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## STRATEGIES AND APPROACHES FOR SMALL AREA STATISTICS

Invited paper prepared by the Office for National Statistics, United Kingdom[1]

## I.  INTRODUCTION

1.  At the June 2000 session of the Conference of European Statisticians, it was decided that the 2001 Plenary Session should focus on "*Small area statistics* and *Statistics in small countries*". This paper covers the first of these topics. It briefly discusses the increasing demands for small area statistics and information, and then describes the situation in the United Kingdom (UK), where a particular policy has stimulated a major new programme of work, aimed at making available a system of Neighbourhood Statistics. This will draw on a range of sources, including administrative data, the census of population, sample surveys, and modelled estimates based on synthetic estimation techniques. The administrative data will be underpinned by geographic referencing systems which link individual records to exact locations. It also describes problems that are particularly difficult to resolve at a small area level, such as disclosure, confidentiality, and boundary changes, and the solutions that are being considered in the UK.

## II.  THE NEED FOR SMALL AREA STATISTICS

2.  The importance of regional and local statistics has increased in recent years in many countries, with a greater emphasis on regional policies. Policy makers need to make sure that resources are targeted effectively and efficiently at the areas most in need. Citizens also wish to know more about their local area, and how it compares with other areas. It has become

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[1] Paper prepared by Dev Virdee, Head of Regional and Local Statistics Unit, ONS, UK

clear that whilst large differences exist between regions, there are also significant differences within the regions. For example, Inner London has the highest GDP per head of population in the European Union, but within Inner London, some of the most deprived areas of the UK exist (eg Tower Hamlets), adjacent to the City of London which contains the "world's richest square mile". Information at the small area level can help to identify such areas and target appropriate action, and thereafter also allow monitoring and assessment of policies.

3. The appropriateness of particular statistics can also be an issue at the regional and local level. The equivalent national statistic may not always be the right one to use at the local level. For instance, GDP per head is used to compare the income and welfare of different countries. Using this same indicator at the regional and sub-regional level does not always make sense. GDP measures the economic activity in an area, generated by those who work there, rather than those who live there. To compare the position of those living in an area, a more appropriate indicator such as disposable household income is required.

4. Small areas can also provide the "building blocks" for allowing flexibility to produce information for a variety of geographies. For instance, policies can be aimed at addressing urban or rural issues, labour markets, health areas, etc. Small building blocks can be used to define urban and rural settlements and labour market areas, and information aggregated to any of these.

5. The current situation regarding availability of small area statistics is very variable between different countries. Those countries where population registers exist, such as the Scandinavian countries, are able to produce statistics from administrative systems more easily than others. At the other extreme, some countries only have small area data available from the population census, once every ten years. However, much more information could be produced by greater use of administrative sources such as tax returns and social security records, and a number of countries are examining such possibilities. Developments in the UK, which does not have comprehensive registers that it can draw upon, are discussed in more detail in the rest of this paper.

6. There is scope to learn lessons from each other's experiences, and in the longer term, work towards producing consistent small area statistics across countries to enable international comparisons to be made. Eurostat's work on regional nomenclatures and statistical frameworks will help meet this aim within the European Union, and other international organisations such as the OECD and UN can help to extend the coverage whilst building on the European experience.

## III.    INCREASING DEMANDS IN THE UNITED KINGDOM

7. In recent years, a number of developments have led to increasing demands for statistics at lower and lower geographical levels. Devolution for Scotland, Wales and Northern Ireland, and the creation of nine Regional Development Agencies in England, has stimulated demand for information for each of these areas, as well as more detail within these. At around the same time, a large-scale reorganisation of local government came into force, with the creation of unitary authorities (UAs) in all of Scotland and Wales and many parts of England. These replaced the previous two-tier structure of local government in these countries, consisting of

counties with many districts within them, each tier having different responsibilities. This resulted in the UAs and districts wanting data that has previously only been available at regional or county level.

8.    However, the most significant new demand for local information has arisen as a result of the UK government's initiative to tackle social exclusion. In 1998, the Prime Minister established the Social Exclusion Unit (SEU) and asked it to report on: "*how to develop integrated and sustainable approaches to the problems of the worst housing estates, including crime, drugs, unemployment, community breakdown and bad schools etc*". The SEU then published a report setting out the need for a National Strategy for Neighbourhood Renewal, with these goals:

- *"to bridge the gap between the most deprived neighbourhoods and the rest of England; and*
- *in all the worst neighbourhoods, to achieve lower long-term worklessness; less crime; better health; and better educational qualifications."*

9.    The report also highlighted the lack of knowledge that exists about the scale of social exclusion in deprived neighbourhoods, and asked: "*If so little is known about the social conditions of an area, how can effective programmes be developed to tackle social exclusion? If the level of deprivation is not known, or reliable baselines cannot be established, it will be difficult to assess whether renewal has been successful.*".

