# Quality on Its Way to Maturity: Results of the European Conference on Quality and Methodology in Official Statistics (Q2004)

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From 1999 to 2001, the Leadership Group (LEG) on Quality, established by the Statistical Programme Committee (SPC) of the European Union following a proposal by Statistics Sweden, analysed the state of the art of quality work in the European Statistical System (ESS). Its final report contained 22 recommendations and was endorsed by the SPC in September 2001 (Eurostat 2002). Recommendation No. 14 called for the establishment of biennial conferences "covering any methodological or quality-related topic of relevance to the ESS." The European Conference on Quality and Methodology in Official Statistics (Q2004) was organised in response to this recommendation. Q2004 was inspired by the success of the International Conference on Quality in Official Statistics (Q2001), in which the recommendations of the LEG on Quality were presented and discussed for the first time.

*Key words:* Quality; official statistics; quality assessment.

## 1. The European Conference on Quality and Methodology in Official Statistics (Q2004)

The European Conference on Quality and Methodology in Official Statistics (Q2004) took place in Mainz, Germany, from 24 to 26 May 2004. It was accompanied by three parallel, one-day training courses on "Introduction to Survey Quality," "Quality Management in Statistical Agencies" and "Variance Estimation in Complex Surveys" on 24 May, and by a Satellite Conference on Data Quality for International Organisations in Wiesbaden, Germany, on 27 and 28 May. The overall goal of Q2004, as a scientific gathering on important methodological and general quality-related topics of relevance to the European Statistical System, was to bring together people representing the current level of knowledge and new developments in the field of quality and methodology in statistics in Europe and the rest of the world.

Q2004 built on the successful experience of the International Conference on Quality in Official Statistics in Stockholm 2001 (Q2001). A comparison of Q2001 and Q2004 brings into relief the achievements in this area over the three years, with Q2004 also presenting new challenges for official statistics in an enlarged European Union and in other parts of

the world. Though Q2004 was a follow-up to Q2001, it was not just a repetition of the latter. Q2001 was clearly focussed on the work of the LEG on Quality and its recommendations. Some of these recommendations became less relevant over the three years, the importance of others increased considerably, and new relevant topics arose. Q2004 was in this respect the continuation of Q2001, though with partly changed emphasis including new topics.

Recommendation No. 14 of the final LEG report did not only call for a conference on quality in statistics. The objective was in fact much more ambitious: to create a regular forum for all those interested in methodological and quality-related activities within the ESS. The target audience therefore also comprised methodologists who do not (explicitly) work on data quality, and quality management experts interested in the implementation aspects of quality management processes in statistical institutes. Consequently, the topics mentioned in the call for papers for Q2004, published in May 2003, were very broad, in order to attract papers from all relevant areas.

The relevance of the conference theme was clearly demonstrated by the high level of interest that the call for papers generated. More than 260 abstracts were submitted, and 498 statisticians and other experts from 48 countries and five continents participated. A total of 41 sessions were organised, including five invited sessions with high-level speakers from official and academic statistical fields. The sessions covered 128 papers on a wide range of topics, including survey and questionnaire design and testing, improving surveys and processes, fieldwork, data processing, weighting and calibration, presentation of statistical data, quality components, quality indicators, quality assessment, quality reporting, corporate quality programmes, metadata, nonresponse studies, nonsampling errors, confidentiality, perception surveys and recommended practices. A further 102 high-quality papers on the same range of topics were identified, some of which were presented in poster sessions.

This article summarises the most striking results of Q2004 from the point of view of the chairs of the programme committee. We will focus on the methods and tools for data quality assessment, a number of methodological developments and the co-operation between academic researchers and official statistics. Finally we make a comparison between Q2001 and Q2004 and present some future perspectives.

