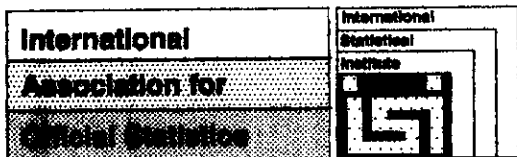


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*Managing Development in the 1990s
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INVITED SESSION 3: QUALITY; IMPROVING AND COMMUNICATING IT

IMPROVING QUALITY OF STATISTICAL DATA THROUGH TRAINING

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ABSTRAIT

Ce papier discute le concept de qualité des statistiques, le contrôle de la qualité des erreurs dans les statistiques et l'amélioration de la qualité des statistiques à travers la formation. Les suggestions, relatives aux types de formation requise pour contrôler ou minimiser les différents types d'erreurs sont discutées. Une brève description du programme régional pour la formation du personnel statistique appelé programme de formation statistique pour l'Afrique (PFSA) est faite en tant que modèle de programme de formation lequel a été utilisé pour former le personnel statistique en Afrique afin de permettre l'amélioration de la qualité des données statistiques.

INTRODUCTION

The quality of statistical data can be affected at all stages of statistical work. This being the case precautions and controls need to be exercised to ensure the production of good quality statistical data. Statistical data of poor quality can lead to harmful consequences when used in decision making, there is therefore need to understand the meanings and limitations of statistical data before subjecting them to use or further analysis.

This paper discusses the concept of quality of statistics, quality control of errors in statistics and improvement of quality of statistics through training. A brief description of a regional programme for training statistical staff called Statistical Training Programme for Africa (STPA) is provided as a model training programme which has been used to train statistical staff to enable, among other things, improvement of the quality of statistical data. In this paper the term "statistics" refers to "statistical data".

THE CONCEPT OF QUALITY OF STATISTICS

By quality of statistics is meant the degree to which those statistics measure what was intended to be measured when the questions and procedures were designed. In fact accuracy can be a synonym for quality [3].

Various points of view regarding judgement of the quality of statistics can be identified [6]: Statistics can be said to be of good intrinsic quality, that is they are reliable and can be taken at their face value; and statistics can also be said to be comparable with other similar sets. In this case, uniformity with respect to concepts, definitions and methods in the compilation of the two sets of statistics exist.

The quality of a given set of statistics can be assessed by applying the following basic criteria: accuracy of the statistical data; validity of different characteristics as measures of the concepts they are intended to measure; uniformity with respect to time reference or other qualification of the characteristics; and completeness with respect to coverage of entire populations or sample.

QUALITY CONTROL OF ERRORS IN STATISTICS

In order to improve the quality of statistics, there is need to institute appropriate quality control procedures for the different types of errors which may occur. The different types of errors over which control may be exercised are as follows [6]: errors due to faulty concepts and definitions; errors due to faulty selection of individuals; observational errors; processing errors; errors due to presentation and publication, and errors due to designing of statistical work.

In the field of surveys, errors affecting estimates are classified under two broad headings: sampling errors and non-sampling errors [2]. Sampling errors depend on the sample design and are estimated by standard errors. Standard errors can be taken as indicators of the reliability or precision of survey estimates. The errors mentioned above, over which control may need to be exercised, fall in the group of non-sampling errors.

It should be stated that the above errors arise due to departure from the prescribed rules of the investigation. Because non-sampling errors may be so large and can affect the results of an investigation (survey or census) substantially, it is desirable for statistical workers to be fully conversant with the different types of errors and their contributions to the result of investigation so that proper care can be taken to control them.

Non-sampling errors are often much larger in magnitude and they generally bias the survey estimates by appreciable amounts. There is no universal method of measuring non-sampling errors. Different components of non-sampling errors need separate treatment. The size and direction of non-sampling errors depends on various factors like the country and social environment, the topic of enquiry and socio-cultural characteristics of interviewers and respondents.

