 1, which gives the medium population projections, derived by CAPMAS using the 1996 Census as a base year and the Egypt 2020 project that included an additional component for migration (Egypt 2020 Project 2002). In 2007, Egypt's population growth rate was reported to be 2.02 percent (Central Intelligence Agency 2009), and the population was reported to be 72.8 million in the 2006 Census (CAPMAS 2009b).

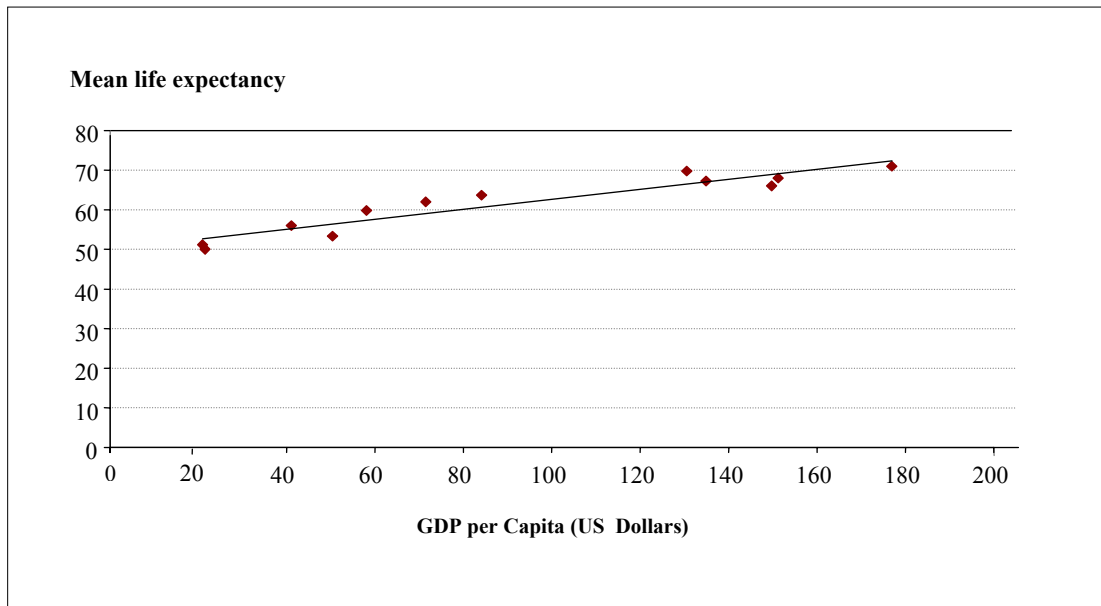
Figure 1. Population Projections in Egypt (1996-2021)



Source: Egypt 2020 Project (2002).

Some Egyptian scholars have suggested that high fertility and population growth are no longer serious concerns, but the question of a sustainable population size for Egypt to maintain a desired standard of living for all citizens remains a serious concern (Khalifa, DaVanzo, and Adamson 2000). This will need to be addressed in the short to medium term. Egypt already imports a significant proportion of its food, and this will become more critical if a global food crisis develops. At some time, Egypt will also experience the ageing of its population as the birth rate decreases and life expectancy increases. Egypt may then need to learn from those countries that are currently experiencing a drain on their economies from the increasing older age groups.

Figure 2. Relationship between GDP and Life Expectancy in Egypt (1970-2007)

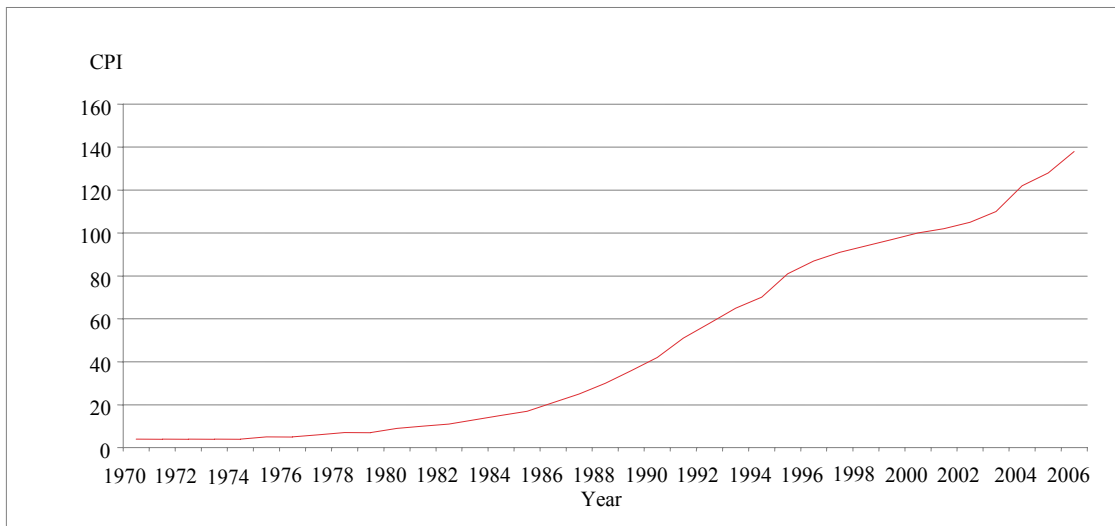


Source: Gapminder (Rosling 2007).

Note: Both data values were available in only 12 years.

As shown in figure 2, there is a small positive relationship between life expectancy and GDP suggesting a slight association between economic and health outcomes in Egypt. In addition, like many other countries, Egypt has had high inflation in recent years. Figure 3 depicts Egypt's Consumers Price Index for the period 1970-2006.

Figure 3. Time Series of the Consumers Price Index (CPS) of Egypt



Source: Central Intelligence Agency 2009.

In summary, among the critical issues facing Egypt are its population size, changing population structure in the future, and increasing food requirements together with balance of payments deficits, high inflation, and the accumulated effect of these issues on increasing disparities between the rich and the poor. As the following extract shows, these economic issues are not new to Egypt and are being addressed by the Egyptian government. “Egypt's

economy...has opened up considerably under former President Anwar EL-SADAT and current President Mohamed Hosni MUBARAK. Cairo has aggressively pursued economic reforms to encourage inflows of foreign investment and facilitate GDP growth. In 2005, Prime Minister Ahmed NAZIF's government reduced personal and corporate tax rates, reduced energy subsidies, and privatized several enterprises...but the NAZIF's government will need to continue its aggressive pursuit of reforms in order to sustain the spike in investment and growth and begin to improve economic conditions for the broader population” (Central Intelligence Agency 2009).