## 2.   Results of Q2004: A Personal View

It is hardly possible to adequately summarise the contents of more than 200 papers in just a few pages. However, as chairs of the programme committee, we, the authors, looked at all the papers during the preparatory phase of Q2004, followed several sessions, and had the opportunity for numerous bilateral contacts during the conference. From this admittedly rather subjective perspective, it is possible to identify some striking developments.[3]

The world of statistics has changed since Q2001 in Stockholm. The changes are not fundamental, but the topics of the papers and the overall composition of the programme show that, at least in broad outline, the issues are not the same as three years ago. Whereas Q2001 was characterised as a point of departure into a more systematic quality world in

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[3] The complete abstracts and proceedings of Q2004 (Federal Statistical Office, Germany 2004) are available at http://q2004.destatis.de

many European statistical institutes, Q2004 was devoted to experiences with broader implementation of these concepts. In addition, the underlying message of many contributions to Q2004 was that the current situation of statistics would necessitate a general rethink of many traditional methods against the background of budgetary pressures, societal changes and new possibilities in the IT field.

## 2.1. Quality assessment on its way to maturity

Although not an end in itself, monitoring and documenting quality lies at the core of every quality management system. Covering all aspects of data quality in parallel, the standard quality report of the European Statistical System developed by the Working Group "Assessment of Quality in Statistics" has become the major reference document for quality assessment at the European level (Eurostat 2003). Not only is this report a general reference document; it has also been shaped by specific needs in many different areas of statistics. Many overview papers at Q2004, and some statements from the final panel discussion, made it clear that quality reporting of this type is the key to effective data-quality management. Implementation is proceeding quickly in a large number of statistical offices. Some good examples were presented at Q2004, covering both the European level (Corsini 2004) and the national level (Burg 2004; Gligorova, Krulik, and Kustura 2004). Furthermore, many other components necessary for data-quality management are rooted in a fairly comprehensive quality reporting framework. This is the case not only for informing users about data quality, but also for calculating aggregated data quality indicators which could be used in internal monitoring as well as in metadata systems for external users (Booleman 2004; Elvers 2004; Hustoft, Linnerud, and Sæbø 2004; Brancato et al. 2004). Such systems, which attempt to integrate data and metadata (including, in part, quality indicators), are deemed highly useful, though fairly ambitious, so that a more step-by-step implementation strategy seems preferable.

The risk associated with quality reports is that they are often too detailed to be used in the context of managerial decision-making and monitoring within statistical institutes or statistical systems. To overcome these problems, a more highly aggregated information system is felt to be necessary. It is not by chance that once standard concepts for quality reporting had been agreed on, attention shifted to quality indicators. Two full sessions of Q2004 were devoted to quality indicators, which highlight the depth of activities regarding this fairly new topic. As with the standard quality report, the basic concepts have been developed in European working groups led by Eurostat. For use within the context of the European Statistical System, a set of standard quality indicators has been developed – one which has not, however, been fully implemented yet (Lindén 2004). A different approach, albeit based on the same quality concept, has been chosen for summary quality profiles of indicators for evidence-based policy making (Hahn 2004). In contrast to the situation with general quality reporting, the development of quality indicators still seems to be in a fairly early phase, at least with regard to some quality components such as relevance, coherence and comparability. Following Q2004, a decision seems to have been taken with respect to the creation of overall ("composite") quality indicators comprising all quality components at the same time. Such composite indicators no longer appear to play a major role (if they ever did).

Quality indicators are an important input for data-quality assessment. However, as already noted by the LEG on Quality, a different set of assessment tools has to accompany such inputs in order to create a sustainable improvement process. The LEG on Quality Implementation, steering the implementation of the 22 recommendations of the LEG, has put considerable effort into the improvement of assessment tools. The first success was presented at Q2004. A complete toolbox of assessment tools is now available for many different organisational contexts. Such methods include various types of quality audits (Eiderbrant-Nilsson 2004; Zilhão et al. 2003), self-assessment tools for statistical products and processes (Laiho and Nimmergut 2004; Thygesen 2004), and a number of approaches to process analysis (Findl 2004; Jones and Lewis 2004; Marker 2004; Fenwick 2004). With all these different methods in place, we currently have an "embarrassment of riches." The availability of such a variety of tools can lead to some confusion. At least some of the tools, either newly developed ones or ones described in state-of-the-art reports, have not yet managed to find their way to users, at least not in a big way. A synthesis is needed, to explore which tools should be used in which particular contexts, and what combination of tools is appropriate for what type of organisations and in what conditions.