10. The SEU then set up 18 cross-cutting Policy Action Teams (PATs), to take forward an intensive programme of policy development, with non-government experts involved to ensure that the recommendations were evidence-based and reality-tested. The 18 teams covered the following policy areas: Jobs; Skills; Business; Neighbourhood management; Housing management; Neighbourhood wardens; Unpopular housing; Anti-social behaviour; Community self-help; Arts & sport; Schools plus; Young people; Shops; Financial services; Information Technology; Learning lessons; Joining it up locally; and finally, *Better Information (Policy Action Team 18 – PAT18).*

11. The deliberations of most of the other PATs confirmed that there was a clear lack of information, and PAT18 set out to look at ways of improving the availability of local information. Better information was identified as being essential in order to:

- Identify and target areas that are most in need
- Diagnose the problems in the area
- Help to devise strategies - what intervention is needed?
- Monitor the strategies to ensure that they are working
- Assess the impact of the strategies - before and after analyses
- Compare deprived areas with the rest - measure the "gap" with the rest

12. The following statistical "domains" were identified, for which local statistics should be made available: Access to services; Community well-being/social environment; Crime; Economic deprivation; Education, skills & training; Health; Housing; Physical environment; and Work deprivation. Underpinning these, about 50 themes were identified.

13. PAT18 then identified the problems and barriers to producing good quality local statistics, and proposed solutions for overcoming these. The key recommendations were:

- The Government should attach a high and early priority to delivering a coherent cross-government information policy and strategy, with particular reference to social exclusion. It should embed practices which regard information as a resource to be shared widely rather than hoarded. This strategy should be co-ordinated by a group of Ministers from key departments across Government.

- Government should ensure that an initial version of "Neighbourhood Statistics", in the form of a ward-level dataset, is made available electronically at nil cost to users no later than April 2001 (there are around 11,000 wards in the UK). This is recognised as an interim measure to provide information support for the National Strategy for Neighbourhood Renewal.

- Following publication of the 2001 Census results during 2002-3 the Government should expand this version to provide a consistent time series of data using Census survey and administrative data in combination, and using a standard geographical referencing system.

- A single organisation, the Office for National Statistics (ONS), should be the operational focus for synthesising and disseminating Neighbourhood Statistics, acting as a focal point for all data held by departments, local authorities and agencies (who will continue to 'own' data).

- ONS, in conjunction with the Data Protection Registrar, the Local Government Association, and the Home Office, should prepare guidance on what sharing of statistical data is currently allowed, with examples of good practice.

- Central government should ensure that cost is not a barrier to accessing "Neighbourhood Statistics".

- ONS should play a lead role in providing training and technical support in the use and interpretation of data. Local government and other agencies should be closely involved.

14. The recommendations have all been accepted by the UK government, and are now in the process of being implemented. ONS were asked to cost the proposals and submit a bid for funds to implement the recommendations. Resources have now been made available to develop the Neighbourhood Statistics Service, and how this will be done is described in the following sections.


**Benefits**

15. The Neighbourhood Statistics project proposes a means of finally overcoming some of the major difficulties faced by those needing consistent, reliable and timely information about small areas.   The project will enable the pinpointing of events and the better study of interactions between factors such as unemployment, housing and physical environment, health and educational achievement at the local area level.   It will help to improve the targeting of policy and help in the design of pilot schemes and in the delivery of full, operational services.   Consistent small area statistics will allow better monitoring of the local

impact of policies, and help to identify displacement effects (where a problem is transferred to a neighbouring area). A PAT18 sub-group audited existing statistical information and concluded that there was a strong case for providing a great deal more.

16. Consistent small area statistics are relevant to the design and monitoring of many government initiatives. Some examples: the New Deal for Communities concerns regeneration and renewal at the local level. The report on Modernising Government stressed the importance of improving the use of evidence and research in government. Another report from the Performance and Innovation Unit, 'Adding It Up', said "Government should know what it knows. Better management and organisation of knowledge within government …would help to communicate analytical results and techniques". The July 2000 Review of Crime Statistics noted the importance of geographic information and recommended assistance for police forces in developing their capabilities for geographic analysis. Reliable small area statistics offer scope to make performance measures more directly relevant to the community and individual.