These problems, however, are facing the entire Egyptian society and, as stated earlier, are too large to be solved simply by government intervention. Solutions will also have to be developed or implemented by local communities and may require changes in public attitudes. Generating such a change will require some understanding among the general public of the statistical data that are used to identify and measure the magnitude of these problems. It is, therefore, necessary to improve, and keep on improving, the statistical literacy of all levels of Egyptian society.

Egypt also has a significant and growing public expenditure, EGP16 billion in 2004/05, and a significant investment in government sector workers, of whom over 11 percent worked in public bureaucracies and local councils in 2005 (CAPMAS 2009). Is Egypt getting the best value from its paid advisors in the public sector? In part, as discussed below, this advice relies on the quality of data that advisors have access to and, in part, on their skills to interpret them.

5. ACCESS TO AND USE OF OFFICIAL STATISTICS

5.1 Utility of Official Statistics

The first United Nations Fundamental Principle for Official Statistics states that official statistics that meet the test of practical utility are to be compiled and made available on an impartial basis by official statistical agencies to honor citizens' entitlement to public information (United Nations 2003).

The legal requirements about dissemination of official statistics vary between countries, but they are almost always available to the general public. The *utility* of official statistics is somewhat harder to evaluate and may differ from the producers' and users' viewpoints. Official statistics require balances to be made. For example, the balance between statistical and administrative needs; continuity in time series and relevance with regard to new statistics to meet emerging needs; providing access to data and maintaining individual confidentiality; burden on respondents and information needs; providing objective baseline information and responding to policy demands. Official statistics need to be “fit for purpose” (Forbes 2008).

One of the key balances that official statisticians need to achieve is between the accuracy and rigor of official statistics and their utility. Without this balance, it is difficult to maintain public trust and confidence in official statistics or to maintain willing and accurate response to requests for data. As previously suggested, one way to increase the utility of official statistics is by investing in the statistical education of different sectors of society. It

seems appropriate that NSOs should themselves have at least some role in ensuring that society adequately understands the information that they present.

5.2 Data Visualization

The internet has provided a way to facilitate rapid and free access to aggregate data, and many agencies have software that allows users to create their own tables or time series, such as Tablebuilder and Infoshare on the Statistics New Zealand. New ways of visualizing official statistics are also being developed. Examples are Hans Rosling's Gapminder, purchased by Google in 2007 (Rosling, H. 2007); the dynamic population pyramids produced by the Federal Statistical Office of Germany; the UK Office of National Statistics; the US Bureau of the Census and the Australian Bureau of Statistics and interactive mapping tools, such as those used on a DVD available from Statistics New Zealand, so that users can investigate regional Commuter Patterns (Statistics New Zealand 2009). What is not clear is the level of skill that users need to be able to interpret these new graphics correctly. There is little international research evaluating which groups of users can interpret or use these new representations correctly. This is an area that needs investigating.

5.3 Access to Data

Increasing the use of official statistics by researchers, academics and post-graduate students is another way of increasing their value. These groups often require access to fine aggregate or unit record level official data (microdata), but NSOs need to balance increasing these levels of access against the confidentiality assurances that they give to respondents (UN Fundamental Principles of Official Statistics, Principle 6, United Nations 2003). This is a huge challenge for NSOs in all countries. Egypt does have some innovative ways of providing access to data such as through its Industrial Products Network. One of this network's stated objectives is to "provide information about industrial production for the scientific research centers, researchers, investors and banks", and it gives all subscribing industrial enterprises an access to "all statistics, indicators and comparisons on the Industrial Products Network", as well as reduces fees for access to other statistics produced by CAPMAS (2009).

Albeit the above, there is much to be learnt from some of the methods used in other countries. For example, the Australian Bureau of Statistics has a variety of ways of providing different levels of access to data. These methods depend on whether the access is to standard outputs, via data-cubes that allow users to create their own tables; to tables customized to users' requests; to Confidentialized Unit Record Files, through remote access by licensed users to datasets or through the secondment of researchers into the statistics agency as discussed in detail in Trewin (2003). Dennis Trewin also chaired the taskforce established by the Conference of European Statisticians that has recently produced a report giving guidelines and principles for microdata access (United Nations 2007b). This report is used as a reference for the remainder of this paragraph, unless otherwise specified. It shows that some European countries such as Denmark, Sweden and The Netherlands use contracting of individuals or organizations to provide access to unit record data, often remotely. Other countries such as the United States and the United Kingdom have created special public use census datasets for

researchers. In the United Kingdom, there is a special longitudinal dataset that links census, vital event and registration data, such as births; deaths; cancer registrations and hospital discharges (ESRC Census Program 2009). The Integrated Public Use Microdata Series (IPUMS International Project) currently collects and provides access to census microdata from 44 countries in a consistent format, while maintaining the confidentiality requirements of each participating country. Some countries, including the United States, Canada, Australia, New Zealand and The Netherlands have data centers or laboratories where, under certain conditions, researchers can access confidential microdata. Australia and New Zealand have an agreement between the NSO and the Universities Vice Chancellors' Committees in order to supply, under certain conditions, Confidentialized Unit Record Files (CURFs) (Australian Bureau of Statistics 2009). These CURFs contain unit record data that have been modified to protect the confidentiality of respondents by methods such as top or bottom coding (giving any set of extreme points their mean value), capping (excluding extreme values), perturbing or swapping data or collapsing categories, but which retains similar distributional properties to the original data set.

Demand for access to the unit record files (microdata) produced by an NSO will only increase over time. A question that arises is the ability of the NSO to provide quality assurance about the output of this research, particularly as the types of models used become more numerous and more sophisticated (Fundamental Principles of Official Statistics, Principle 4, United Nations 2003). If this is an issue for the statistics agencies, then, it will be even a greater problem for the analysts, who need to interpret the research and provide advice to their governments. Evidence-based decision-making is impossible without access to, and understanding of, information and knowledge. But debates on goals, measurement, policy development, monitoring and bridging the information and knowledge gap often do not even mention statistical literacy issues.

5.4 Increasing the Statistical Literacy of Users of Official Statistics

What does it mean to be statistically literate with respect to official statistics? The meaning used throughout this paper is having an understanding of metadata about the statistics (why, when, where, how and what data was collected); of the analysis used to obtain the statistics; and the statistical meaning and the real world interpretation of the statistics. It seems obvious that increasing the statistical skills of government advisors should also decrease the number of policies developed on an inadequate empirical basis. Another major challenge facing official statisticians is that the communication of their results to the general public is usually via the media or the internet and may be too specialized and technical for non-experts. The benefits of providing targeted training for groups, such as journalists, are obvious. What is less clear is the specific role of NSOs to educate other various groups on the use of official statistics. The role of NSOs in wider statistical education has been under debate for some time. A workshop of official statisticians held at the 57th International Conference on Teaching Statistics in Singapore in 1998 came to a general consensus that this should be focused on informal education initiatives, i.e., with such groups who do not have access to the usual education avenues, such as schooling or university. NSOs are not education

agencies, but they can only facilitate the learning of, rather than actively teach, statistics (Forbes 2008).

