



Comparing Internal Migration between Countries: Who Collects What?

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Abstract

This paper derives from a program of research which aims to develop a robust framework for cross-national comparisons of internal migration. Stage one examined the obstacles to such comparisons and made proposals for a battery of 15 migration indicators covering four broad dimensions of population mobility which were then tested using British and Australian data. Wider implementation requires assembly of databases for countries around the world. Stage two takes the first steps towards this goal by establishing a worldwide inventory of contemporary practice with respect to collection of internal migration data, based on published sources and a comprehensive survey of national statistical agencies. Information collected includes the source and type of data, migration intervals and zonal system. This paper summarises the conclusions from Stage 1, reports results from the Stage 2 inventory and sets out proposals for a collaborative network to implement the cross-national indicators worldwide.

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Contents

<i>Abstract</i>	ii
<i>List of Tables</i>	iv
<i>List of Figures</i>	iv
Introduction	5
Comparative Studies of Migration	6
Impediments to Cross-National Comparison	8
Towards a Global Inventory of Internal Migration Data	10
Internal Migration Data at a Global Scale: Who Collects What?	13
Scope and Completeness of the Inventory	13
Types of Data Collected	15
Multiple Measures	17
Other Dimensions of Census Data on Migration	17
Future Steps	18
Literature cited	21
Appendix A	25
Appendix B	27

List of Tables

Table 1	Proposed measures for cross-national comparison of internal migration
Table 2	Principal data items collected in the global migration data inventory
Table 3	Coverage of internal migration database by continent (number of countries)
Table 4	Countries collecting internal migration data by continent and source
Table 5	Census year for countries collecting internal migration by continent
Table 6	Countries collecting internal migration at the Census by continent and data type
Table 7	Countries collecting transition data at the Census by continent and data type
Table 8	Countries collecting duration of residence data at the Census by continent

List of Figures

Figure 1	Countries collecting multiple types of data at the Census by data type
Figure 2	Countries collecting transition data at the Census by transition interval
Figure 3	Facsimile of University of Queensland Internal Migration Inventory Query Page

Introduction

This paper reports results from a program of research which aims to facilitate cross-national comparisons of internal migration, the ultimate goal being to develop a robust set of measures that can be used by researchers and adopted by national statistical agencies. The stimulus to this work derives from the fact that, compared with fertility and mortality, surprisingly little attention has been given to understanding the way internal migration varies between nations. This is not to suggest that cross-national comparisons have never been made: a large and valuable literature can be found. However, comparative indicators are conspicuous by their absence from international statistical collections, such as the UN Demographic Yearbook, and there exists no comprehensive 'league table' of mobility akin to those ranking countries according to rates of birth and death. This lack of development can be traced partly to the multifaceted nature of migration and the absence of internationally agreed measures but it also reflects a lacuna of information on what migration data are collected and their availability to the research community.

The first stage of a project to address these issues, undertaken as a joint British-Australian study, aimed to identify the obstacles to rigorous cross-national comparisons and review the strengths and limitations of potential comparative measures. This culminated in proposals for a battery of 15 migration indicators designed to capture the diversity of migration experience (Rees *et al.*, 2000a; Bell *et al.*, 2002). Implementation of these measures calls for wide-ranging debate and refinement by the international research community, a key component of which will be comprehensive testing and empirical evaluation. An essential pre-requisite is assembly of the necessary migration data for countries around the world. The second stage of the project is designed to establish the foundation for this work through an inventory of internal migration data collections that assess the scope of contemporary international practice. It is the first results from that work which form the principal focus of the current paper.

The next section provides a concise summary of prior work involving cross-national comparisons of migration, and sets out the measures proposed in Stage 1 of the project. This is followed in section three by discussion of the way in which differences in definition, measurement and data collection may impose obstacles to implementation. Section four builds on these findings to establish parameters for a global inventory of internal migration data collections and describes the multiple elements of the data collection strategy. The results are set out in section five, revealing substantial diversity in data collection practice. Section six examines the implications of these differences for the generation of comparable indicators and proposes a strategy for further progress.

Comparative Studies of Migration

Previous interest in cross national studies of migration has taken a number of forms. Several collections can be found comprising case studies of various countries organised around a particular theme. A prominent example is the 'Handbook' assembled by Nam *et al.* (1990), which methodically described the sources of migration data, patterns of movement, selectivity, causes and consequences of migration in 21 countries dispersed widely around the world. More recently Rees and Kupiszewski (1999a) have completed a systematic analysis of internal migration in 28 countries of Europe (see also Rees *et al.* 1996). As well as being more spatially focused, the European study takes the additional step of formally contrasting the types of migration data available across the range of countries studied (Rees and Kupiszewski, 1999b). Other collections have compared particular aspects of internal migration, the most obvious example being that concerned with counter-urbanization (e.g. Champion, 1989).

Complementing these multi-country studies is a growing body of bilateral comparisons, often exploiting uncommon similarities between particular country datasets to investigate specific aspects of migration behaviour. Examples here are the work of Stillwell *et al.* (2000) on migration effectiveness in Australia and Britain, Newbold and Bell (2001) on return migration in Canada and Australia using fixed interval data, and Holdsworth (2000) examining the significance of cultural norms in the dynamics of leaving home in Britain and Spain.