Another striking development is the fairly strong link that has emerged between quality management and methodological research. Here, the way has largely been paved by the European Commission's Fifth Research Framework Programme, of which a number of relevant projects were presented at Q2004. The most visible example was a project entitled "Data Quality in Complex Surveys in the new European Information Society" (DACSEIS), which integrated its final conference into three sessions of Q2004. However, there are yet other examples of the more intense dialogue that is taking place between methodologists and quality management specialists. To name just a few examples, projects being undertaken under the Fifth Research Framework Programme include some in the fields of cross-national harmonisation of household panel data (CHINTEX), editing and imputation processes (EUREDIT and INSPECTOR), statistical disclosure control (CASC), small area estimation (EURAREA), statistical metadata (METANET) and data collection methods (CODACMOS).

### 2.2.   *Methodological trends: a revolution in the making?*

It is a common prejudice that compared to the work on sampling errors, nonsampling errors are seriously under-represented in scientific discussions. This may still be true with regard to the number of publications, the number of pages in statistical journals, the number of professorships, posts in statistical offices etc. However, the Q2004 conference programme, similar to those of other recent conferences, paints a somewhat different picture. Of the papers dealing with sources of error in surveys, those focusing on nonsampling errors were clearly in the majority. The programme contained numerous contributions, including the areas of unit and item nonresponse, coverage errors, measurement errors, etc. One might conclude, firstly, that Q2004 demonstrated the increased importance attached to nonsampling errors, not only as part of a quality component, but also as a topic of research, and secondly, that the practitioners of

official statistics are sufficiently interested in the subject for them to give presentations on it at an international conference.

Research on nonsampling errors presented at Q2004 focused on three broad areas: the response process in surveys, the methodological peculiarities of international surveys, and computer-assisted surveys. As regards the response process, speakers presented papers on the evaluation of unit nonresponse and item nonresponse with the help of experimental study designs (Beerten and Freeth 2004; Timm 2004) or data matching approaches (Fraller, György, and Horváth 2004; Brancato, d'Orazio, and Fortini 2004). The increased interest in the response process is equally reflected by a number of papers focusing on questionnaire design and testing issues.

Given the European dominance at Q2004, it is not surprising that methodological problems relating to international surveys were an important topic. The comparability of data produced in different Member States is an important challenge for the European Statistical System, e.g., with regard to the monitoring of national policy results, using structural indicators ("Lisbon strategy"). In the field of household surveys, a fruitful exchange of ideas was established at Q2004 between the survey experts of the European Statistical System and those of nonofficial international surveys such as the European Social Survey. In both contexts, a wealth of experience is available regarding different approaches to the production of harmonised statistical information. Deepening and intensifying this dialogue will certainly prove rewarding, both for statistical offices and for academic statisticians, and could be an important topic for future Q-conferences.

Q2004 made it clear that computer-assisted data collection techniques, like computer-assisted telephone interviews (CATI) and computer-assisted personal interviews (CAPI), have become standard instruments in both national statistical offices and academic research. Options for quality control in computer-assisted surveys (Berkel, Brakel, and Vosmer 2004) and the effects of mixed-mode data collection designs were some of the focal points of Q2004. For instance, research on mixed-mode effects will continue to be of outstanding importance given the increased use of web-based surveys (Jones et al. 2004). In official and academic surveys, many hopes are pinned on the use of web-based data collection techniques. However, for both technical and socio-cultural reasons, it is highly unlikely that entire populations could be approached with Internet-based data collection instruments in the near future, and even more unlikely that it will be possible to draw representative samples of the desired target populations via the internet. Mixed-mode techniques are one possibility for exploiting the advantages of web questionnaires for at least parts of the populations. At the same time, it is these very possibilities (such as graphic design and multi-media features, interactive elements and questionnaires tailored to the needs of various sub-populations), which are liable to produce mode effects.