However, over time, there seems to have been an increase in the number of national statistics agencies that are directly or indirectly involved with statistics education initiatives. Such initiatives are no longer limited to the informal sector. A number of NSOs have made quite large investments in a range of education activities designed to increase the statistical literacy of their users. Agencies contributing to the book entitled *Government Statistical Offices and Statistical Literacy* by Campos et al. (2008), published by the International Statistics Literacy Project, provide a variety of training courses for various groups including expert users, media, educators and the general public. These agencies are willing to share these ideas with other national agencies. Examples include:

- Statistics Finland's courses and tailored training:
(http://tilastokeskus.fi/tup/tilauskoulutus/index_en.html), e-course in statistics;
(http://tilastokeskus.fi/tup/verkkokoulu/index_en.html) and Tools for Learners
- Statistics Canada's regional training workshops are data user, for anyone who commissions or conducts surveys, or needs to develop his/her ability to assess and interpret survey results, provides electronic statistical support resources for the general public on their website (*Finding and Using Statistics*, *Statistics: Power from Data*, *Teacher's Guide to Data Discovery*, *Definitions*, *Data sources and methods*) and outreach programs targeting particular user groups, including educators, journalists, or aboriginal communities.
- Statistics Portugal's *Accao Local de Estatistica Aplicada (ALEA)* web site designed to help the general public gain statistical literacy skills.

Ensuring that people have the skills to understand the growing avalanche of data that they face is an ongoing challenge. At the 57th International Statistics Institute Conference, mentioned above, there were several sessions related to the need to increase statistical literacy. Two sessions were specifically devoted to official statistics: educating the public on how to use official statistics, and the roles of statistical agencies in developing statistical literacy, in addition to another that discussed the challenge of building a supply of statisticians for the future. In this regard, one of the issues facing NSOs is establishing priorities for training different groups of users. Some agencies, including the Australian Bureau of Statistics and Statistics New Zealand, have developed specific strategic plans for increasing statistical literacy. The Australian Bureau of Statistics has identified five target groups: school students; tertiary students including vocational education, university students and teachers/lecturers; opinion leaders including journalists; decision-makers including members of parliaments and staff from agencies at all levels of government; and the general community including small business owners and community groups (Australian Bureau of Statistics 2009). Statistics New Zealand's education strategy has three distinct parts; each initially had a different name: raising the skills of staff within the agency itself (*The Power of Numbers*); enhancing the skills of staff in other government agencies (*Beyond the Numbers*) and training targeted community groups such as the media, small businesses and schools (*Understanding the Numbers*).

The reasons for NSOs to invest in statistics education resources vary from a desire to increasing the use of current statistical outputs, to improving the level of understanding of the methods used to produce them, or to increasing the pool of statisticians available as potential employees; thus, ensuring the continuing production and quality of official statistics. All NSOs have the common goal of encouraging willing and reliable response to their surveys. A selection of statistics education initiatives and their potential benefits for Egypt is given in the following sections. These are divided into sections discussing five groups of learners: school children; tertiary students; government advisors; national statistics agency staff; and targeted community groups who are likely to be considered as priorities by most statistics agencies.

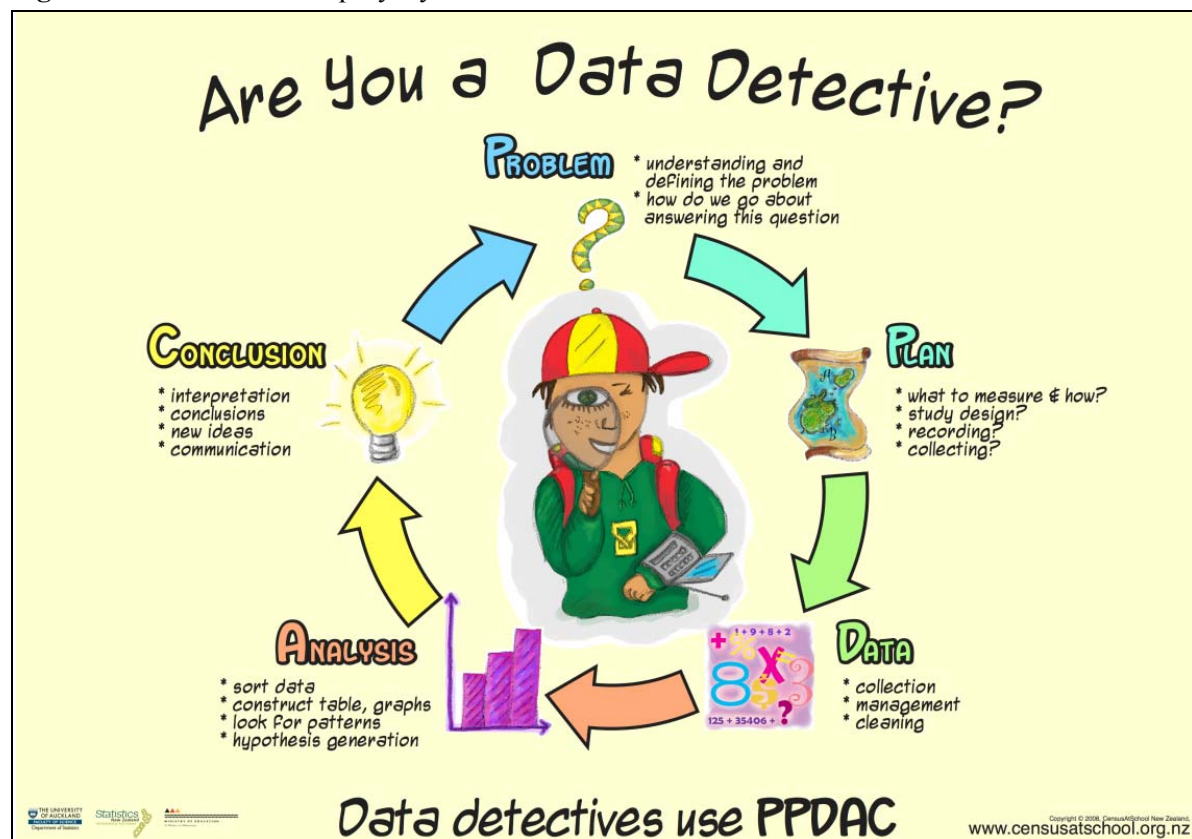
5.5 Statistics Education in Schools

Almost all the national statistics agencies, mentioned in the preceding section invest—either directly or in collaboration with their ministries of education—in developing resources for schools and students. This is a long-term investment, both in terms of producing a more statistically literate general public, and also potentially increasing the future pool of statistics graduates. Today's children are tomorrow's decision-makers. A number of different approaches to working with schools have been used throughout the world, often depending on the amount of statistics programs in the school curriculum.