In surveys, major components of non-sampling errors are mainly coverage errors, non-response and response errors [4]. Techniques for detection and measurement of non-sampling errors generally include: post-enumeration checks (re-interviews of a sub-sample of respondents), external checks against data from other sources (other surveys, administrative records, etc.) and internal consistency checks in the results.

IMPROVEMENT OF QUALITY OF STATISTICS THROUGH TRAINING

Training of statistical staff is a continuous process. In order to improve the quality of statistics, the basic skills of staff charged with the responsibility of producing these statistics should be strengthened.

The table below is an attempt to suggest types of training that may be required to control or minimise the different types of errors which have been identified earlier in this paper.

TYPE OF ERROR	TYPE OF TRAINING REQUIRED TO CONTROL OR MINIMISE ERROR
Faulty concepts and definitions	Seminars, workshops to discuss concepts and definitions. Specific training courses prior to a survey or census in the different areas of statistical work.
Faulty selection of individuals	Sampling theory, cartography (frame construction), selection and use of frames in surveys and censuses, seminars, workshops and specific training course prior to a survey or census in the different areas of statistical work and cartography.
Observation errors	Specific training course prior to a survey or census, measurement and interview techniques should be thoroughly covered. On-the-job training in the various fields of statistical work to ensure skilled staff.
Processing errors	Data processing course covering aspects of coding, editing, checking, tabulation, computer programming and use of software packages.
Presentation and publication errors	Training course or workshop on table design and presentation, copying and printing errors. Workshop on data interpretation and presentation.
Designing of statistical work	Academic and practical training plus on-the-job training.

The improvement of staff skill has to take place at all levels of staff: professional, middle and clerk/enumerator levels. The professional statisticians should be taught theoretical and applied statistics, middle level staff should be also be taught theoretical and applied statistics while the clerks/enumerators should be provided practical skills required for the collection, processing and reporting of statistics. In fact assessment of the quality, reliability and internal consistency of data before being subjected to rigorous statistical analysis is an important task of a professional statistician. This being the case, careful attention ought to be paid to the design and delivery of training programmes to ensure maintenance of an adequate balance between theory and applications.

Theoretical training should cover the whole field of statistical theory, sampling and non-sampling errors, etc. This implies the preparation of syllabuses which are adequate for this type of training. Applied statistics should cover the basic tools for analyzing statistics such as regression and correlation tools, time-series analysis, index numbers, etc. In addition basic tools for compilation, presentation (tables and graphs) of statistical data should be covered. Interpretation of statistics is another important area that ought to be covered.

Clerks and enumerators should normally have basic educational qualifications i.e. school certificate level and in addition should be trained for each investigation they undertake. Enumerators should be trained in the basics of censuses and surveys, errors which could arise, in particular non-sampling errors, should be emphasised. These courses sometimes called enumerator courses should become a regular activity of the statistical office.

Clerks and enumerators should also be trained in the techniques of data processing which should include: coding, editing and tabulation. Manuals produced by professional should be used for these training programmes. This category of staff should also be trained on how to present statistical data for publication purposes. These days computers are in wide use and as such the camera ready type of publications are common. Manuals should also be written by the office to ensure certain standards and norms.

In most statistical offices, middle level staff are assigned the task of supervision in various investigations. They should also receive training for each investigation they undertake. Their training should be done in two stages: firstly together with enumerators for that investigation and secondly they should be trained separately on supervisory duties. This will ensure that both enumerators and supervisors are operating at the same wave length in terms of the particular investigation as regards concepts, definitions and procedures for that investigation.

Finally because of the great need to have training programmes for each investigation and the general statistical education for staff of the statistical office, there is need for each statistical office to establish its own training branch/section as part of the organisational structure of the office. This would fit in with in-service statistical training programmes already in place in a number of African National Statistical Offices. This I believe is one of the ways to improve the quality of statistics being produced by many countries in the world.

