

# The dissemination of statistical literacy among citizens and public administration directors

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## 1. Introduction

The dissemination of Statistical Literacy is one of the most important challenges that statisticians have to cope with at the beginning of the 21<sup>st</sup> Century.

The aims of this paper is to show: (i) why there is need for quantitative skills and, in particular, for statistical literacy in the present information age and what is the content of statistical literacy that should be disseminated; (ii) how to prepare a strategic plan, defining actors and actions, to improve statistical literacy and culture in particular among citizens and public administration directors; (iii) the activities implemented or planned in the field by the International Statistical Institute (ISI) and, in Italy, by the Italian Statistical Society (SIS) and Italian National Statistical Institute (ISTAT).

## 2. Needs for dissemination of statistical literacy

### 2.1. Preface

The fight against illiteracy in the world – under the leadership of UNESCO – has achieved considerable success. However, it is observed that the lack of literacy is usually accompanied by weaknesses in quantitative skills, while numeracy, and in particular statistical literacy, received little visible attention and are the weakest component in the programme against illiteracy, despite their apparent centrality in people's everyday lives and functioning at work.

As officers of UNESCO have said many times, the concept of literacy should be seen as an evolutionary variable, changing with the changes in economic and social situation of the world. Now, familiarity with quantitative thinking is more and more a requirement of contemporary society, while the need is much less appreciated. It is evident that in our information society - always more complex and segmented and in rapid transformation- we are living in a kind of “cage of statistical information”, that is very important because it helps us to determine and define “everyday life”, the quotidian issues of race, gender, economics, politics, and education, that shape and create our view. The government, the public administration units, the politicians, the trade unions, the managers and also the citizens need to use much of this statistical information, giving correct interpretation to the data and using statistical reasoning and methods for the analysis of phenomenon and, above all, to make their decisions. It is therefore evident that the diffusion of statistical literacy and culture for all is an important challenge that the academic and official statisticians have to face, and to create a future in which statistical information is truly at the service of Society and to have a Society which is more aware of its own “condition” and less subject to the fluctuations of figures.

### *2.2. The need for statistical literacy of the citizens*

In today's life, for a general citizen at least, statistical literacy is necessary: the capacity of applying statistical reasoning and interpreting statistical information is a stronger and stronger request of the Society. The globalisation of the economy, the advancements in the technology, in particular in computers (with the capability to analyse big data bases) and in the means of communication (Internet, etc.), the increasing collection of statistical information is creating many new jobs for those who can read, follows directions, understand mathematics (basic) and interpret statistical information, that is those who have analytical, quantitative and, in particular, statistical skills. On the other hand, statistical literacy is necessary for informed citizenship: to understand "everyday life", to make rationale decisions, to have knowledge-based social control of public policy and of the activity of public administration. Shortly statistical literacy is becoming fundamental for living in a full democracy. There is no doubt that, in the age of information and computers, if we really want to render the citizens as independent as possible and free of influence and conditioning, the only real course of action is to have them attain a higher degree of statistical culture (or literacy).

### *2.3. The need for statistical culture among the staff members of the public administrations*

In the organisation and management of public administration units there is now a new model of production that come from the push towards decentralisation, the development of the autonomy of each unit and the introduction of responsibility of managers for the results obtained. This requires the development of the functions of planning, management control and evaluation at the different levels at which the decision processes are formalised. It easy to show that this asks for pertinent *statistical information systems* and each phase of the process requires appropriate statistical information and indicators and the use of appropriate statistical methods to carry out the requested analysis (through cost, efficiency and effectiveness measures; simulation and impact analysis; users' satisfaction analysis; etc.). For some staff members of public administration there is a clear need for statistical skills, while for the most part, for the general staff and for the directors statistical literacy is enough.

### *2.4. What does statistical literacy really means?*

Statistics begins with the notion that we use data to answer questions and it is important to remember that data are not just a set of numbers; data consist of a set of measurements. The issues of measurement must be a major objective of statistical education and of statistical literacy dissemination.

We agree with David Moore's thinking (repeted also in Moore, 1997) that statistical education should focus on data and on statistical reasoning rather than on either the presentation of as many methods as possible or the mathematical theory of inference. Understanding statistical reasoning should be the most important objective of the dissemination of statistical culture: we should devote more emphasis to data and concepts, at the expense of less theory and fewer recipes.

However we do not think that we have to disseminate statistics for all, but statistical literacy for all (see the discussion of Moore's paper by Anne Hawkins (Moore, 1997)).

Numeracy and statistical literacy include therefore: facility in dealing with numbers and quantitative problems; in understanding basic mathematical ideas and patterns, statistical reasoning and the importance of thinking in terms of probability, the importance of data production and presentation, the omnipresence of variability, and the quantification and explanation of variability.

We think that the knowledge of basic concepts of statistics and probability are important, but understanding the meaning of information is essential (such as, the ability to recognise the nature and limitations of statistical information, to be able to distinguish a 'good' number from a bad one; the knowledge of the implications of using various sampling processes on the accuracy of the results; etc.).

### **3. The preparation of a strategic plan for dissemination of statistical culture and literacy**

We need to have in mind that the diffusion of statistical culture and literacy requires the implementing a pervasive educational process, that involves a shifting in the cultural axis towards a scientific-empirical culture, that is difficult to reach. The educational process should be implemented both in school, with a systematic approach to enhance educators' awareness of the use of simple statistical methods and of statistical data for effective teaching (that should be done across the different disciplines emphasising the *problem-solving approach*), and in the society.

However, to create and disseminate culture, and in particular statistical culture, is not so easy and does not lead to immediate and tangible results. To obtain good results it is necessary to prepare a long term strategic plan that includes all the detailed objectives and actions to be implemented resolutely.