17. The major benefits from the project as a whole will flow from meeting the needs that organisations, especially central and local government departments and agencies, have for the rich statistical resource that will be created. ONS will be proactively encouraging and promoting appropriate use for a wide range of purposes. Key applications will fall into the following main categories:

- Providing the evidence on which to base policy - Increasingly policy is being targeted at the inner cities or other tightly defined areas. The Neighbourhood Statistics Service will enable policy makers to draw together all the available data for an area and identify the key interactions, and also to identify areas with particular combinations of characteristics. For example, many policies, programmes or initiatives including the National Strategy for Neighbourhood Renewal, Local Strategic Partnerships, New Deal for Lone Parents, the Government's Crime Reduction Strategy, Health Action Zones and others often require piloting in a few areas before being implemented generally. Pilot areas need to be selected carefully to allow for proper monitoring and assessment. Small area statistics will support the systematic selection of areas against clear criteria, and also support the proper monitoring of a scheme's impact. More generally, all policies – including the mainstream ones such as health which are not normally seen as "area-based" - need to be monitored and many have quantified targets attached. Small area statistics not only provide the basic data for this monitoring but also allow more precise focusing of targets. Where schemes are focused on geographical areas of greatest need, small area statistics allow the systematic and transparent selection of the target areas.

- Making better use of existing information - administrative records held by government departments, local area offices, local government, National Health Service (NHS) databases etc will be drawn together and analysed on a consistent geographic basis. Where considerations of data protection permit, value will be added as data from separate sources are presented for the same geographical areas. For example, it will be possible to see if a small area identified by the Census as having a high concentration of overcrowded households also has children with relatively low educational achievement (Department of Education and Employment data), poor

health (NHS data) and high unemployment (ONS data). Thus, one of the primary benefits of this investment will be much better use of existing administrative data.

- Allocating budgets -The improved statistical base will help with the preparation and assessment of bids under programmes such as Single Regeneration Budget and New Deal for Communities. More accurate identification of priority areas for expenditure, or for policy intervention, should mean that resources can be allocated more efficiently.

- Analysis - the improved statistics will help policy-makers to examine all sorts of small area economic and social characteristics. For example clustering of certain types of economic activity and their interactions with the surrounding area would be amenable to analysis using these tools, as would the impact of major infrastructure projects and inward investment. Using geographical and statistical analysis tools, it will be possible to contribute to studies on the effects of, say, living within certain distances of radio transmission towers or motorways on people's health, or on the incidence of particular medical conditions. Whilst the public access service will not allow the analysis of data about individual people, the geo-referencing of records will support the work of bona fide researchers who are allowed access to source records on an exceptional basis.

- Improved operational benefits to organisations providing services, eg ability of social services departments to plan better location of services such as day care centres, and better routes for services such as meals on wheels.

- Wider benefits of improvement to quality and range of local data – the project will lead to improvement of accuracy and greater geographical breakdown of key higher-level indicators, such as regional and sub-regional GDP, consumption expenditure and government accounts.

## IV. THE UK APPROACH TO MEETING THE NEED FOR SMALL AREA STATISTCS

**Organisation of work programme**

18. The Office for National Statistics will be responsible for the development and management of the Neighbourhood Statistics Service and the other recommendations that will help to deliver better information. The Social Exclusion Unit and Neighbourhood Renewal Unit are leading policy customers for better information for Neighbourhood Renewal purposes, but there will also be many other users, ranging from central and local government to local community groups, businesses and individual citizens. Key partners are Ordnance Survey (the UK's mapping agency), who will help to develop and implement the geographic referencing systems described further below, and the Local Government Association (LGA), who will co-ordinate the role of local authorities as both users and suppliers of Neighbourhood Statistics.

19. The project is also dependent on close co-operation with many other organisations, particularly other central government departments and local authorities as suppliers of data. Among central government departments, the Department of Social Security, Home Office, Department of Health, Department for Education and Employment and the Department of Environment, Transport and the Regions all recognise that they have key roles in providing data to the Neighbourhood Statistics Service. These departments also have policy responsibilities in terms of dealing with social exclusion, and will therefore be users of the information.