A number of other activities or measures could be undertaken as part of the development to improve the quality of statistics through training as follows:

- (i) The development of teaching materials to suit local conditions.
- (ii) The development of quality control measures for different statistical investigations and operations. Through this various statistics can be checked and improved upon with regard to reducing errors.
- (iii) Syllabuses for teaching programmes need to be revised to ensure that elements of quality of statistics are covered - sampling and non-sampling errors.
- (iv) For each investigation, training courses should be conducted to ensure that concepts, definitions, etc. are well understood by both enumerators and their supervisors.
- (v) For each investigation, supervision should be emphasized at every stage to enable spotting of errors and correcting them as the operation continues. Through supervision, the quality of statistical data can be improved.
- (vi) Methods of appraisal of quality of basic data ought to be developed to enable inclusion in the syllabuses and teaching programmes for various courses. For example in the field of population, various measures have been developed but in many other areas such measures are yet to be developed.

THE STATISTICAL TRAINING PROGRAMME FOR AFRICA

HISTORICAL PERSPECTIVE

It should be recalled that during the 1960s and the 1970s, the majority of statistical offices in Africa faced a number of problems including shortage of staff and high turnover of their qualified staff. These problems were discussed extensively for the first time at the second session of the conference of African statisticians in June/July 1961. As a result the conference initiated an intensive training programme aimed at overcoming the above problems with an initial emphasis on middle level statistical training.

The staffing of statistical offices was further discussed at the ninth session of the conference of African statisticians in Lome, Togo in 1975. A recommendation that a working group to consider African statistical training needs be convened was made at this meeting. Such a working group was convened in Munich, Germany in August 1977. The working group gave special attention to the improvement of existing training centres and their effective utilisation, the practical orientation of their teaching programmes, reduction of the loss of qualified staff at national statistical office (NSO) and financial resources required including the coordination of statistical training activities in and outside Africa. At the tenth session of the conference of African statisticians in October 1977, it was noted that the staffing situation of countries of the region was still unsatisfactory. The conference therefore adopted a comprehensive programme entitled "Statistical Training Programme for Africa (STPA)" [5] which was formally instituted by resolution 9 ECO (XVIII) of the Economic Commission for Africa (ECA) Executive Committee at its 18th session held in Khartoum (Republic of Sudan) in 1978. The STPA became the main instrument for promoting the teaching of statistics for statistical personnel in Africa.

STPA OBJECTIVES AND INSTITUTIONAL FRAMEWORK

The main objective of the STPA was to ensure that the African region has a permanent supply of qualified statistical staff for the NSS and other organizations in the public sector as well as the private sector. STPA was originally conceived as a ten year programme aimed at ensuring Africa's self sufficiency by: increasing the number of trained statisticians and improving and maintaining the quality of the serving statistical staff. This programme was aimed at teaching those already employed by the statistical offices and those expected to be employed by the statistical offices.

It was initially proposed that STPA should serve as a framework for the coordination of the establishment, improvement and if need be, the expansion of training facilities in Africa. It was decided that STPA should concentrate in the following training areas: professional; post-graduate and specialised studies; and middle level. The institutional arrangements of STPA included: establishment of a regional mechanism (regional component of STPA) to provide operational support to the improvement and expansion of the STPA at ECA through a project; selection of existing training centres to participate in the programme; selection of STPA associate centres generally outside Africa to supplement basic training activities to be undertaken by STPA centres; strengthening NSS which were expected to supply trainees and employ those trained at the STPA centres; and collaborative

arrangement with multilateral and bilateral agencies such as the European Union, the Commonwealth Secretariat, the Canadian International Development Agency (CIDA), the Swedish International development Agency (SIDA), Germany, United Kingdom (U.K) and other bilateral agencies which expressed interest to participate in the programme.

Over the years, sixteen STPA centres were selected on the basis of their inter-regional or regional character of their services and the practical orientation of their teaching programmes. A total of eight associate STPA centres were also selected over the years. The list of STPA centres and associate STPA centres is included as appendix.

