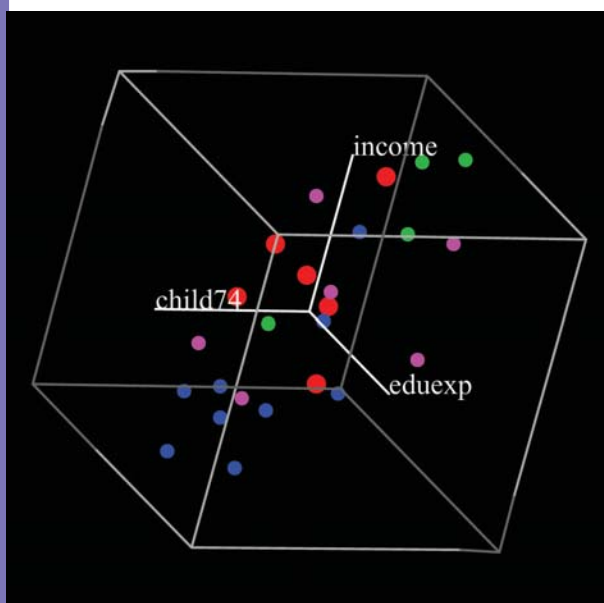


*In the past few years it has been increasingly evident that European universities and colleges are not producing quantitatively competent social scientists in sufficient numbers. This comes at a time when there is a growing demand for social scientific researchers with statistical and modelling skills, not only from universities and research centres but also from various user communities both in government and in a range of organisations in both the private and voluntary sectors. In particular, there is*

## Quantitative Methods in the Social Sciences (QMSS)

**An ESF scientific programme**



*increasing recognition across Europe of the need to base government policy, at all levels, on sound scientific information and significant investments are being made in the large and complex datasets necessary to inform such policy.*

*Although there are some social scientific disciplines where this problem is not felt, elsewhere many commentators have viewed the situation as becoming critical. Several explanations have been offered for how this situation has arisen, but it is unlikely that any theory offers a single solution to a complex problem and it is also impossible that, in the short term, there can be a productive solution to address the root causes. Therefore there is a need explicitly to address the skills shortage through a programme which attacks the major areas of need and which aims to use a network of senior researchers across Europe to foster a new network of junior scholars trained in the design and analysis of quantitative social scientific data.*



The European Science Foundation acts as a catalyst for the development of science by bringing together leading scientists and funding agencies to debate, plan and implement pan-European initiatives.

## Aims and objectives

There is a growing demand for social scientists with strong quantitative skills in Europe, not only in universities and research centres but also in government and in other organisations in both the private and voluntary sectors. The demand is driven in part by a growing recognition of the need to base public policies on sound scientific information and increasing investment in large and complex datasets to provide such information. The European Social Survey, sponsored by the European Science Foundation, is one important example of such a dataset.

In the face of this demand, it has been increasingly evident in the past few years that European universities and colleges are not producing quantitatively competent social scientists in sufficient numbers. This applies not only to social scientists with the skills to apply quantitative methods in substantive fields but also to social statisticians and others with more specialist methodological skills.

Several explanations have been offered for how this situation has arisen. Some relate to factors such as school curricula and increasingly informal primary and secondary education which predicate against strong quantitative skills; others argue that changes in university curricula

have meant a reduction in the importance of formal research methods training; still others point to the comparative economic benefits for junior scholars with quantitative skills of careers in, for example, the financial sector as opposed to social scientific research.

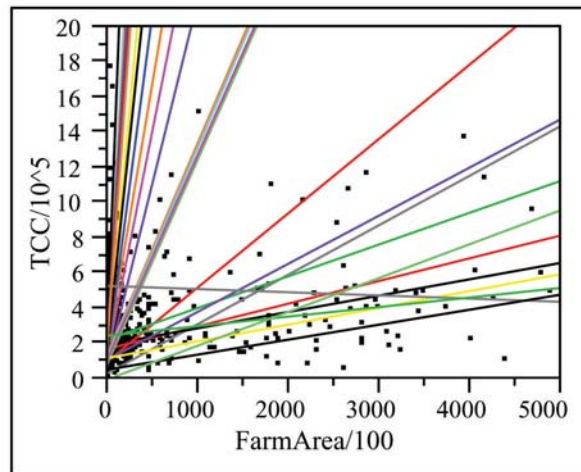
This programme does not set out to address such possible root causes. Rather, it starts from a recognition that, despite such influences and trends, there remain many centres of excellence in quantitative social science in Europe. The programme aims to build upon this position, drawing upon the support of senior researchers to foster the development of a new generation of quantitative researchers, especially by encouraging pan-European networking. The aim is to strengthen links not only across countries but also between social scientists using quantitative methods in substantive research and social statisticians and others with more methodological interests.