In terms of the emphasis on statistics in the school curriculum, New Zealand is possibly leading the world by introducing a new mathematics and statistics curriculum in 2008 that does not only put statistics on an equal footing with mathematics, but also covers schooling from new entrants, 5 years old, to the end of secondary schooling, 17–18 years old (Ministry of Education 2007). Statistics New Zealand staff have been involved in the development of the statistics part of this curriculum, which has three separate threads running through each level of the curriculum: statistical investigations (using a statistical enquiry cycle); statistical literacy (interpreting statistical and probability statements made by others); and probability with the content getting more sophisticated as the level advances. As shown in figure 5, the statistical inquiry cycle used at all levels is based on the Problem, Plan, Data, Analyze, Conclude (PPDAC) devised by Wild and Pfannkuch (1999) and given in figure 5.

The implementation of a new school curriculum provided Statistics New Zealand with an ideal opportunity to design new products to support schools, such as small Synthetic Unit Record Files (SURFs) that could be downloaded for classroom use, and to promote the use of free web-based public releases including: Hot Off The Presses; Infoshare (time-series data sets) and QuickStats from the Census about places and subjects in school classrooms. Official statistics products can be used at all levels of the new curriculum, and a section of the Statistics New Zealand website, Schools Corner contains curriculum-based activities and information for primary and secondary school teachers, including classroom resources and a newsletter, StatZing! (Statistics New Zealand web site, School Corner).

Figure 5. The Statistical Inquiry Cycle



Source: <http://www.censusatschool.org.nz/resources/poster/>.

Egypt has national standards for education that includes mathematics, and within mathematics, statistics (Mina 2009). A recent international study entitled The Trends in Mathematics and Science Study (TIMSS) evaluated the mathematics skills of grade 8 school children in four subject domains, of which chance and data was one. In this study, while Egyptian children scored reasonably high when compared to other Arab countries, their mean score was well below the international average when all participating countries were considered (Supreme Education Council 2008). Perhaps changes to the Egyptian mathematics school curriculum should be considered, including ways of ensuring that statistics becomes an integral part of all children's learning. However, whether or not curriculum changes are successful may depend on the level of input obtained from a variety of users of statistics, including official statisticians, for the development of these changes.

The statistics educator, Reda El-Said Asar, suggests that there is a need for an experimental approach in statistics teaching in Egyptian schools to stimulate interest in practical tasks both within and outside the classroom. “The connection between statistics content and everyday experience needs to be strengthened to make students believe that statistics is a practical, interesting and meaningful subject” (Asar 2002).

This view is also supported by Professor Fayez Mina who, in his discussion of moves taking place in science generally to achieve more understanding of reality with the intention of affecting and changing it, states that “statistics is most likely to be...at many different study and research levels” and that the major teaching approach for statistics will be “the 'applied' one, basically practical problems, with a great room for developing creativity” (Mina

2002). Children like to learn about themselves and the world or country they live in. One way of achieving this, while also learning the basics of chance and data, is to use real data in the classroom. If it has not already done it, CAPMAS could consider establishing some sort of collaborative relationship with Egyptian education agencies to develop datasets for school use from the official statistics it produces, together with appropriate teacher resources. Statistics education at schools will have the long-term benefit of raising the level of statistical literacy in the general public in Egypt, as these school children become adults responsible for making decisions for themselves, their families, their businesses or their communities.

For over a decade, there has been a culture in New Zealand of collaboration between leading statistical educators and Statistics New Zealand to explore ways of promoting the use of these products in statistics education and to facilitate the creation of new products, specifically, for classroom use at all levels (Forbes et al. forthcoming). There are benefits to both parties in this collaboration. The statistics agency raises publicity for its survey, and Census activities creates greater awareness of the range of its products, increases the uses and users of its statistics, and provides new development and presentation opportunities for staff. Statistics educators gain an increasing number of real world datasets available for students to use, as well as classroom exemplars for teachers.

NSOs in other countries also have educational initiatives for schools that could be adapted in Egypt, including:

- The Australian Bureau of Statistics (ABS) Education Services Unit, whose objectives are to promote greater understanding, knowledge and access to ABS statistics by teachers, librarians and students, increase statistical literacy in the school sector and the broader community, and promote statistics as a career choice for students (The Australian Bureau of Statistics web page).
- The Italian National Institute of Statistics' web page, For Students, that provides school and university students with a guide to official statistics data and methodologies (Istat–Istituto nazionale di statistica web page).
 - Educational resources intended for both teachers and students to use include Statistics through examples (http://www.istat.it/servizi/studenti/binariodie/Stat_per_esempi/index.htm).
 - The Worth of Data (<http://www.istat.it/servizi/studenti/valoredati/>).
- Statistics Portugal's ALEA web site; one of the few containing articles and graphs published by the media with activities asking school students to interpret this information.
- Statistics South Africa's (Maths4Stats) project that involves the agency's funding a group of regional coordinators (former teachers) working in collaboration with the Department of Education, the South African Statistical Association (SASA) and the Association for Mathematics Education in South Africa (AMESA) to encourage the development of mathematics education at schools. This is seen as “an important bedrock for statistics” in South Africa (Campos et al. 2008).

One particular initiative that is being used by an increasing number of agencies to promote statistics learning at schools is some form of a children's census, most commonly the international internet based CensusAtSchool (CAS-I 2009). As stated earlier, children like to

collect and compare data about themselves. Undertaking a census or a survey is at the heart of the work of national statistics agencies, therefore, these offices should support children being exposed to this form of data collection within their statistics learning, so that they can understand their value and, as adults, become willing respondents. As the then General Director of Statistics Sweden, Sten Johansson, said, “a population census is best achieved when participation is a well understood and widely accepted civic duty” (Conti and Lombardo 2002). Through their own activities, taking part in their own census, children can learn how and why a census is used.