ACHIEVEMENT OF STPA

Statistical training institutions under STPA were assisted through: The preparations of guide syllabuses whose main objective was to assist in the maintenance of curricula and qualifications; Provision of short-term visiting lecturers to teach various courses (sixty five lecturers were fielded); and Provision of limited equipment for teaching and research purposes. Trainers at STPA centres were trained, a total of 39 fellowships were granted during the period 1978-1993. In-service statistical training programmes at national level, middle level statistics training programmes at national level, postgraduate and specialised training, workshops, seminars and on-the-job training were established and/or improved upon.

One important achievement of STPA is that it has helped to improve the quality of statistical data through the improvement in the quality of staff. However special special staff training programmes are needed to enable further improvement in the quality of statistics being produced at the operational level.

CONCLUSION

Training to improve the quality of statistics cannot be achieved at once, it is a stage by stage process. At the academic level, universities and statistical training institutes such as STPA centres have trained professional statisticians and middle level statistical staff. At the low level (clerks/enumerators) training has been undertaken at the statistical offices. All these training programmes while aiming at increasing the number of trained statistical staff should also aim at improving the quality of statistics which they produce. What perhaps has emerged from the paper is that academic training needs to be supplemented by more practical training through workshops, seminars and specific survey, census courses in each field of statistical work to explain a number of concepts, definitions, etc. These courses lead to the minimisation of errors and overall diminution of errors in the statistical data.

In the case of surveys and censuses, training has to be organised for each survey/census. Enumerators and supervisors have to be trained first, followed by a separate training for the supervisors. Training has to be separately organised for the data processing staff to ensure coding, editing and tabulation operations are conducted smoothly. The preparation of reports arising from surveys, censuses and other investigation for publication requires separate training arrangements. It is certainly true that at the end of all these training courses, the quality of data is likely to be improved.

List of STPA Centres

Appendix

French-speaking Centres: 1. Institute national de statistique et d'économie appliquée (INSEA), Rabat, Morocco; 2. Institute national de la planification et de la statistique (INPS), Algiers, Algeria; 3. Centre européen de formation des statisticiens - économistes des pays en développement (CESD), Malakoff, France; 4. Institute sous-régional de statistique et d'économie appliquée (ISSEA), Yaoundé, Cameroon; 5. Institute de Formation et de Recherche démographiques (IFORD), Yaoundé, Cameroon; 6. Institute africain et mauricien de statistique et d'économie appliquée (IAMSEA), Kigali, Rwanda; 7. Collège statistique de Dakar (CS), Ecole Nationale d'économie appliquée, Dakar, Senegal; 8. Ecole National Supérieure de Statistique et d'Economie Appliquée (ENSEA), (Abidjan, Côte d'Ivoire).

English-speaking Centres: 1. Institute of Statistics and Applied Economics (ISAE), Makerere University, Kampala, Uganda; 2. Department of Statistics, University of Ibadan, Ibadan, Nigeria; 3. Eastern Africa Statistical Training Centre (EASTC), Dar-es-Salaam, United Republic of Tanzania; 4. Department of Statistics, University College of Botswana, Gaborone, Botswana; 5. Department of Statistics, National University of Lesotho, Maseru, Lesotho; 6. Department of Statistics, University of Ghana, Legon, Ghana; 7. Regional Institute for Population Studies (RIPS), Legon, Ghana.

Portuguese-speaking Centre 1. European Centre of Statistics for developing countries (CESD -Lisbon), Higher Institute of Statistics and Information Management, Lisbon, Portugal.

List of Associate STPA Centres

1. The Munich Centre for Advanced Training in Applied Statistics for Developing Countries, Munchen, Germany; 2. The Institute of Development Studies (IDS), University of Sussex, Brighton, U.K.; 3. The Applied Statistics Research Unit (ASRU), University of Kent, Canterbury, U.K.; 4. The International Statistical Programs Centre (ISPC), Bureau of the Census, Washington, U.S.A.; 5. The Institute of Social Studies (ISS), The Hague, the Netherlands; 6. The Department of Statistics, University of Newcastle upon Tyne, U.K.; 7. The Department of Probability and Statistics, University of Sheffield, U.K.; 8. The Indian Agricultural Statistics Research Institute (IASRI), New Delhi, India.

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