In summary, the programme's aims are:

- to increase the number of European social scientific researchers trained in quantitative techniques;
- to foster the development of a new generation of methodologists and quantitative social scientists through enabling pan-European networking;
- to share new methods appropriate for the analysis of social and economic datasets and thus to encourage research applying and developing new methods; and
- to provide illustrative analyses of pan-European datasets, such as the European Social Survey, and thus to generate further analyses of such data.

The programme's strategy for achieving these aims includes:

- drawing on the expertise and experience of senior researchers;
- encouraging interaction between methodological researchers and social scientists applying quantitative methods to substantive areas;
- relating training to pan European datasets of substantive interest across Europe;
- emphasising cross-national methods and studies.



## Programme approach

The programme objectives will be addressed through a series of integrated workshops and seminars which will serve to train junior researchers in the latest methods to analyse social scientific data and will provide the opportunity for senior researchers to share their research.

The combined duration of each integrated workshop and seminar is expected to be nine days, with a two day seminar following a one week workshop. It is expected that twelve workshop/seminars will be held in total. They will take place at various locations within the participating countries.

The workshops and seminars will be organised within five broad areas of quantitative methods. Topic teams of up to five senior researchers from the participating countries will oversee the scientific planning of the workshops and seminars within each of these topic areas.

The first three workshop/seminars will take place in summer 2004 on subjects which fall within the following three topic areas:

- Theory and Practice in the Analysis of Longitudinal Data;
- Theory and Practice in the Analysis of Cross-National Cross-Sectional Data;
- Measurement, Data Collection and Data Quality.

A further nine workshop/seminars are planned for 2005 and 2006 on subjects which fall within one of the five topic areas, which are described below.

The programme will conclude in 2007 with a conference which will bring together the different topic areas.

### Workshops

The workshops will provide training in fields of quantitative methods identified by the topic teams within their topic areas.

They will be led by two senior researchers, identified by the topic teams as having high international standing in their field. The two instructors will have complementary expertise. One instructor will normally be experienced in the application of the methods covered by the workshop in substantive research. The other instructor's primary expertise and field of research will normally be more methodological.

About thirty junior researchers will be recruited to take part in each workshop via a call for participants. About fifteen participants will be selected with primarily methodological research interests, with the remaining fifteen more interested in the application of quantitative methods in various disciplines and substantive fields. The workshops will provide integrated training for both groups, providing opportunities for interaction between them,

while facilitating also the development of the separate skills needed by each group.

Most workshops will include computer-based sessions, using data, and the senior researchers will usually be supported by an assistant, responsible for the organisation and support of such sessions. The data will usually be either from large pan European studies which have internationally comparable data, for example the European Social Survey or the Luxembourg Income Study; or from some of the studies which take place in many European countries and can be broadly comparable, for example studies of elections.

### **Seminars**

At the end of each workshop there will be a two day leading edge seminar on the same topic addressed in the workshop at which the speakers will be leading international researchers in the field. The junior researchers participating in the workshop will also take part in the seminar. The papers will be expected to feature data and refer to applications in a range of social science disciplines.

### **Conference**

The concluding conference in 2007 will feature overview papers of each topic area together with parallel sessions, some of which it is expected will feature papers from junior researchers who participated in the workshops. In particular, some funds will be available to support collaboration in the preparation of papers by pairs of junior researchers, one with more methodological interests and one with more substantive interests.

## **Topic areas**

Five topic areas have been selected to reflect methodological fields where there is an increasing amount of relevant data and where there are opportunities to extend applications in substantive areas for which there are important social science questions. The five areas

certainly do not constitute a list of all areas in which quantitative methods help the social sciences. In particular, there are two methodological fields, multilevel modelling and simulation, which do not appear explicitly under any of the five headings below but are considered as important cross-cutting approaches likely to feature in several areas.

The five areas are:

### **1. Theory and Practice in the Analysis of Longitudinal Data**

Longitudinal data are increasingly seen as essential to address many social scientific questions, in particular questions about pathways to particular outcomes. A wide range of such data is now available. Some European countries have conducted longer-term cohort studies for many years, for example the birth cohort studies in the United Kingdom, the interdisciplinary study of adult development in Germany and the Swedish level of living survey. Internationally comparable data across Europe has also been available for some years from a number of household panel surveys, including the European Community Household Panel survey, to be replaced by the European Union Survey of Income and Living Conditions.