5.6 Use of a Children's Census to Promote Statistics Literacy

National children's censuses had their genesis in New Zealand in 1990, in the form of a paper-based questionnaire on Children's Census, run by the New Zealand Statistical Association, to promote the Third International Conference on the Teaching of Statistics within primary schools. Following international publication of its results (Forbes 1996), both Statistics Italy (ISTAT) and The Royal Statistical Society Center for Statistical Education, together with the NSO in the United Kingdom undertook similar projects in 2000, respectively called ‘Censimento a scuola’ (Conti and Lombardo 2002) and ‘CensusAtSchool’. The latter extended the paper-based form of the original Children's census to an internet survey linked to the 2001 UK population census. It has now developed into the International CensusAtSchool, in which an increasing number of countries participate. Currently, these are the United Kingdom, South Africa, Canada, Australia, New Zealand, and Ireland, and it is also being piloted in Japan and the United States. There is an open and public access to randomly sampled datasets from the first five countries on the international database (<http://www.censusatschool.com>). In some countries, such as New Zealand and the United Kingdom, CensusAtSchool is partly funded by the NSO, and in others, such as Canada, Australia and South Africa, it is entirely run by the NSO. In almost all countries, the NSO plays some role, despite the fact that many of the direct benefits to the agency of putting resources into the development of school children (such as a greater pool of statistically capable recruits) may not be seen for decades. This is a long-term investment for the future.

By participating in their own census, children learn both skills useful in their general life, such as form filling; measurement taking; negotiation and communication skills; as well as specific statistics skills such as the collection; processing; summarizing; and presenting of data. As well, they have access to a class dataset that can be used to investigate their own characteristics or compare themselves to others. While CensusAtSchools is internet-based, it can be used in a paper-based form to reach rural or disadvantaged communities. In both 2002 and 2009, the NSO Statistics South Africa ran a paper-based version. The 2009 version, that involved a 10 percent sample of all schools, was run using the aforementioned Maths4Stats coordinators as field staff, and was undertaken collaboratively with the South African Department of Education. The first national and regional results from this survey were presented at the International Statistics Institute conference in Durban in August 2009. North (2009) suggests that, especially in rural South African communities, class data could be posted at the back of the room and used throughout the year as a resource for statistics activities. One of her exemplars for South African teachers was based on a CensusAtSchool

question about recycling and first got classes to compare their views with the national results. This was then followed by an exercise where children collected playground rubbish over a week (forming a time series), sorted rubbish into types (classifying), and counted and weighed small standard containers (large yoghurt pots), then compared their rubbish collection results with their recycling views. Through one simple and engaging exercise, children learnt a number of statistical skills. The New Zealand CensusAtSchool has been used as the springboard for the development of new pedagogy to foster informal statistical inference learning (Wild et al. 2009).

Even at a national level, rather than school, the costs involved in participating in an internet-based census are relatively small, particularly if an existing format is used. For example, the total annual funding for CensusAtSchool in New Zealand is NZ\$50,000 (roughly \$37,000). The majority of these costs are for promotion of the census and for developing classroom resources for teachers and students. Involvement in an international census has been shown to generate interest in statistics from both teachers and students. Even if computers are not widely available in all schools, children can learn a variety of skills through conducting and taking part in their own census, whether this is at the classroom, the school or the national level, as well as having fun. Having some form of this activity in classrooms should be considered by those agencies in Egypt with responsibility for raising statistical skills, including the CAPMAS.

5.7 Official Statistics in Tertiary Education

Egypt has been well versed in the academic training of general statisticians; having had statistics teaching at the university level since 1923, statistics texts in Arabic since 1933, a post-graduate Institute of Statistics at Cairo University since 1947 and now has a number of academic statistics research institutes such as the Cairo Demographic Centre (Sarhan 1957). However, the following discussion focuses on post-school education, specifically, in the production, use and understanding of official statistics. Different countries have different approaches to the academic training of official statisticians. Many NSOs expect to train new recruits in those aspects of statistics that are particular to official statistics, such as survey and questionnaire design, imputation, weighing and estimation. However, other educational initiatives may have a more immediate impact on the recruitment pool available to official statistics agencies, as well as providing training in official statistics. Examples include promoting the teaching and awareness of official statistics within traditional undergraduate statistics courses or developing post-graduate papers or degrees specifically in official statistics. Where the development of specific official statistics education initiatives has occurred, it has almost always been the result of a partnership or collaborative arrangement between a statistics agency and academic statisticians. Some initiatives that have been implemented in countries other than Egypt are given below.

5.8 Academic Courses in Official Statistics

Many countries, including Egypt, have academic courses or qualifications in Demography, but academic courses that cover official statistics more generally are not common. In the United Kingdom (UK), for instance, there is the Master's course in Official Statistics (MSc

Official Statistics), specifically developed for government statisticians by the Office of National Statistics, in collaboration with the University of Southampton (University of Southampton, School of Social Sciences 2009). The UK Royal Statistics Society also offers some professional courses such as Questionnaire Design that would benefit official statisticians.

In New Zealand, a Network of Academics in Official Statistics (NAOS) was formed comprising representatives from the Statistics Department in each of the seven main New Zealand universities. This group does not only give advice to the national statistics agency, but also works in partnership with it on a number of specific projects (Forbes 2007). Current projects include introducing more official statistics, e.g., ethics, sampling theory, and confidentiality techniques into undergraduate statistics degrees; developing a national post-graduate official statistics paper that could be included in Honors and Master's Applied Statistics degrees; and developing a Graduate Diploma in Official Statistics. The Graduate Diploma is intended for those graduates whose undergraduate major is in an area other than statistics, and who are either working or aim to work in a government agency that produces or uses official statistics. In addition, Statistics New Zealand has sponsored a half-time Professor in Official Statistics in the School of Government at Victoria University of Wellington. The aim of this position is to increase the use of official statistics and to establish official statistics as a recognized academic sub-discipline within statistics.

6. TARGETED TRAINING FOR POLICY ADVISORS IN OFFICIAL STATISTICS

Not only do governments make a significant investment in the public sector, but they are also, to some extent, dependent on the public sector, particularly those in public bureaucracies, for sound advice. For this advice to be of the highest quality, it needs to be based on accurate quantitative evidence and robust analysis. The New Zealand Government Statistician has stated that policymakers need data at four stages of the policy cycle (Bascand 2009a). First, they need data at a fairly high level of aggregation, (e.g., nationally) to help identify or define a particular problem. Second, they need data to help identify causes (e.g., disaggregated socioeconomic data to identify educational, ethnic, or family factors). Third, they need data to monitor and manage the implementation of policy (e.g., what is delivered and to whom?) and finally, they need data to evaluate the impact (outcomes) of their policies. In summary, an understanding of official data is an essential element of policy advice as this provides evidence to policy-makers for designing policy and evaluating its impact (Bascand 2009a). Egypt needs to answer for itself whether it needs to improve the quantitative skills of its own policy advisors. If this is the case, then initiatives aiming at ensuring that advisors have adequate understanding of the statistical information they are presented with must be a priority.