A separate body of literature can be identified which has focused more directly on establishing how countries differ according to particular measures of mobility. One pioneering line of work here is due to Long (1991) who published what appears to be the first international 'league table' comparing countries with respect to mobility. Drawing on data from the 1980s round of Censuses, Long (1991) clearly demonstrated the higher levels of mobility that characterise the four new world countries, and the relatively low mobility prevalent in European countries. Long (1991) analysed crude migration intensities and focused on explaining the observed differences. Rogers and Castro (1981), on the other hand, examined the age structure of migration, showing that behind these variations there is remarkable similarity between countries in the shape of the migration age schedule, irrespective of aggregate mobility levels. Attempts have also been made to compare countries with regard to migration distance. Long *et al.* (1988) reported results based on simple comparison of median migration distance while Courgeau (1973a) proposed a more complex

approach using regression coefficients derived by relating migration intensity to number of regions at a range of spatial scales.

Building on this work in the context of a comparative analysis of migration in Britain and Australia, Bell *et al.* (2002) identified four dimensions of population mobility, each of which, it was argued, provided a particular perspective on the dynamics of population movement. These distinguished the two facets of migration recognised above, namely migration intensity and migration distance, but added a further two aspects – migration connectivity and migration impacts – that have attracted increasing attention among within-country studies but are less commonly found in cross national comparisons. Connectivity, also variously termed *spatial concentration*, *spatial inequality* or *spatial focusing* (Plane and Mulligan 1997, Rogers and Raymer 1998), refers to the way migration flows act to link together zones in a spatial system. The strength and pattern of these linkages help reveal the evolution of settlement patterns (Rogers and Raymer 1998) and can provide valuable insights into the role and function of individual regions within the settlement system (Bell and Maher, 1995). The migration impacts dimension aims to capture the effects exerted by migration in transforming the pattern of human settlement through redistribution of population across the spatial system.

If cross-national comparisons are to be made, it was argued, consideration should be given to all four of the above dimensions of mobility. To these ends, Bell *et al.* (2002) proposed a battery of 15 indicators of migration that might be used to make such comparisons. Space precludes a detailed exposition but Table 1 provides a brief description of each and summary equations are set out in Appendix A. Six indicators were identified under migration intensity, four of which aim to measure the overall amount of mobility in the system, with varying degrees of analytical sophistication, while the remaining two capture key facets of the migration age profile. For migration distance, three indicators were included, the median distance moved, the distance decay parameter from a spatial interaction model, and Courgeau's K , described earlier. Another four measures were identified to assess connectivity. The simplest of these are the Index of Connectivity, which captures just the proportion of non-zero flows, and the Index of Inequality which compares an observed matrix of flows with a hypothetical distribution. More complex alternatives are the Coefficient of Variation proposed by Rogers and Raymer (1998), and a weighted version of the Gini Index suggested by Plane and Mulligan (1987). Bell *et al.* (2002) preferred the last of these, partly because it has definable bounds, but it is computationally very intensive. The last group consists of two measures designed to capture the impact of migration. The first is a system-wide version of the familiar Migration Effectiveness Ratio which indicates the overall efficiency of

migration as a mechanism for redistribution. The second is a system-wide version of the net migration rate that signifies the impact of this redistribution on the pattern of human settlement

Impediments to Cross-National Comparison

Although the measures set out in Table 1 can be clearly specified, implementation is not always straightforward. For example, Rees *et al.* (2000a) have shown how computation of the GMR is highly sensitive to the stopping age used for its calculation. At a more general level, Bell *et al.* (2002) identified a series of issues in regard to the definition, measurement and collection of data which may impose obstacles for cross-national comparison of migration. These derive from:

- *The types of data that are collected.* Migration can be measured in a number of ways with the two most common forms of data being *events* and *transitions*. The former are normally associated with population registers which record individual moves while the latter generally derive from Censuses which compare place of residence at two discrete points in time. Because one source counts *migrations* while the other counts *migrants*, data from these two sources are not directly comparable (Boden *et al.* 1992) either in aggregate or in terms of age-time plans (Bell and Rees forthcoming). Other countries approach the problem in quite different ways, collecting data such as frequency of moves in a defined interval, or duration of residence (Bell 1996).
- *The intervals over which migration is measured.* Another set of difficulties arise when migration is measured as a transition over intervals of differing length. For instance some countries measure migration over a one year interval while others collect data for five years. Because transition data fail to capture multiple moves, the recorded count increases as a non-linear function of time. Despite sustained attention to the issue (commonly termed the one year-five year problem), no algebraic solution has been found by which to translate from one reference period to another (Courgeau 1973b; Kitsul and Philipov 1981; Long and Boertlein 1990; Rogerson 1990a; Schmertmann 1999). As will be revealed below, this is problematic because countries vary widely in the transition intervals over which migration is measured. Variations in interval length pose particular difficulties for age-related measures.
- *Issues of temporal comparability.* If reliable comparisons are to be made, migration data should refer to the same intervals of time. The UN mandates Censuses at the start of the decade but, in practice, countries differ in Census timing and frequency. Moreover, even coincident timing does not imply identical contexts since national economic cycles may not be in phase.