Once the research on nonsampling errors has become more firmly established in the statistical community, the need to broaden the horizon and look for new solutions which might not chime with traditional text-book approaches will become increasingly apparent. For example, increasing nonresponse problems make traditional probability sampling methods more and more problematic. Subpopulations that are difficult to reach risk being under-represented when nonresponse rates increase. Recent developments show that the focus regarding nonrespondents is less on the overall response rates, and more on the response rates of those problematic subpopulations. Although probability sampling seems

increasingly to fail in recruiting such subpopulations, a return to quota sampling methods is manifestly not the solution. Consequently, new methods have to be developed which enable institutes of official statistics to reduce both cost and bias, and to preserve the methodological strengths of traditional probability sampling approaches. Examples presented at Q2004 included "double sampling" (Stoop 2004), using access panels with controlled access rules (Nimmergut and Körner 2004), or accumulating respondents over successive waves (Slock, Vanderhoeft, and Quoilin 2004).

Perhaps even more of a "creeping revolution" is affecting the status of accuracy in the overall assessment of data quality. Whereas it was used in the past more or less synonymously with "quality," or was at least considered the most important component of the current, all-encompassing definitions of the quality of statistics, accuracy is increasingly being seen in a different light. Researchers and official statisticians are bidding farewell to the idea of completely error-free data, although accuracy is still considered the ultimate aim, and therefore highly desirable. There seems to be a general tendency to accept that micro- or macro-data sets should be as accurate as necessary given the survey objectives and prevailing conditions (including the available resources), but that they need not achieve the highest possible level of accuracy. This change in attitude does not mean that any level of accuracy is acceptable. Basic levels of accuracy will always have to be respected, although the concept of a "basic level" is fairly vague and requires further investigation. The changed attitude was reflected in different parts of the conference on fairly diverse topics. Examples include the move from micro- to macro-editing, the increasing role of (multiple) imputation and calibration, and matching techniques as a special form of imputation (Rässler and Münnich 2004; Kuchler and Spieß 2004; de Waal 2004; Wein 2004).

A particularly high-profile example is the secondary use of administrative data and the measurement of their accuracy. The less the postulate of error-free data is followed in practice, the more administrative data become an alternative to surveys. As mentioned above, however, the creeping change in attitude should not and does not mean that any administrative data, whatever their quality, are suitable for use. On the contrary, Q2004 made clear that administrative data could not be considered a cure-all for recent challenges in official statistics. Using administrative data can be advantageous for many reasons, such as a reduced response burden or the possibility of obtaining large sample sizes at comparatively low cost. However, many conference papers showed that the quality of administrative data is by no means always taken for granted. It seems that with the broader use of administrative data, more and more quality concerns are becoming visible. A number of speakers pointed out that the use of administrative data is related to a number of basic preconditions, which are not always easy to fulfil (Gruber 2004; Grun-Réhomme and Vasechko 2004; Foss 2004; Stefanovic 2004; Becker 2004). In many cases, the fundamental problem is that statistical concepts do not fully match the concepts of public administration (which have been defined with other purposes in mind than providing a basis for statistical information). Even if such conceptual problems can be solved, statistical institutes are often not the "owners" of the administrative data, and have little influence on the production process. In many cases, little in the way of quality assessment can be done within the statistical institute. When different registers are linked, further problems arise because of conceptual differences between the registers. The papers

presented at Q2004 suggest that an efficient use of administrative data requires, first of all, intensive communication between the administrative bodies providing the data and the statistical office responsible for their use. For example, Gruber (2004) suggests the use of service-level agreements with the providers of administrative data. For quality measurement, a differentiated set of analysis methods is needed, but none is yet available. The papers showed that, compared with the situation regarding surveys and censuses using the primary data collection method, quality measurement and quality reporting for surveys based on administrative data are still in their infancy.