Because the users of statistical information and methods have different characteristics and needs, and also the dissemination means of the culture are different, there is not a standardised "menu" of statistical culture. Therefore it is important to tailor specific "menu" and specific educational strategies, whether linked to statistical literacy needs or to more professional statistical education.

Therefore it is important to involve all the actors of the mentioned educational process in the preparation of the strategic plan: in particular the scientific statistical societies and the national and local statistical agencies (fostering the interaction between academic and official statisticians), but also the schools, the universities, the mass-media, the professional associations, etc..

In order to prepare a plan for the diffusion of statistical literacy and culture it will be useful to construct two matrices: the first regarding the different groups of recipients of educational actions (policy makers, directors of public administration offices, journalists, citizens, etc.) by their types of statistical needs, that shows the content of the necessary knowledge and educational actions; the second regarding the relationships between spreaders of statistical culture and literacy and recipients, that shows the diffusion process and the possible actions and the means to be used.

In this way it is possible to target the statistical "menu" to the specific audience. For example, with reference to the public administration units the need for statistical training is quite different for different staff and, above all, we have to distinguish between the preparation or training required of the new employees and the training necessary for the personnel in service ( for the directors it will be useful to organise specific seminars and/or short course or workshops). It is also important to evaluate the needs for knowledge in different subject matter disciplines in connection with statistical needs.

In general, from this kind of exercise it is clear that some organisations must do the diffusion of statistical literacy (such as the national statistical agencies, the statistical association and the schools) and that some organisations must be at the same time spreaders and recipients of the statistical literacy educational process. Some of them, that are *intermediary spreaders*, have a very important role in the educational process, at least for the citizens (school teachers, journalists and mass-media, libraries).

### **4. The actions carried out by ISI and in Italy, by SIS and ISTAT, for dissemination of statistical literacy**

We would like to conclude this paper by presenting a short summary of the activities implemented or planned in the field by the ISI and, in Italy, by SIS and ISTAT.

#### *4.1. ISI and statistical literacy*

As reported by R. Smulders (1995), the ISI established a Committees on Statistical Education that set up a number of Task Forces on teaching statistics at the school level and on international Conferences on statistical education (the most important of them being the International Conference on Teaching Statistics – ICOTS – by a general consensus of both statisticians and non-statisticians). As suggested by the Committee, recently the ISI established the International Association for Statistical Education (IASE) recognising the importance of the diffusion of statistical education.

Finally, the ISI launched the World Numeracy Programme (WNP) in order to spread quantitative skills all over the world in areas and populations (especially in developing countries and among the young) which could benefit most from increased knowledge of numbers and their applications, with particular regard to statistics. The programme includes various projects whose implementation requires 7-8 years and for some of them ISI has asked for financial help from UNESCO. The activities are on going, but the development of the projects are meeting various difficulties.

#### *4.2. The diffusion of statistical literacy in Italy*

In Italy there is now a very important and fruitful interaction between ISTAT and SIS to improve the diffusion of statistical literacy and culture. In fact in Italy, by law, statistical information is considered a public good and ISTAT has among its duties also the dissemination of statistical culture. SIS, as are other statistical associations, has been engaged for many years in the diffusion of statistical literacy and culture through a specific centre (CIRDIS) established in Perugia and other Italian Universities.

SIS and ISTAT have already organised a First National Conference on the Dissemination of Statistical Culture (in 1997), with the co-operation of the Ministries of Education and of the Public Administration. Now, together with the Ministry of Education, they are organising a specific programme to carry out a “Census of Children” in all of the Italian Elementary and Primary Schools (as it is already done in New Zealand). The project has a short term objective to sensitise the citizens to the population census of 2001 and a long term objective to foster the diffusion of statistical culture and literacy in the schools. The didactic value of the experience that will be carried out ( the children, their teachers and families will be involved in the collection and analysis of data) will represent an inductive approach to probability and statistics in most of the disciplines.

Especially ISTAT is also doing a lot of other activities for the diffusion of the statistical literacy and culture in the public administration units: diffusion of statistical information by the Internet and by television; dissemination of statistical information at the local level with specific points for access to the data (including links with the libraries); preparation of popularising publications for the citizens and for the schools; seminars for journalists and opinion leaders; training for the public administration staff, and in particular for the public statistical offices. The need of a wide and disseminated growth of statistical culture in the civil administration has focused the need for planning training and spreading proposals. Solutions has been pioneered in planning training paths with the aim of strengthening professional skill, in emphasising the role of statistics and statisticians in planning and controlling within the civil administration defined aims. The present training plan foresees four different education processes for the development of statistical skills, from statistical literacy to advanced statistical skills.

All the experiences have showed some important lessons in order to reach some durable results: first, the main obstacles are the “refusal” to use statistics and the preservative cultural context; second, we have to implement a “politics of alliance” with the intermediary spreaders to getting in touch with the receivers in an appropriate way; third, the implementation of the diffusion of statistical literacy and culture is a gradual conquest, that require thousands of small diffused activities in the territory.

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## Résumé

*La diffusion de la culture statistique est une de plus important défis que les statisticiens devront débrouiller dans le 21<sup>emé</sup> siècle. Cet communication montre que le besoin de la culture statistique (de base) est toujours plus importante dans la société de l'information pour les citoyens et les directeurs de l'administration public. Il est donc nécessaire de préparer un plan pour l'établissement d'un parcours éducatif et de formation pour la diffusion de la culture statistique. Quelque renseignement est aussi fournit sur les activités développées de part de l'Institute International de Statistique et, en Italie, de la Société Italienne de Statistique (SIS) et de l'Institute National de Statistique (ISTAT).*