Such data may be used to address many substantive topics including the consequences of teenage pregnancy, pathways into and out of crime, or transitions to old age. Indeed, research into all aspects of the life course can often be placed in the context of a flow diagram on which previous experience can influence subsequent outcomes. As well as single outcomes such as those highlighted above there is a major imperative to consider multiple risks for example for teenage outcomes such as pregnancy, drug misuse, crime and scholastic under-achievement which may be inter-related.

A wide range of statistical methods are available to analyse longitudinal data. These include methods of survival and event history analysis for event based data

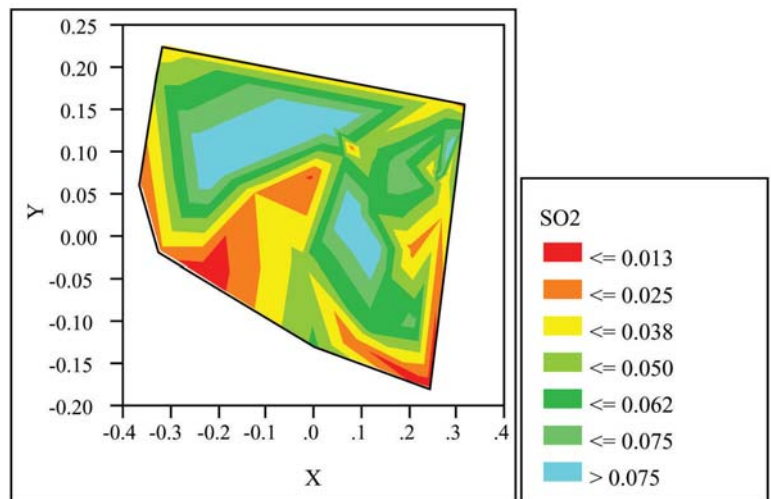
as well as a variety of modelling methods for continuous outcome panel data. The methods may incorporate multilevel models, graphical models and structural equation models. Many theoretical and practical issues arise, for example, when attempting to assess which of a number of potential pathways are supported by the data.

## 2. The Collection and Analysis of Network Data

Network analysts are interested in modelling relationships between actors (individual or corporate) to depict the structure of a group and the impact of this structure on the functioning of the group and/or on actors within the group. Researchers can also make use of network analyses to examine processes of change and evolution within a group over time. There are many different topics, of interest to social and behavioural scientists, which have been studied by network analysts and these include community elite decision making, exchange and power, solidarity, control and regulation in organisations, diffusion and adoption of innovations, corporate interlocking, social support, evolution and change in personal friendships, consensus and social influence and coalition formation.

Standard data analytic techniques generally focus on observational units and their characteristics. In social network analysis, while the attributes of the actors may be included, it is the data on the ties amongst the actors that is of primary interest. Where final data sets comprise both structural (network) and compositional (actor attributes) analysis of the data can prove complex. This analysis can be approached only with sophisticated graph theoretic, algebraic and/or statistical methods used in network analysis.

Other methodological concerns, related to network data measurement include the boundary of the network and the type of relational data collected. While many



Contour Plot for SO2

network studies focus on small groups of actors, which have clearly defined actor set boundaries, recent network studies of actors such as elite business leaders in a community have less well-defined boundaries. Special sampling techniques such as snowball sampling and random nets can be used to define actor set boundaries. Complete networks retain the underlying assumption that all actors (theoretically) can relate to each other in the social network. An ego-centred network consists of a focal actor, termed ego, a set of alters who have ties to the ego, and measurements on the ties among these alters.

## 3. Theory and Practice in the Analysis of Cross-National Cross-Sectional Data

There is an increasingly rich set of pan European cross-sectional datasets available, including the European Social Survey, which is collecting comparable data in over 20 countries, and which will potentially have important implications for informing policy and for understanding and tracking attitudes across Europe. Labour force surveys provide another example, as brought together in the Luxembourg Employment Survey.

As has been noted for many of the large international data collection exercises, such as the Demographic and Health Surveys programme or the World Bank



Living Standards Surveys, analysing cross national data is not simply a case of putting together a series of data sets and adding a dummy variable for nation. Instead, there is a wide range of cultural, socio-economic and spatial considerations required to be able meaningfully to compare data say from Greece with those from Ireland. In addition, there is much debate over strategies to analyse cross-national data sets – such data are often hierarchical, but with complex structures and standard statistical tests may be problematic with very large sample sizes.