## 2.3.   *The research and development infrastructure in official statistics*

The success of conferences such as Q2004 depends on their ability to attract both official statisticians and statistical researchers. Though the two groups are often basically trained in similar areas, their professional development and perspectives usually differ significantly. Members of statistical offices often feel disconnected from recent developments in methodology, with the effect that newer methods tend not to be applied in practice. Even where information on methodological developments is available, it usually takes quite a long time before it is actually used. On the other hand, statistical researchers often lack a basic understanding of the tasks and *modus operandi* of the various fields of official statistics. These cultural gaps require enhanced understanding and co-operation between the two groups.

Q2004 offered various possibilities for an exchange of views and better mutual understanding. The first day of the conference was devoted to three parallel short courses on survey quality, quality management in statistical offices, and variance estimation in complex surveys. All three courses, which were attended by members of both groups, were so popular that restrictions had to be applied on the number of participants.[4] Several speakers in the conference sessions referred to the need for a better co-operation between institutes of official statistics and universities, for example in research projects or training programmes.

A key condition for successful co-operation between researchers and official statistics is that the former have access to micro-data. This ever-present condition can easily be met, as long as confidentiality aspects are respected. The literature offers numerous possibilities for guaranteeing the confidentiality of micro-data, although direct access is not possible without modifications to those data. A balance therefore has to be struck between confidentiality on the one hand and maximising the use of the information contained in the micro-data on the other. Some remarkable efforts and interesting new options regarding this balance were presented (Cox 2004; Black and Haworth 2004; Seastrom et al. 2004; Singh and Yu 2004).

## 3.   **Changes Since Q2001**

When comparing Q2001 and Q2004, it is important to remember the circumstances, which led to the organisation of the former. Q2001 had two core objectives: firstly, the

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[4] It is worth noting that the topic of variance estimation in complex surveys was present throughout the conference and was the subject of the final event of the DACSEIS project.

presentation of the results of the LEG on Quality, and secondly, increasingly awareness for quality in statistics. Q2001 was therefore centred on the topics relating to the work of the LEG on Quality, such as quality frameworks, circulation of information, auditing and self-assessment, quality and customers, documentation, customer and staff satisfaction surveys, and the strengths and weaknesses of the European Statistical System. In contrast, Q2004 was more generally oriented towards quality and methodology in official statistics. Specific topics of the first conference, such as the characteristics of the ESS, were of no particular interest at Q2004.

Despite these objective-related differences, a comparison between Q2001 and Q2004 shows clear developments. Q2001 was concerned with a conceptual basis, while Q2004 was the first on actual implementation. Core topics of Q2001, such as users, customers and clients, Current Best Methods and minimum standards, and quality management models, only played a minor role in Q2004, in the sense that no specific presentations or sessions were devoted to these issues, although the topics themselves had a "latent" presence throughout. It was no longer felt necessary to talk about this basis, as it was felt to be a given. Instead, specific applications of tools were at the centre of interest. Quite a number of presentations and even entire sessions were devoted to applications of quality-related issues in various statistical areas, such as economic statistics or National Accounts. The core of both conferences, however, was the same, namely standard topics of quality work in statistical production. Both conferences covered the wide range of topics relating to surveys (from survey design to the presentation of data) and to the general quality cycle (from quality components to quality reporting), but also standard topics such as metadata, variance estimation, nonresponse analysis and process improvement. The move from more theoretical topics to their implementation over the three years from 2001 to 2004 might also reflect the work of the LEG on Quality Implementation. Finally, it should be mentioned that Q2004 also covered additional topics such as data warehouses and small-area estimations, issues that are currently enjoying considerable interest.