- *Population coverage and migrant definition.* Countries may also differ in the way particular groups are treated with respect to migration. For example, the British Census of 1981 recorded students at their home address whereas the 1986 Australian Census registered the college as the usual residence for this group. The net effect is to inflate the Australian data relative to their British counterparts. Similar problems may arise with other groups; for example the UK National Health Service Central Register excludes armed forces personnel, prisoners, etc. Censuses may also differ in key definitions. In Australia, a person's usual residence is the address where they have lived, or intend to live, for six months or more during the Census year. In Britain and New Zealand, on the other hand, no residence criteria are specified: usual address simply means the location at which the respondent normally lives (ABS 1991, Bell 2002).
- *The division of space and the measurement of distance.* Comparisons will inevitably be affected by differences in the geographic size and shape of nations, and by the pattern of human settlement. The measurement of distance for migration analysis itself poses a complex conundrum (Boyle and Flowerdew 1997, Rogerson 1990b). The most significant issues for cross-national comparison, however, relate to the number of units into which the territory is divided – the scale dimension of the Modifiable Areal Unit Problem (MAUP), which plagues all geographical studies (Wrigley *et al.* 1996). Differences in the geography for which migration data are available will inevitably affect the results obtained, particularly for measures such as connectivity and migration impact, but in ways that are unpredictable. One solution is to compare migration processes and patterns at a range of spatial scales (eg Bell *et al.* 2002). Another approach is to develop a broadly comparable set of regions in each country based around some common, functional division of space (eg Blake *et al.* 2000, Stillwell *et al.* 2000). Ultimately the potential for such analysis will be dependant upon the data that are available for each country.
- *Data quality, processing and availability.* Under-enumeration is common to all population data sources but the problem is compounded for migration analysis because the most mobile groups are those most likely to be overlooked. The impact on comparative analysis will be exacerbated where countries adopt different approaches to data editing. In the 2001 British Census missing variables were imputed and whole new households created whereas the 1996 Australian Census missed 2% of the total population and left unedited the responses from a further 5% who failed to identify their usual residence in 1991 (Bell and Stratton 1998). In a very real sense cross-national comparisons will also be affected by the procedures used for coding of migration data, especially the geographic level to which current and previous place of residence are assigned. Interaction matrices are complex to

construct and the full flow matrix may not be available in machine readable form, even if the requisite data were collected (Rees and Kupiszewski 1999b).

These differences in the definition, measurement and processing of internal migration present formidable problems for comparative analysis. Even at the level of just two countries, substantial effort may be needed to harmonize key dimensions of the data to a point where reliable comparisons can be made (see eg Rees *et al.* 2000b; Blake *et al.* 2000; Bell and Rees 2000 and forthcoming). For multilateral comparisons, it is clear that an understanding of the nature, scope and limitations of the data in each country is an indispensable pre-requisite to informed analysis.

Towards a Global Inventory of Internal Migration Data

There appears to have been only one previous attempt to establish a global inventory of internal migration data collections. That endeavour derives from a 1972 proposal by the UN Statistical Commission, with a final report from the worldwide survey published in 1978 (United Nations 1978). For the student of migration, the report makes fascinating reading. While the original aim was to develop guidelines for collection of migration data, the Commission decided that ‘the need for, and possibilities of, international comparability were not as great in the case of internal migration statistics as in that of international migration statistics....and the desired statistics would necessarily vary significantly from one country to another’. After reviewing the provisional study results, the Commission firmed on this view, concluding that ‘although internal migration was an extremely important phenomenon for most countries...the wide diversity of national needs and practices made it difficult to formulate recommendations on migration statistics currently’ (United Nations 1978, iii). Despite these reservations, the Commission determined that a report summarising contemporary practise would provide useful background for national statistical agencies, supplementing the earlier guide to methods of estimating migration (United Nations 1970). The ensuing document identified 121 countries that collected migration data and reported on a range of features including the sources of migration information, the type of data collected, and the uses to which it was put. It also attempted to identify how migration was defined and establish the geography of the ‘migration defining regions’, but with less success.

The survey of migration data conducted by Rees and Kupiszewski (1996, 1999b) mentioned earlier was less ambitious in spatial coverage but somewhat more definitive with respect to the data collected. For the 28 European countries included, the study established not only the types of data available but also the temporal intervals over which migration was measured, the time span for

which the data were held and the statistical geography against which migration was recorded. One variable apparently excluded from the analysis was place of birth, so the study provides no information on the availability of lifetime migration data.

The UN and European studies offered valuable guidance as to the type of information which should be sought in a new, global inventory, but we also took into account the data needed to implement the comparative measures listed in Table 1. The initial study design divided the information required into four broad categories:

- the type of vehicle used to collect the migration data (Census, Register or Survey)
- the nature of the data sought (transitions, events, duration of residence, number of moves), and the way the data item was measured (eg transition interval)
- the zonal system against which migration was recorded (number of zones and nomenclature), and
- the population characteristics available for migrants (age and sex only identified).

A complete list of data items collected is set out in Table 2. No attempt was made to elicit a formal definition of migration for each country (as in the UN study), nor did we attempt to assess the availability of flow matrices (as in the European study). The project did, however, build on the methodologies used by its predecessors.

Both the UN and European studies were based on questionnaire surveys of national statistical offices. Survey work formed part of the research strategy for this project too, but the inventory reported here also draws on other sources of information. Four main research tools were used:

- A comprehensive review of prior inventories and published papers
- Systematic mining of international statistical organisation websites
- A questionnaire survey of national statistics agencies, and
- Collection and analysis of individual country Census forms

There are numerous ways in which to define the number of countries in the world but for the purposes of this study it was decided to adopt the listing of United Nations member countries generating a total of 191 target nations (<http://www.un.org/members/index.html>)¹. A formal database structure was established to provide a framework for the inventory (Table 2). We then sought to populate the cells in the database from the above sources, with thorough cross-checking for consistency as additional data items came to hand. A logical first step was to draw on prior

¹ In fact our listing has two anomalies: it recognises Greenland as a separate entity but excludes East Timor which had not yet achieved member status at the time the project began.

work, such as the European project (Rees and Kupiszewski 1999b), other multinational collections (eg Nam *et al.* 1990) and individual country studies. The three volume set of national population Census handbooks, though now somewhat dated, provided valuable insights into the development of Census questions around the world, including those on migration (Domschke and Goyer 1986; Goyer and Domschke 1983; Goyer and Draaijer 1992). They also underlined the low priority accorded to migration issues in early Census-taking. Not until the 1980 round of Censuses was place of residence in a specified year recommended as a priority topic by the UN World Population Census Programs, although place of birth received this rating consistently from 1950 (Goyer and Draaijer 1992, 10). Two other published volumes of considerable value were the Statistical Yearbook of the Commonwealth of Independent States (CIS 2002) and Law's (1999) guide to administrative regions of countries around the world.