While some of the above projects proposed for the general academic sector, such as a Graduate Diploma in Official Statistics, could also be used to increase the statistical literacy skills of state sector employees, in New Zealand this group is regarded as important enough to receive targeted training. The NSO (Statistics New Zealand); the agency responsible for cross-departmental state sector issues (State Services Commission); and the Industry Training Organization responsible for state sector training (Learning State) jointly developed a

Certificate in Official Statistics in 2007 that was specifically designed for state sector employees. This certificate was structured as a set of short-courses, taking account of evidence that this was what employees and managers preferred and that getting a formal qualification in statistics was an incentive to study (Forbes 2009). The content of the certificate was based on statistical literacy theory, but focused on official statistics as well as general statistics methods (Wild and Pfannkuch 1999). One of the innovative aspects of the certificate is that the assessment is competency based. That is, students are required to demonstrate that they have a certain level of understanding and skill and, within a given timeframe, can re-sit units until the required level is attained. Students are not awarded grades. Another innovative aspect was that from the first conception of this qualification, a group of academics from statistics departments (the previously mentioned NAOS representatives) advised on the number and content of each unit, and agreed to work collectively with Statistics New Zealand to deliver the four statistics units. By order of delivery, in a public sector context, these are (i) resolve ethical and legal issues in the collection and use of data; (ii) interpret statistical information to form conclusions for projects; (iii) assess a sample survey and evaluate inferences and (iv) evaluate and use statistical information to make policy recommendations.

A case study approach is implemented with two main publications being used for teaching in all four units, and two others for assessment. These are selected annually from Statistics New Zealand's official statistics releases, such as the Household Labor Force Survey (Statistics New Zealand 2008a); and Retail Trade Survey media releases (Statistics New Zealand 2008b); other government agency releases, for example, an evaluation report commissioned by the Ministry of Social Development (Fergusson et al. 2005); and the 2006 Maori Language Survey (Te Puni Kokiri 2007); research reports The New Zealand Insulation Study (Howden-Chapman et al. 2007); and media articles (Gault and Chapple 2007). The final *umbrella* unit of the certificate is a workplace-based statistics project that is partly assessed by the learner's manager. To date, almost 60 members of staff, from both Statistics New Zealand and other agencies, have enrolled in the certificate, and 26 have already completed it.

Whether or not training for government advisors leads to a formal qualification is a matter for individual countries, such as Egypt, to decide. Few countries can afford to ignore targeting this group, as most education regimes have led to graduates in either literacy-based or numeracy-based disciplines, but very few with both sets of skills. As a result, in many countries, government policy-makers may have high literacy, but limited numeracy skills.

7. MAINTAINING THE SKILLS OF NATIONAL STATISTICS OFFICE STAFF

As stated earlier, in order to increase the use of official statistics in Egypt, users will need to view these statistics as being both relevant and of high quality. To maintain high standards requires a high level of professional statistical expertise within the NSO itself. Different national statistics agencies have different strategies for the recruitment of staff and for the maintenance of statistical capability within the agency, but all offices invest in the training of their own staff. One of CAPMAS's objectives is to implement regular training programs on applied statistics to its staff and to employees of other governmental organizations (El Gendy

2007). Currently, CAPMAS does provide training programs for its staff, for example in technological skills through the Information Technology Training Center (ITTC), but does not appear to have any other external training programs listed on the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC 2009).

The demand for statisticians is growing worldwide. In May 2009, the Chief Economist of Google was cited as saying, “the...job in the next ten years will be statisticians” (Revolutions 2009). Competition among statistically competent staff is going to increase, and there is likely to be an increasing need to recruit staff from disciplines other than statistics. This will lead to an increasing need for statistics training. These training needs can best be met by NSOs forming partnerships with the academic sector to develop special courses, such as those previously mentioned in the section on Academic Courses in Official Statistics. Collectives of agencies, such as (SESRIC) can also come together to provide training. Another example of this type of collectives of agencies is The United Nations Statistical Institute for Asia and the Pacific (UNSIAP) that produces training courses for Asian and Pacific official statisticians. Tae Rim Lee (2009) from UNSIAP has recently reported on some innovative teaching methods using both iTV and iMobile (phone) that have been developed. However, it is likely that individual statistics agencies will also have to increase their investment in in-house training to maintain their overall statistical capability.

For example, Statistics New Zealand has recently developed a Statistics Capability Framework for all staff who does not have tertiary qualifications in statistics. This consists of three components: quantitative skills and knowledge for non-technical staff; basic statistics; and core statistics for staff involved in the preparation of statistical outputs. This framework was primarily designed as an evaluation tool for managers to determine the training needs of their staff, but turned up to identify a range of on-line and other teaching resources that can be used to address skill gaps as well.

One issue that will need resolving in all countries, including Egypt, is the appropriate investment split between in-house and external training for statistics agency staff, and providing statistical literacy training for external groups. However, increasing investment in the overall statistics education is essential, if there is a real desire to strengthen official statistics systems.

8. INCREASING STATISTICAL LITERACY OF TARGETED GROUPS IN THE COMMUNITY

Statistical literacy training is needed by many groups in the community. All groups that make decisions for themselves, their members or influence the decisions made by others should be statistically literate. Regrettably, this is not always the case. Each country needs to set its own priorities when developing training initiatives for specific community groups. For instance, in countries such as Canada and New Zealand, a key area may be training or advice for indigenous communities, whereas in other countries, it may be regional administrators or voluntary organizations. General guidelines for those community groups wanting to undertake their own surveys have been produced by many NSOs, e.g., Statistics New Zealand (1995; 1998). There are, however, two groups that are critical users of official statistics in all countries; these are the media and businesses.

The media need to have an understanding of the official statistics they report as communications via media outlets, such as newspapers, television or the internet may be the only exposure to official statistics to the majority of the public. In New Zealand, there has been a noticeable increase in both the quality and level of media reporting of official statistics. One initiative that could be partly responsible for this is the compulsory inclusion of statistics units in national journalism courses, developed by the Journalism Training Organization in collaboration with Statistics New Zealand; the latter fosters this training with an annual prize for the best media article written by a journalist student that uses official statistics

Businesses are critical for different reasons. Understanding how they can personally use official statistics as a business tool is likely to increase their willingness to participate in official surveys and to provide accurate information. In addition, business investment is a critical component of sustainable economy, and business decisions need to be based on accurate and timely data. Statistics New Zealand has targeted small- to medium-sized businesses, and worked with the New Zealand Chamber of Commerce to deliver free seminars called *Go Stats* for these businesses. These seminars are designed to show businesses how the use of official statistics can improve their results.