## Description of project

20. The Neighbourhood Statistics Service will bring together many different mechanisms for producing statistics in order to provide as complete a picture as possible of every local area. In particular, the following strategies will be developed in parallel, some of which are described in more detail in the following sections:

- Make maximum use of administrative information that is currently held, unused, in public sector systems
- Geographically reference the data held in administrative systems so that it can be aggregated to any geographic boundaries
- Develop the technical tools and systems to enable public sector bodies to do the above, at nil or low cost to them.
- Develop methods of synthetic small area estimation to compile statistics for those themes for which administrative data do not exist, and large surveys are not possible
- Small area population estimates will be produced to provide denominators for other statistics, as well as being useful in their own right
- Disclosure control protocols will be developed to ensure that no information about individuals can be seen or deduced from the various databases that will be brought together
- Analytical facilities will assist users in handling and using the large amounts of data that will be made available
- The results of the 2001 Census will be integrated into the Service, and as a result of the above strategies, many of the Census-type variables will be updated thereafter so that users do not have to wait another ten years for the next Census.
- Advice on methodology and questionnaire design - where data are collected locally, or local surveys are carried out, advise on standard questions and methodologies will be provided. This will promote consistency and therefore comparability between areas, and improve efficiency by giving those carrying out local surveys the means to avoid 'reinventing wheels'.
- Support for users, helping them to get the maximum benefit from the Service. This will entail working with the Local Government Association, and enable facilities such as a user group, helpline, newsletters and clear on-line information about what is available and how to use it. Feedback will be sought on usefulness of the data, how they are presented, the service offered, and how Neighbourhood Statistics should develop.

- Best practice will be shared - guidance on good practice in sharing data and matching records will be developed and disseminated, to overcome the confusion and uncertainty in this area identified by PAT18.
- Free dissemination and access will primarily be via the Internet, through user friendly map-based interfaces, and additional facilities for ad-hoc analyses may be made available.

**Geographic Referencing System and Administrative Data**

21. It is central to the Neighbourhood Statistics approach that existing administrative records held in the computers of hundreds of organisations across the public sector will be processed, at source, to produce geographically precise information in a new and innovative way. This will be a technical, but highly significant, step towards joining up and getting the most from public sector information systems. It involves using new and innovative software and geographic (grid) references needed to enable the creation and integration of accurate statistics for small areas. This is not currently possible because of the many different and imprecise methods used to add a location reference to existing data.

22. This approach avoids the slow and expensive business of completely new data collection. The key to making this work is that the technical software and improved geographic referencing datasets required (collectively referred to as the geographic referencing framework) will be developed centrally. These will then be made available freely (together with guidance and support for implementation) to the organisations which hold the records so that they can create, and 'own', the small area statistics themselves, without having to pass potentially confidential records to ONS. These organisations include a wide range from major government departments, such as DSS, which hold centralised national record systems, down to, say, a single doctor's surgery, which has a prescriptions database. It will be possible to use the same technical solution across the board. Although there will be no obligation placed on the organisations to co-operate, the proposals are being shaped so that there are effective incentives, namely:

- Free use of a powerful software package that will contain elements that are currently only obtainable at high cost and which are not user-friendly.
- The software will facilitate the production of statistics largely automatically, keeping the work and costs to organisations to a minimum.
- The ability to link geographic codes to administrative records will allow organisations to fully exploit commercial Geographic Information Systems to access their own administrative data in new ways, enhancing the usefulness of their data to themselves, and thereby improving productivity.
- Where appropriate, central government departments, the Local Government Association and others will provide guidance to ensure that the use of the software is as comprehensive and consistent as possible.
- Local organisations that take up the tools can expect to get early rewards for doing so in terms of information for their area – there will not be a dependence on complete national coverage.

23. This approach also provides a solution to the problem of boundary changes. It is important to be able to measure the change in an area's position accurately over time with consistent data, but such change can often be masked by changes to the boundaries of an area that continues to bear the same name. Geographically referencing and holding the raw data will enable the data owners to reconfigure their old data to new boundaries when such changes occur.

## Small area estimation methods and tools

24. Some key statistics cannot readily be produced for small geographical areas because no suitable administrative sources exist. An important example is household income, for which ONS is committed to producing small-area estimates, following the decision not to include an income question in the 2001 Census. Whilst estimates are available at the national and regional level, these cannot in practice be extended down to small areas – the survey costs would be too great if the sample was to be large enough to provide robust estimates for every small area. This type of approach needs to be extended to a wide range of subject areas, ranging from health and education to economic variables.

25. ONS, supported by academic experts, will therefore develop methods for producing small-area estimates from national survey data using advanced statistical techniques, and drawing heavily on Census data, to give the best possible information for each small area consistent with higher level aggregates. One special case of this is the need to have population estimates for small areas for years other than the Census years. This has long been a demand of local government, and the need for denominators to put Neighbourhood Statistics into context requires the development of these now to be given high priority.