Printed publications were supplemented with electronic sources. Development of the internet has of course revolutionised access to information, and statistical organisations have been among those at the forefront in using this technology. Several directories to national statistical agency websites can be found (Appendix B) and while the scope of information available on these sites varies widely, many provide valuable guides to the demographic information that is available. As often is the case, however, internal migration tends to be less comprehensively treated than other demographic processes. Few countries formally report migration statistics on the web and fewer still describe in any detail the type of data collected. Statistical agency web sites do, however, often document their geographical classifications which aids in understanding of the flow data likely to be available, and some (though less than might be expected) also provide on-line access to their Census forms.

The same want of attention to internal migration is also apparent in the growing number of international agency websites providing demographic data, but several organisations did provide invaluable leads for this study (Appendix B). Among the most useful were the UN Statistics Division listing of national Census dates, the US Census Bureau links to statistical agency websites and the University of Minnesota IPUMS websites which provided a first port of call for copies of individual Census forms. Of the international sites, the surprise package was the International Monetary Fund General Data Dissemination Site which provided useful snippets of information about the population data in numerous countries. In terms of statistical organisations, the award must go to the National Statistical Office of Mongolia, not only for the shortest url (<http://nso.mn>), but also for being the only agency to provide on its website sufficient information to complete all of the data items required in the database.

While secondary sources can provide valuable information, data accuracy is ultimately best served by first hand contact with individual countries. To these ends, a tightly structured questionnaire was designed around the information required and in July 2002 this was used in a survey of all 191 target nations. To streamline the process, the invitation to participate was forwarded to national statistical agencies via email, with an embedded hyperlink to a password-protected, online survey form. Once submitted, data from the form were automatically transferred to a slave database on a secure server, then manually validated against existing information before integration with the master database. Forty-one target countries had no identifiable email address so the survey was converted to a standard recording schedule and forwarded by regular mail.

The overall response rate to the survey (15%) was modest but, fortuitously, it tended to be the smaller nations that are least integrated into the global economic and statistical system, for which the requisite data were typically lacking in secondary sources, that were most likely to respond. Following the survey cut-off, we initiated one-to-one communications with those agencies for which information was still lacking and pursued the less demanding strategy of requesting copies of their latest Census schedules. So successful was this approach that it was subsequently extended to other national offices and regional statistical organisations. The result is an extensive collection of Census forms covering 117 countries of the world and written in a bewildering array of languages. The project has proved a useful source of employment for international students at the University of Queensland in translating Census forms into English. While the forms do not uncover important aspects of coverage, coding and processing of the data, they do reveal the nature of the migration-related questions that were asked and the level of detail that was sought. This goes some way, at least, to establishing the dimensions of contemporary global data collection practice.

Internal Migration Data at a Global Scale: Who Collects What?

Scope and Completeness of the Inventory

Of the 191 countries in the study, complete or partial information has been assembled for 158 (83%). Coverage is complete for Oceania and North America, and data have been assembled for all but four European countries and for all but five in Latin America and the Caribbean (Table 3). Most of these omissions are for countries that are geographically very small². Information for Africa and

² In Europe we lack data for Moldova, Bosnia-Herzegovina, San Marino and Liechtenstein. In Latin America the knowledge gaps are for Antigua-Barbuda, Bahamas, Saint Kitts and Nevis, Saint Vincent and the Grenadines, and Guyana.

Asia is less complete, with 12 countries in each continent missing any useable data. In Africa, the principal voids are in the Middle and Northern parts of the continent³ while in Asia the biggest gap is in the Middle-East, with more isolated data deficiencies dotted across South, Southeast and East Asia⁴. Many of the countries for which it has not been possible to obtain data are either geographically small (and may not collect internal migration data at all), are currently disrupted by war or civil strife, or have politically repressive regimes that may collect but not release data on population movements.

All but four of the 158 countries for which we have data collected internal migration statistics in some form. The four countries which do not appear to collect such data are Malawi, Singapore, Andorra and Nauru. The remaining 154 nations employ a mix of data sources but the most common was the Census, with 138 countries (90%) drawing data from this source. Thirty-five countries (23%) utilised data from some form of population register while 22 (14%) employed a survey (Table 4). Thirty-six countries (23%) drew on more than one information source. Table 4 reveals considerable geographic variation in the types of data sources used. Population registers are common across Europe, as Rees and Kupiszewski (1999b) have shown, almost rivalling the Census across the 38 countries for which we have data⁵. Registers also feature strongly in Asia, with just under one quarter (8) of the 34 nations drawing migration data from some form of registration system⁶. Sources of this type appear to be much less common in other parts of the World, although at least some forms of registration data appear to be available in parts of North and Latin America. The project identified comparatively few regular, large scale surveys of migration but there were scattered occurrences, particularly in Africa and Asia. The 13 countries in Oceania stand out for their apparently exclusive reliance on Censuses for data on population movements.