9. CONCLUSION

It is acknowledged that there are currently some gaps in official statistics, particularly with respect to global issues. These gaps must be, and are being, addressed by international bodies such as the United Nations Statistical Commission (UNSC) and the Organization for Economic Co-operation and Development (OECD). But, in the long-term, the issue of ensuring that individuals have the skills and knowledge to appropriately use official statistics may be of equal importance. Official statistics need to be used to be useful. Despite the efforts of NSOs to increase the variety of data visualization tools that are available to data users, there is little international research to determine whether or not these users can correctly interpret these representations. Improved access to the unit record (micro) data, produced by statistical agencies for researchers and academics, will increase the use and, accordingly, the value of official statistics. However, this access needs to be balanced with the confidentiality and secrecy constraints under which national statistics agencies work.

Governments need to invest in developing statistical literacy skills at a young age through education at schools. While official statistics agencies should play some role in this regard, it is up to individual countries to determine the scope and extent of their involvement. One particular initiative that could be used to stimulate interest in statistics education is a children's census. Collaborative relationships between the NSO and the academic sector are essential to ensure an adequate supply of statisticians and accordingly the ongoing capability of official statistics agencies. Developing either formal or informal partnerships with education providers is also a key element of the successful endeavors to raise statistical literacy skills in the general public.

Two groups are critical users of official statistics; these are the media and businesses. The media are critical as their communications could be the only vehicle through which the

majority of the public receive official statistics. Businesses are critical not only because they need to make good decisions informed by good data, but also because national statistics agencies need them to be willing and accurate respondents to their surveys. A third critical group is governments' own policy advisors and decision-makers. Governments invest the equivalent of billions of dollars in the wellbeing of their citizens. Ensuring that their advisors can appropriately interpret the quantitative evidence, on which they base their decisions, must be a high priority in all countries.

In the author's opinion, the priorities for investment in statistical literacy training for most statistics agencies should be targeting *(i)* policy advisors, as these make decisions that will influence the future for us all; *(ii)* children, as they will be the inheritors of that future and *(iii)* the media, as they put meaning to official data for the majority of the public.

No statistical agency can afford not to be involved, at some level, in the training of its users. If it does not already exist, establishing some sort of collaborative relationship between CAPMAS and Egyptian statistics educators and their associations would have long-term benefits for the level of statistical literacy of the general public in Egypt. In the long-term, this will in turn increase the level of use and accordingly the value of Egypt's official statistics. CAPMAS will need to resolve for itself the best split in investment between in-house and external training for statistics agency staff, and statistical literacy training for external groups. A useful mechanism for realizing this objective would be either through the strategic planning processes within the NSO, or by developing a specific strategic plan for increasing statistical literacy. It is acknowledged, however, that there are costs associated with implementing educational initiatives, and these may need to be addressed by the Egyptian government, if it wishes to strengthen its official statistics system, and thereby increase the value of its official statistics.

REFERENCES

- ABS-Australian Bureau of Statistics. 2009. ABS Education Strategy.
<http://www.abs.gov.au/websitedbs/d3310114.nsfhome/curf:+abs/>
- Asar, R. 2002. An experimental approach for teaching statistics in the Egyptian schools. Paper presented at the 6th International Conference on Teaching Statistics (ICOTS 6), in Cape Town, South Africa.
- Bascand, G. 2009a. The role and challenges for official statistics in policy evaluation. Paper presented at the 2009 Australasian evaluation international conference, in Canberra, Australia.
- . 2009b. Paper presented at the role of official statisticians roundtable at the 3rd OECD world forum on statistics, knowledge and policy, October 2009, in Busan, Korea.
- Campos, P., S. Forbes, P. Giache, R. Helenius, M. Mafafo, J. Sanchez, P. Taylor, and M. Townsend. 2008. *Government Statistical Offices and Statistical Literacy*. A publication of the International Statistical Literacy Project.

<http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>

CAPMAS. 2009a. Central Agency for Public Mobilisation and Statistics. The most important economic indicators, the Arab Republic of Egypt for the years 2003/04 – 2004/05. <http://www.capmas.gov.eg>

———. 2009b. The final results of population and housing census 2006. <http://www.capmas.gov.eg>

CAS-I. 2009. Census at School. <http://www.censusatschool.com>

Central Intelligence Agency. 2009. The World Fact Book. <http://www.cia.gov/library/publications/the-world-factbook/geos/xx.html>

Conti, C., and E. Lomardo, E. 2002. The Italian census at school. Paper presented at the 6th International Conference on Teaching Statistics (ICOTS 6), in Cape Town, South Africa.

Desrosieres, A. 1998. *La politique des grands nombres: Histoire de la raison statistique*. Trans. Camille Naish. *The politics of large numbers: A history of statistical reasoning*. Harvard University Press.

Egypt 2020 Project. 2002. Egypt population projections. Egypt 2020 conference presentation, Third World Forum.

El Gendy, A. 2007. System of official statistics in Egypt: Situation assessment and strategic objectives. Partnership in statistics for development in the 21st century. Paper presented at the Paris 21st consortium.

ESRC Census Programme. 2009. <http://www.census.ac.uk/guides/Longitudinal.aspx>

Fergusson, D., J. Horwood, E. Ridder, and H. Grant. 2005. Early start evaluation report, Christchurch: early start project Ltd. Report for the Ministry of Social Development. Wellington, New Zealand.

Forbes, S. 1996. Raising statistical awareness. *Teaching Statistics* 18 (3): 66-69.

———. 2007. Partnerships to produce teaching resources in statistics. Paper presented at the 55th International Statistics Institute conference, in Lisbon, Portugal.