#### 4. Design and Analysis of Intervention Studies

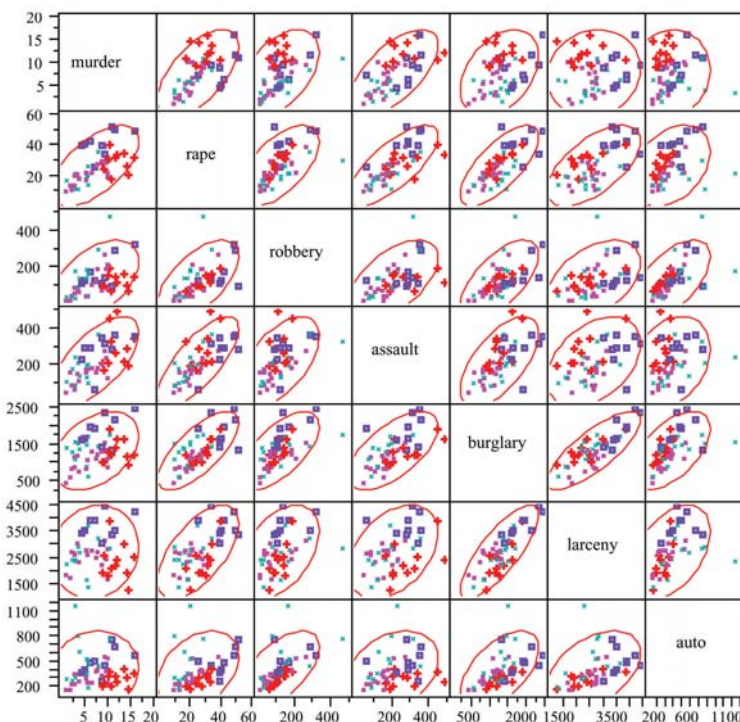
In many social science applications, especially those related to policy, there is interest in evaluating the impact of interventions. Examples include the reduction of recidivism, the impact of changing types of welfare payments or strategies for child support and care, and the impact of government initiatives on small business success or failure. Indeed, with the increase in pan European legislation there is even more need to be able properly to evaluate the effect of policies nationally and at a pan-European level and hence to inform new policy.

Such evaluations raise many issues of design and analysis. Randomised controlled trials (RCT) and Group Randomized Designs, initially developed amongst medical scientists, are often viewed as the ‘gold standard’. While there may be a greater potential for RCTs in the social sciences than has been the case in the past few decades, there will remain many situations where it is either ethically or practically not possible to undertake a RCT. In such cases a number of quasi-experimental or case control designs may be employed. Such non-randomised designs raise a number of problems for analysis, not least of which is the problem of confounding, for example if a policy intervention is assigned to areas in a non-random way and the outcomes of interest are influenced not only by the intervention but also by the local context.

Multiple studies are often undertaken of the effects of the same intervention, perhaps in different locations, and it is then often important to consider how to combine the results of these studies. Issues for consideration include not only the design but also sample sizes, measurement reliability and the representative nature of the participants.

#### 5. Measurement, Data Collection and Data Quality

The validity of all of the methods of analysis described in the above four topic areas depends upon the quality of the data collected. Data quality may be defined in terms of errors arising from many factors, including measurement, sampling and non-response, and these errors may bias statistical analyses as well as affect standard errors. Research based upon pan-European data faces the special problem of potential lack of comparability of data between countries, for example because of language differences or the collection of data by different organisations.



There are two main types of methodological question:

- (1) how to prevent and reduce errors in the design of measurement and data collection instruments, and
- (2) how to detect and treat errors when they arise.

Examples of (1) include question design in computer assisted and web-based surveys and methods of reducing survey non-response.

Examples of (2) include consideration of the treatment of sampling errors for

complex survey designs, weighting and imputation methods for missing data and measurement models to handle measurement error.

The European Social Survey provides a particular opportunity to investigate such methodological issues in a cross-national context. A programme of methodological research was built into this survey project, in order to investigate major issues in face-to-face surveys such as non-response, and the effect of mode of data collection.



## Opportunities to participate

### Junior Researchers

Calls for participation in the workshop/seminars will be issued three times, early in 2004, 2005 and 2006. Applicants should be completing, or have recently completed, doctoral work in a relevant field of study.

Junior researchers selected to participate in the workshop/seminars will also be

eligible to apply for funds to support the preparation of a paper for the final conference.

### Senior Researchers

Calls for expressions of interest to take part as an instructor on a workshop or as a speaker at a seminar will be issued three times, late in 2003, 2004 and 2005.



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