It is important to stress that this picture reflects the information assembled in the database and may not capture the full scope of data collections, even across the 158 countries for which we have some data. In the absence of first-hand responses from informed sources in each individual country, there is a strong likelihood that some population registers and surveys have been overlooked. We have deliberately omitted occasional surveys, such as the 80 odd Demographic and Health Surveys

³ African countries for which data are missing are Burundi, Somalia, Tanzania, Angola, Congo, Democratic Republic of Congo, Equatorial Guinea, Sao Tome and Principe, Algeria, Libya, Tunisia, Guinea-Bissau.

⁴ In Asia data are missing for the Democratic People's Republic of Korea, Bhutan, Turkmenistan, Lao People's Democratic Republic, Myanmar, Cyprus, Iraq, Kuwait, Lebanon, Qatar, Saudi Arabia, United Arab Emirates.

⁵ Laihonon (1999, 2000) provides an excellent overview of the development of administrative systems as a replacement for the traditional Census in countries of Western and Northern Europe.

⁶ The eight are China, Republic of Korea, Japan, Kazakhstan, Nepal, Malaysia, Armenia, Israel, Mongolia

conducted widely around the world over the past two decades (Schmertmann 1999), but other domestic instruments which might have been included, are hard to track down. Coverage of Censuses is probably more complete since international agencies more thoroughly document these collections. The balance of this analysis therefore focuses primarily on the types of data sought in those 138 countries which collect migration data via a Census. In proceeding, however, it is useful also to note that 20 countries have been identified in which Censuses are conducted but which do not appear to collect data on migration⁷.

Notwithstanding the best endeavours of the UN to encourage regular Census-taking and common timing among member nations, there is substantial variation between countries in contemporary practice. While some countries undertake Censuses on a systematic five or ten yearly basis, others are much more sporadic and, in some cases, the latest Census is now quite dated. For the purposes of this project we have sought to assemble the data from the latest Census in each country, irrespective of its timing. Table 5 reports the details. For almost 90% of countries the data are drawn from a Census taken after 1990. Just 17 datasets come from Censuses taken prior to this date and only 8 of these predate 1987. Most of the older Censuses are from Asian or African countries, the oldest observation being the Afghan Census of 1979.

Types of Data Collected

Three main forms of migration data are commonly collected in Population Censuses:

- migration transitions, derived by comparing place of residence at the Census with place of residence at some previous date
- duration of residence, and
- number of moves that occurred within a defined interval.

Table 6 sets out the frequency with which each of these types appear in the 138 country dataset. Transitions may be recorded for any interval but analysts often distinguish ‘place of birth’ so these data, which generate statistics on lifetime migration, are identified separately in the table. The results indicate that 105 nations collect data on place of birth (within the country) and 120 collect place of residence at some other prior date. There is also a large number of countries (75) that ask for information on duration of residence, but only one was identified that sought data on the number of moves made over a defined interval (Japan). Duration of residence data were widely sought in

⁷ The twenty are: Andorra, Austria, Belgium, Denmark, Finland, Germany, Greenland, Iceland, Democratic People's Republic of Korea, Lebanon, Malawi, Myanmar, Nauru, Netherlands, Nigeria, Norway, San Marino, Singapore, Slovakia, Sweden.

Asia and Africa but less commonly elsewhere. Place of birth data featured strongly in Censuses across all continents but were least ubiquitous in Europe and Asia.

Although place of previous residence at some prior date appears to be the most common data type, Table 7 shows there was little commonality between countries in the choice of reference date. Among those countries collecting transition data (other than since birth), the most popular interval was five years (53 countries), with a further 26 countries specifying a one year interval. Another 33 countries did not to specify an interval at all, electing instead simply to capture the last transition, irrespective of when it occurred. Finally, there were 31 countries which employed some other length of interval. Common choices included 2, 7, 9, 10, 11 and 13 years, but a number of countries used less traditional points of reference. If our translation is correct, for example, the 1994 Census of Morocco asked for place of residence “during the second to last Eid Al-Adh’ha”, the Islamic Feast of Sacrifice which concludes the traditional Hajj, or Pilgrimage to Mecca. Since the 1994 Moroccan Census was held in September, and the Eid Al-Adh’ha normally falls in February, this suggests an interval of about 19 months. In a similar vein, the 1999 Census of the Solomon Islands asked respondents where they were living “before the 1997 National Election”, the 1983 Census of Djibouti sought information on place of residence “at the time of Independence”, while the 1997 Census of Mozambique requested data on where people were living “at the end of the war in 1992”. The 1995 Census of the Philippines stands alone in asking for an anticipated residence five years in the future.

Some interesting geographic variation is apparent in choice of transition intervals. One year intervals appear to be most common in Europe (principally parts of Southern and Eastern Europe plus the UK and Ireland), but also feature in a number of African and Asian countries, together with Australia and Canada. Five year intervals are more popular across Latin America, Asia and Oceania. It is in Africa and Asia that the practice of measuring transitions without a fixed interval appears to be most widespread. However, non-standard intervals appear in Censuses across all continents and, perhaps surprisingly, are especially prominent in Europe.

Although transition data are the most common form of migration data, collection of data on duration of residence is also very common (Table 8). Twenty-five of the 28 African countries collecting migration data at the Census sought information on duration of residence and the same was true of 25 of 30 Asian nations. Around two-fifths of countries in Europe, Latin America and Oceania did likewise. Countries differed, however, in the spatial framework against which duration was measured. In 20 of the 75 countries, the question sought to establish duration of residence in

the dwelling currently occupied. In 45 other countries, however, it was length of residence in the same 'locality' that was requested, while the remaining ten Census forms appear to leave interpretation in the hands of the respondent. These differences are important because changes of residence clearly occur more often than shifts between localities. Moreover, given sufficiently detailed coding, duration of residence in the same dwelling can provide a surrogate measure of numbers moving over the previous one year interval, thereby paralleling the single year interval transition statistics.