## 4.   Looking Ahead

Q2004 was a forum for presenting results and providing information on progress in (research) projects, and it gave participants from all over the world an opportunity for an exchange of views. Although this is certainly a success, it is not sufficient. Quality means continuous improvement, and if our attempts at improvement were limited to presentations, discussions and exchanges of views, we would in fact be going backwards. This is especially true for a fragile institutional network such as the European Statistical System, which comprises the official statistical institutes of the EU Member States and which is faced with national and international interests that are sometimes competing. In a system such as the ESS, improvement of quality cannot be achieved by individual countries running different quality-related projects at different speeds and different depths. The overall quality of the joint products of the ESS – and not just Eurostat – requires some kind of harmonised approach at the European, i.e., at the ESS, level.

Several speakers, particularly invited speakers, referred to this topic. Svante Öberg, the Director General of Statistics Sweden, reminded the conference in his contribution to the plenary opening session that the impetus of the work on quality at European level achieved through the Leadership Group on Quality, Q2001 and Q2004, should be used not just for making vague declarations of intent but for establishing perspectives and objectives, which should be as tangible as possible, at the ESS level. He proposed a road map for systematic quality improvements in official statistics at the EU level, which should be as specific as possible and contain a timetable with measurable progress indicators. The decision-making bodies of the ESS might consider this idea worthwhile and initiate specific actions to be included on the road map and implemented by a group of experts at the European level, such as the LEG Quality Implementation Group, which has monitored implementation of the LEG on Quality recommendations since their formal approval in September 2001.

Further investment in the quality of statistics would also be a crucial element in mitigating the effects of a core problem currently facing official statistics in the EU and, presumably, in almost every country: namely, the increasingly restrictive budgetary situation. It is well-known from a wide range of studies in the private and public sectors, official statistics and elsewhere, that investment in quality brings rewards. Investment in quality in official statistics will lead, among other things, to improved methodologies and fundamentally new methodological approaches and concepts. Several examples were mentioned during the conference and in this article, such as the move from traditional probability sampling methods to new approaches, the increasing importance of imputation and related methods, and the increased (secondary) use of administrative data, especially in the light of changing views on accuracy. In addition, new technologies offer completely new survey concepts, for example via the Internet, while new management approaches for statistical data collection (such as the concept of a Statistical Clearinghouse, developed and introduced by the Australian Bureau of Statistics (ABS)) and new data analysis approaches such as data warehouses are growing in importance.

Numerous other proposals for future activities were aired. Here are just a few examples:

- Actions should be launched for a better exchange of good examples, and further recommended practices should be developed. International organisations such as the OECD, UN and IMF have a special responsibility in this respect, apart from further harmonising their quality concepts, which still differ to some extent.
- The international community of official statisticians should actively participate in the development of ISO standards. Currently, an international standard on market, opinion, and social research services is under preparation by ISO's technical committee No. 225. Even if official statistics seem poorly represented in the committee itself, this does not mean a poor quality of representation by the statistical institutes though a more public discussion of the draft standards might be desirable.
- Many participants urged a stronger network for statistics-related research at the European level. It was argued that the ESS will not be able to cope with the future challenges in research and development unless more effective ways of co-ordinating the research efforts of the statistical offices can be found. Q2004 at the same time showed that many statistical offices are currently developing solutions for similar

problems. Improved research co-operation could foster better solutions and might at the same time lead to some synergies. A research network could also be helpful to further improve co-operation with academic researchers. During the conference a number of institutional arrangements were discussed as a means of providing institutional support for official statistics at the European level, for example in the EU's framework programmes on research.

Last, but by no means least, one topic was present throughout the conference, to a greater or lesser degree. There was general unanimity that Q2004 should be just the first in a series of biennial conferences on important methodological and general quality-related topics of relevance to the ESS. And indeed, there is a reasonable chance of such a series materialising. The next conference in the series will be hosted by the UK's Office for National Statistics (ONS): Q2006 will take place 24–26 April 2006 in Cardiff, Wales. (Further information can be obtained at http://www.statistics.gov.uk/q2006) Furthermore, first preparations seem to be already on their way for Q2008.

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