———. 2008. Raising statistical capability: Statistics New Zealand's contribution. Government Statistical Offices and Statistical Literacy. International statistics literacy project publication. <http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>

- . 2009. Creation and evaluation of a workplace based certificate in official statistics for government policy makers. Paper presented at the International Association of Statistics Education conference, August, in Durban, South Africa.
- Forbes, S., M. Camden, N. Pihama, P. Bucknall, and M. Pfannkuch. Official statistics and statistical literacy: they need each other. Special edition of *The Statistical Journal of the Institute of Official Statisticians* (to be published early 2010).
- Gapminder Foundation 2009.
<http://www.gapminder.org/about-gapminder/history/>
- Gault, L., and Chapple, I. 2007. Gore the least gay town in New Zealand, reported in Sunday Star Times, Sunday, 29 July 2007, in Auckland, New Zealand.
- Gutu, S. M. 2009. Globalisation and the global world crises: the role of official statistics in the African context. Paper presented at the 57th session of the International Statistical Institute, in Durban, South Africa.
- Howden-Chapman, P., A. Matheson, J. Crane, H. Viggers, M. Cunningham, T. Blakely, C. Cunningham, A. Woodward, K. Saville-Smith, D. O'Dea, M. Kennedy, M. Baker, N. Waipara, R. Chapman, and G. Davie. 2007. Effect of insulating existing houses on health inequality: Cluster randomised study in the community. *British Medical Journal* 334 (7591): 460-464.
- International Statistics Literacy Project. 2009.
<http://www.stat.auckland.ac.nz/~iase/islp/>
- IPUMS International. 2009. Integrated Public Use Microdata Series
<http://www.international.ipums.org/> International/
- ISTAT - Istituto Nazionale di Statistica.
<http://www.istat.it/servizi/studenti/>
- Keuning, S. 2009. Statistical needs emerging from the financial crisis and the ECB's initiatives for more comprehensive financial statistics. Paper presented at the 57th session of the International Statistical Institute, in Durban, South Africa.
- Khalifa, M., J. DaVanzo, and D. M. Adamson. 2000. Population growth in Egypt: A continuing policy challenge. Centre for Middle East public policy, population matters project. Issue paper, IP-183.
- Lee, T. R. 2009. Web based new paradigm of statistics education. Paper presented at the International Association of Statistics Education conference, August, in Durban, South Africa.

Mina, F. 2002. Some features of future statistics education. Paper presented at the 6th International Conference on Teaching Statistics (ICOTS 6), in Cape Town, South Africa.

———. 2009. Models of mathematics curriculum development in Egypt. Proceedings of the mathematics education into the 21st century. 10th International Conference. 417-419, in Dresden, Germany.

Ministry of Education. 2007. The New Zealand Curriculum. Wellington, New Zealand.

New Zealand Government. 1975. Statistics Act 1975, No. 1, Public Act. Wellington, New Zealand.

http://www.stats.govt.nz/about_us/about-statistics-new-zealand/statistics-act-1975.aspx

North, D. 2009. Activities for teachers in South Africa. Paper presented at the 3rd international CensusAtSchool workshop. Kwa-Zulu Natal University, in Durban, South Africa.

Revolutions 2009.

<http://www.blog.revolution-computing.com/2009/05>

Rosling, H. 2007. Gapminder. GapMinder Foundation

<http://www.gapminder.org/about-gapminder/history/>

Royal Statistics Society. 2009.

<http://www.rss.org.uk>

Sarhan, A. E. 1957. Teaching of statistics in Egypt. *The American Statistician* 11 (1): 15-17.

SESRIC. 2009. Statistical, Economic and Social Research and Training Centre for Islamic Countries 2009.

http://www.sesric.org/train_inst_detail

Statistics New Zealand website, Schools Corner.

<http://www.stats.govt.nz/schools-corner/>.

Statistics New Zealand. 1995. A guide to good survey design. Wellington, New Zealand.

<http://www.stats.govt.nz>

———. 1998. Guide for the collection of community information. Wellington, New Zealand.

http://www.search.stats.govt.nz/search?w=+Guide+for+the+Collection+of+Community+Information&w_pre=1998.+Guide+for+the+Collection+of+Community+Information&af_pre=&button.x=43&button.y=9

———. 2008a. Household labour force survey: June 2008 Quarter – Media Release. Wellington, New Zealand.

<http://www.stats.govt.nz/store/2008/08/household-labour-force-survey-jun08qtr-mr.htm>

- . 2008b. Retail Trade Survey: June 2008 Quarter – Media Release. Wellington, New Zealand.
<http://www.stats.govt.nz/store/2008/08/retail-trade-survey-jun08qtr-mr.htm>
- . 2009. Workforces on the move: Commuting patterns in New Zealand.
<http://www.stats.govt.nz/Commuter Patterns>
- Statistics Portugal's Accao Local de Estatistica Aplicada (ALEA).
<http://www.alea.pt>
- . 2009. Workforces on the move: Commuting patterns in New Zealand
<http://www.stats.govt.nz/Commuter Patterns>
- Stiglitz J. E., A. Sen, and J-P. Fitoussi. 2009. Report by the Commission on the Measurement of Economic Performance and Social Progress.
http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf
- Sunday Star Times. 2007. Gore the least gay town in New Zealand. *Sunday Star Times*, July 29.
- Suprme Edcuation Council. 2008.
http://www.english.education.gov.qa/section/independent_schools/2008op/Te
- Puni Kokiri. 2007. 2006 Survey of the health of the Maori language. Final Report. Ministry of Maori Affairs. Wellington, New Zealand.
- Townsend, M., P. Campos, S. Forbes, P. Giache, R. Helenius, M. Mafafo, J. Sanchez, and P. Taylor. 2008. Efforts of statistical offices across the world to complement school curricula. Paper presented at the joint statistics meeting, in Colorado, USA.
http://www.amstat.org/meetings/jsm/2008/onlineprogram/index.cfm?fuseaction=abstract_details&abstractid=300352
- Trewin, D. 2003. Access to microdata-issues, organization and approach. Plenary paper presented at the 51st session of the UN statistics commission and economic commission for Europe conference of European Statisticians, in Geneva, Switzerland.
- . 2009. How can official statistics contribute to the analysis of climate change impacts, vulnerability and policies. Paper presented at the 57th session of the International Statistical Institute, in Durban, South Africa.
- United Nations. 2003. “The operation and organization of a statistical agency”. In *Handbook of Statistical Organisation*, 3rd ed. Statistics division, studies in methods, Series F, No. 88. United Nations.
- . 2007a. World fertility patterns 2007. Department of economic and social affairs. Population division.

<http://www.unpopulation.org>

———. 2007b. Managing statistical confidentiality and microdata access. Principles and guidelines of good practice. Report of the taskforce set up by the conference of European Statisticians.

UK Royal Statistics Society.

<http://www.rss.org.uk>

University of Southampton, School of Social Sciences. 2009.

<http://www.southampton.ac.uk/socsci/socstats>

Wild, C. , and M. Pfannkuch. 1999. Statistical thinking in empirical enquiry (with discussion). *International Statistical Review* 67 (3): 223-265.

Wild. C. J., M. Pfannkuch, M. Regan, and N. Horton. 2009. Precursor Statistical Inferences. (In draft, available from c.wild@auckland.ac.nz)