Multiple Measures

Many countries collect more than one type of migration data at the Census. The combination of place of birth with place of previous residence is most common (93 countries), and more than half of these countries also assemble data on residence duration. Figure 1 shows that other blends of data also occur and there were just 22 countries which confined their efforts to a single data type. Of these, 15 concentrated exclusively on place of previous residence, three (Cote d'Ivoire, Grenada and Ghana) collected data only on place of birth and four (Uzbekistan, South Africa, Bangladesh, and Malta) confined their attention to duration of residence. On the other hand there was just one country (Japan) that rated mobility so highly as to collect all four types of data at the Census.

Where countries collected transition data (other than place of birth), the overwhelming majority (100 of 120) focused on a single transition interval (Figure 2). Just three countries (Afghanistan, Oman, and Trinidad and Tobago) sought information on place of residence at three different points in the past, but another 17 assembled data for two intervals. Of these, nine countries asked both one year and five year transition questions (Australia, Botswana, Canada, Greece, Republic of Korea, Malta, Mozambique, Namibia and Samoa) while another eight combined either one year (Albania, Croatia, Hungary, Macedonia) or five year (Brazil, China, Maldives, Philippines) data with information for some other interval.

Other Dimensions of Census Data on Migration

Space precludes presentation of data on the geographies for which migration data were collected worldwide. Indeed, the assembly of reliable data on the zonal systems employed is a daunting task and reliable results cannot be derived from perusal of Census forms alone. Careful scrutiny of documentation describing Census coding procedures will be needed. cursory perusal of the

information assembled to date indicates that the scope of the zonal systems employed varies markedly between countries, ranging from more than 10,000 zones in the UK to less than 10 in Belarus, Tajikistan, Swaziland and Tuvalu. These differences in scale will almost certainly hinder rigorous cross-national comparisons. Perhaps the most significant issue for comparative analysis, however, is that relatively few Censuses appear to measure all residential moves. Unless a specific question is asked, transition data will usually capture only those moves that cross zonal boundaries, omitting any changes of address that occur within the zone of current residence. In the absence of alternative measures, this effectively precludes calculation of aggregate migration intensity.

A final feature of the data which merits brief mention is the inclusion of other questions of interest in Censuses of the various world's nations. Two groups of questions stand out. The first are the questions on reasons for moving which are found in the Censuses of eleven countries. Most countries asking this question pose it in a relatively general form, but others are more specific. For example, the 1999 Solomon Islands Census asked people away from home 'Did you flee because of ethnic tension?'. Similarly the 2001 Census of Armenia and the 1999 Census of Kazakhstan both asked whether migration had been involuntary or forced. Another interesting group are the countries which endeavour to capture aspects of temporary migration. While many Censuses seek to identify people who are away from home, thirteen countries show more formal recognition of non-permanent mobility. This number includes a surprisingly large contingent of European nations (Albania, Croatia, Czech Republic, Italy, Lithuania, Macedonia and Switzerland) as well as African countries such as Morocco, Madagascar and Chad, the last of these being the only Census that formally seeks to distinguish between 'sedentary' and 'nomadic' populations.

Future Steps

Bell and Rees (forthcoming) argue that placing migration in a comparative framework offers a number of benefits: results for individual countries become more meaningful when viewed in an international context; commonalities and differences help to distinguish unusual findings from those that have more general applicability; cross-national contexts provide a more rigorous test-bed for migration theory; they also encourage greater analytical rigour in empirical research in individual country settings. As the material assembled in this paper makes clear, however, the goal of assembling an international league table of comparative migration indicators faces a daunting obstacle course. Countries differ widely in regard to the types of migration data they collect, the sources used, the way migration is measured, the time intervals employed, the periodicity of

collection, the scope of the questions, and the spatial frameworks involved. Harmonisation between countries on any of these dimensions is a major undertaking (Rees *et al.* 2000b).

In terms of the migration indicators proposed earlier, even computation of the simplest comparative measure, the crude migration intensity, is not readily accomplished for a majority of countries of the world. We have located single year Census-based transition data for less than 14% (26) of the 191 target countries. This number might be lifted to 52 by adding data from 26 other countries that maintain population registers, though many registers only capture inter-regional moves, and harmonisation of event and transition data would also be needed. Supplementing this with information from countries that collect data on duration of residence in the same dwelling could raise the total to 75 - but this is an optimistic estimate and still covers less than 40% of the list of nations. Focusing on a five year transition period using the same strategy might increase the success rate to as high as 101 countries, but exacerbates comparability problems and precludes computation of that most elegant of indicators, the migration expectancy (Rees *et al.* 2000). If broader comparisons are to be made, further progress will be needed in the quest for analytical solutions to the problem of comparing migration measured over intervals of differing lengths (Rogerson 1990, Schmertmann 1999).

For the other three dimensions of migration identified earlier, the issues of comparability are compounded by differences in migration space. It is here that the various aspects of the MAUP, discussed earlier, take on their greatest significance because of the huge diversity that exists in the size, shape, settlement pattern and administrative geography of the world's nations. Nevertheless, as recent work has shown, it is possible to make productive comparisons of migration dynamics between countries which differ radically in their physical and human geography, as well as in their migration data (Bell 2002, Rees *et al.* 2000, Stillwell *et al.* 2000, 2001).