26. The benefits of these techniques are to be seen in the way the new estimates will complete the local picture where administrative data leaves gaps. Much of the work over this period will relate to development of formal methods and software, supported by the academic community and international partnerships. The developmental work in the first two or three years will lay the foundations for regular statistics to be produced in the future.

## Disclosure control methods and systems

27. Without protective measures being taken, the statistics contained within the Neighbourhood Statistics Service may, under certain circumstances, have the potential to disclose confidential information about people or households. It is essential that proper measures are taken to avoid this and that these measures are of a high technical standard – beyond criticism by academic commentators etc. ONS has established a programme of work related to that for the 2001 Census to ensure that this minimum requirement is met.

28. This work includes developing disclosure control methods and systems that can be used by public sector bodies supplying data, assisted by specialist ONS staff, to protect data supplied for Neighbourhood Statistics. These methods might also be adapted by supplier departments for other datasets collected for purposes other than Neighbourhood Statistics. This will have the benefit of allowing more small area statistics to be put into the public

domain, and so contribute to the evidence base, without risk of breaching the obligation to protect confidentiality.  An example of such use is for local agencies to share data with each other within the "health observatories" being established in many parts of the country – data that may only be available in their area and of importance to them, but not necessarily available or required on a national basis. The tools provided would be part of the harmonised methods that ONS will take the lead in promoting nationally.

29. One particular aspect of the disclosure protection policy being developed for the Service is to agree on a small geographic building block, which will contain information that has been treated to prevent disclosure. These areas are likely to be the Census Output Areas (about 200,000 in total) that will be developed for the 2001 Census, and will contain about 100 to 125 households each. Users will then be given the facilities to produce aggregates as groups of these building blocks.

**Development phases**

30. The service will be built up over several years. The key phases are planned to be:

- **Launch phase** - February 2001 - an initial database from existing sources, mainly for England, providing data down to ward level with some analytical tools.  This phase is accompanied by a major drive to explain and promote the service.
- **Incremental phase**  - through 2001 and into 2002 - additional datasets added from existing sources over a period of months.
- **Enhancements phase** - from 2002 - still mainly at ward level but with a wide range of new estimates (building on small area estimation techniques) and improved analytical tools.
- **GIS implementation phase** - in 2002 - a geographic information system will be incorporated and the first point-referenced data (location of services and social/physical infrastructure) added.
- **Census launch phase** - in 2003 - a large amount of new Census data, and some other statistics, will be added at the Census Output Area level (20 times more detailed than wards).
- **Full service phase** - from 2003/2004 - further datasets added at the Census geography, including specialised local ones, and the point-referenced data extended as far as is consistent with confidentiality.  The service will be developed further in time to allow users the maximum flexibility in the output geography.

31. The first phase of the Service – the ward level database – has been launched and is now being used extensively (website address www.statistics.gov.uk/neighbourhood). In parallel, work is about to start on the longer-term phases to develop the more comprehensive and more flexible systems, which will also dovetail with the arrival of the Census results in 2003.

**Economic Benefits**

32. The benefits of small area data, underpinned by a system of geo-referencing and the other components of this project are expected to accrue across a range of policies and activities,

and quite significantly in some cases. Whilst the impact in some particular areas may be relatively small, the overall impact should be large and much higher than the costs. The availability of Neighbourhood Statistics will improve the efficiency of significant elements of government spending – either by spending the same budget and increasing the positive outcomes, or having the same outcomes and spending less money – or a mixture of the two.

33. An indication of the scale of benefits that might accrue from the project can be estimated by looking at some of the spending programmes where local data might be useful and then seeing what happens if a marginal efficiency improvement is achieved in that overall spend. In England, such programmes account for over £2 billion per year. An economic appraisal has shown that efficiency improvements of less than 0.5 per cent per year (cumulatively) of the expenditure on such a selection of area-based programmes will lead to the full costs of Neighbourhood Statistics being recovered in around three years.

## V.    SUMMARY

34. This paper has described the increasing pressures for small area statistics, and the work programme that has just begun in the UK to meet these demands. The UK developments have shown how the importance of local statistics is being recognised by policy users. As a result, resources have been justified and provided to develop better information at the local level. An incremental approach has been adopted to delivering the full vision, making available some "quick wins" using the most readily available information, in parallel with starting work on projects which will deliver a more flexible and wide ranging service over the next few years.

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