This project has taken some first steps towards better understanding of the scope of internal migration data assembled by nations around the world. The overarching goal is to help advance migration analysis towards the same rigorous foundation already long established in the fields of fertility and mortality (Rees *et al.* 2000). One mechanism to assist in achieving this is to generate a shared resource. To these ends, we have already provided open access to key fields of the global database via an on-line query facility that returns a table for any selected nation. The requisite *url*, together with a facsimile of the output page, is illustrated in Figure 3.

If the nascent database is to reach its full potential, the most significant task now requiring attention is the validation of the current database contents, and its extension to those nations and data items which remain as yet undefined. This is a task best suited to statisticians and migration scholars who have first hand knowledge of the data in individual countries and regions. In keeping with the principle of a shared resource, we therefore propose to establish a network of interested colleagues around the world to share in the refinement, and analysis, of this unique database. We welcome you to participate.

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Appendix A

Computing the Measures of Migration

No.	Indicator Name	Equation/Source
<i>Measures of migration intensity</i>		
1	Crude Migration Intensity	$CMI = 100(M / P)$
2	Standardized Migration Intensity	$SMI = 100\{(\sum_x \sum_s m_{xs} P_{xs}) / (\sum_x \sum_s P_{xs})\}$
3	Gross Migraproduction Rate	$GMR = \sum_{xs} m_{xs}$
4	Migration Expectancy	$ME_x = \left[\sum_{y=x}^{y=z} m_y L_y \right] / l_x$
5	Peak Migration Intensity	Peak intensity on the age schedule
6	Age at Peak Intensity	Age at which the peak occurs
<i>Measures of migration distance</i>		
7	Median Distance Moved	50 th percentile
8	Distance Decay Parameter (<i>b</i>)	$M_{ij} = A_i B_j O_i D_j d_{ij}^{-b}$
9	Courgeau's <i>K</i> Index	$CMP = K \log n^2$
<i>Measures of migration connectivity</i>		
10	Index of Migration Connectivity	$I_{MC} = \frac{\sum_{i \neq j} \sum_{j \neq i} MC_{ij}}{n(n-1)}$
11	Index of Migration Inequality	$I_{MI} = \frac{\sum_{i \neq j} \sum_{j \neq i} M_{ij} - M_{ij} }{2}$
12	Migration Weighted Gini	$MWG^A = \frac{\left[\sum_i G_i^O \frac{\sum_j M_{ij}}{\sum_{ij} M_{ij}} + \sum_j G_j^I \frac{\sum_i M_{ij}}{\sum_{ij} M_{ij}} \right]}{2n}$
where		
$G_i^O = \frac{\sum_{j \neq i} \sum_{l \neq i, j} M_{ij} - M_{il} }{2(n-2) \sum_{j \neq i} M_{ij}}$		
and		

		$G_j^I = \frac{\sum_{i \neq j} \sum_{k \neq j, i} M_{ij} - M_{kj} }{2(n-2) \sum_{i \neq j} M_{ij}}$
13	Coefficient of Variation	$CV = \frac{\sqrt{\frac{\sum_i \sum_{j \neq i} (M_{ij} - \bar{M})^2}{n(n-1)}}}{\bar{M}}$
<i>Measures of migration impact</i>		
14	Migration Effectiveness Index	$MEI = 100 \left\{ \frac{\sum_i D_i - O_i }{\sum_i (D_i + O_i)} \right\}$
15	Aggregate Net Migration Rate	$ANMR = 100 \left(\frac{\sum_i D_i - O_i }{\sum_i P_i} \right)$

Source: modified after Bell *et al.* (2002)

Where:

- M internal migrants
- P population at risk
- x age
- s sex
- m migration intensity
- ME_x migration expectancy at exact age x
- M_y age-specific migration probability at age y
- L_y stationary population aged y
- l_x life table population at exact age x
- z last exact age to which the life table population survives.
- i, j, k, l zone subscripts
- M_{ij} migration flow between zone i and zone j
- O_i out-migrants from zone i
- D_j in-migrants to zone j
- A, B balancing factors
- d_{ij} distance between the i and j zones
- b regression coefficient – distance decay function
- K regression coefficient in Courgeau's K
- n number of regions
- MC_{ij} link between i and j (0 or 1)
- M_{ij}^h hypothetical flow between i and j
- G_i^O Gini index for region-specific out-migration
- G_j^I Gini index for region-specific out-migration

Appendix B

Key Websites Providing Leads to Metadata on Internal Migration

No	Centre and weblinks	Data Provided
	UN Statistics Division http://unstats.un.org/unsd/demographic/census/cendate/index.htm US Census Bureau http://www.census.gov/main/www/cendates	Census dates around the world
	US Census Bureau http://www.census.gov/main/www/stat_int.html Statistics Belgium http://www.statbel.fgov.be/census/links_en.htm CSDE University of Washington http://csde.washington.edu/library/intlcensus.shtml UCLA GSE&IS data on Latin America http://www.gseis.ucla.edu/faculty/chu/count-aja/country.htm Michigan State University Libraries for Eastern Europe http://www.lib.msu.edu/ticket/census.htm	Links to national central statistical agencies
	Minnesota Population Centre IPUMS project http://www.ipums.org/international/CensusForms/ http://www.hist.umn.edu/~rmccaa/ipumsla/celade.htm http://www.hist.umn.edu/~rmccaa/ipums-europe/enumeration_forms.shtml.htm	Online access to facsimiles of Census forms, some documentation and links to country websites
	Library of Congress Business Reference Services http://www.lcweb.loc.gov/rr/business/census/intlcensus.html#electronic NIDI http://www.nidi.nl/links/nidi6300.html University of Michigan http://www.lib.umich.edu/govdocs/stdemog.html#intl International Monetary Fund GDDS site http://dsbb.imf.org/Applications/web/gdds/gddshome/	General Population Links

Table 1: Proposed measures for cross-national comparison of internal migration

No.	Indicator Name	Shorthand	Description
<i>Measures of migration intensity</i>			
1	Crude Migration Intensity	CMI	Total moves over population at risk
2	Standardized Migration Intensity	SMI	Age-standardised CMI
3	Gross Migraproduction Rate	GMR	Sum of age-specific migration intensities
4	<i>Migration Expectancy</i>	<i>ME</i>	<i>Total moves over a hypothetical lifetime</i>
5	Peak Migration Intensity	PMI	Peak intensity on the age schedule
6	Age at Peak Intensity	API	Age at which the peak occurs
<i>Measures of migration distance</i>			
7	<i>Median Distance</i>	<i>MD</i>	<i>Distance moved at the 50th percentile</i>
8	Distance Decay Parameter	b	Exponent from a spatial interaction model
9	Courgeau's Index	K	Regression slope of CMIs at various scales
<i>Measures of migration connectivity</i>			
10	Index of Migration Connectivity	I _{MC}	Proportion of non-zero flows in a matrix
11	Index of Migration Inequality	I _{MI}	Departure from a hypothetical flow matrix
12	<i>Migration Weighted Gini</i>	<i>MWG</i>	<i>System-wide index of spatial concentration</i>
13	Coefficient of Variation	ACV	SD divided by the mean of a flow matrix
<i>Measures of migration impact</i>			
14	<i>Migration Effectiveness Index</i>	<i>MEI</i>	<i>Assymetry of inter-zonal migration flows</i>
15	<i>Aggregate Net Migration Rate</i>	<i>ANMR</i>	<i>Extent of redistribution through migration</i>

Source: Modified after Bell et al. (2002)

Table 2: Principal data items collected in the global migration data inventory

Panel A: General Data	
1 Country	5 Are internal migration data collected?
2 Region	6 Census is a source of data
3 Continent	7 Register is a source of data
4 Statistical Bureau	8 Survey is a source of data

Panel B: Population Census	Panel C: Population Survey	Panel D: Population Register
1 Date of last Census	1 Name of survey	1 Name of register
2 Date of next Census	2 Purpose of survey	2 Purpose of register
	3 Population coverage	3 Population coverage
	4 Frequency	4 How long operating
3 Place of birth within country	5 As for Census	
4 Place of usual residence at Census	6 As for Census	
5 Place of residence 1 year ago	7 As for Census	
6 Place of residence 5 years ago	8 As for Census	
7 Place of residence other interval	9 As for Census	
8 Specify other interval	10 As for Census	
9 Duration of residence (DoR)	11 As for Census	
10 DoR = same dwelling or locality	12 As for Census	
11 N of moves in last n years	13 As for Census	
12 Specify n	14 As for Census	
13 Name of smallest zone for which data collected	15 As for Census	5 As for Census
14 Number of such zones	16 As for Census	6 As for Census
15 Name of smallest zone for which data available	17 As for Census	7 As for Census
16 Number of such zones	18 As for Census	8 As for Census
17 Data available by age	19 As for Census	9 As for Census
18 Data available by sex	20 As for Census	10 As for Census
19 Comments	21 As for Census	11 As for Census

Source: University of Queensland Survey

Table 3: Coverage of internal migration database by continent (number of countries)

Continent	Information available	Information not yet available	Total
Africa	41	12	53
Asia	34	12	46
Europe	38	4	42
Latin America	28	5	33
North America	3	0	3
Oceania	14	0	14
TOTAL	158	33	191

Source: University of Queensland Survey, 2002

Table 4: Countries collecting internal migration data by continent and source

Continent	Total countries	Data sources			
		Census	Register	Survey	Multiple sources
Africa	40	38	0	7	6
Asia	33	33	8	7	12
Europe	37	26	22	3	12
America	31	28	5	5	6
Oceania	13	13	0	0	0
TOTAL	154	138	35	22	36

Source: University of Queensland Survey, 2002

Table 5: Census year for countries collecting internal migration by continent

Continent	Year of Census					Total countries
	pre 1986	1986-1990	1991-1995	1996-2000	post 2000	
Africa	6	5	10	12	5	38
Asia	2	2	6	16	7	33
Europe	0	1	1	4	20	26
Latin America	1	0	4	9	12	26
North America	0	0	0	1	1	2
Oceania	0	0	0	9	4	13
TOTAL	9	8	21	51	49	138

Source: University of Queensland Survey, 2002

Table 6: Countries collecting internal migration at the Census by continent and data type

Continent	Place of birth	Other transition	Duration of	Number of moves	Total countries
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	interval		residence		
Africa	33	28	25	0	38
Asia	19	30	25	1	33
Europe	19	26	11	0	26
Latin America	22	23	9	0	26
North America	2	2	0	0	2
Oceania	10	11	5	0	13
TOTAL	105	120	75	1	138

Source: University of Queensland Survey, 2002

Table 7 Countries collecting transition data at the Census by continent and data type

Continent	Space to which data refer				
	One year	Five years	Other defined date	No reference date	Total countries
Africa	7	6	9	9	28
Asia	3	16	7	12	30
Europe	12	4	11	5	26
Latin America	1	16	3	6	23
North America	1	2	0	0	2
Oceania	2	9	1	1	11
TOTAL	26	53	31	33	120

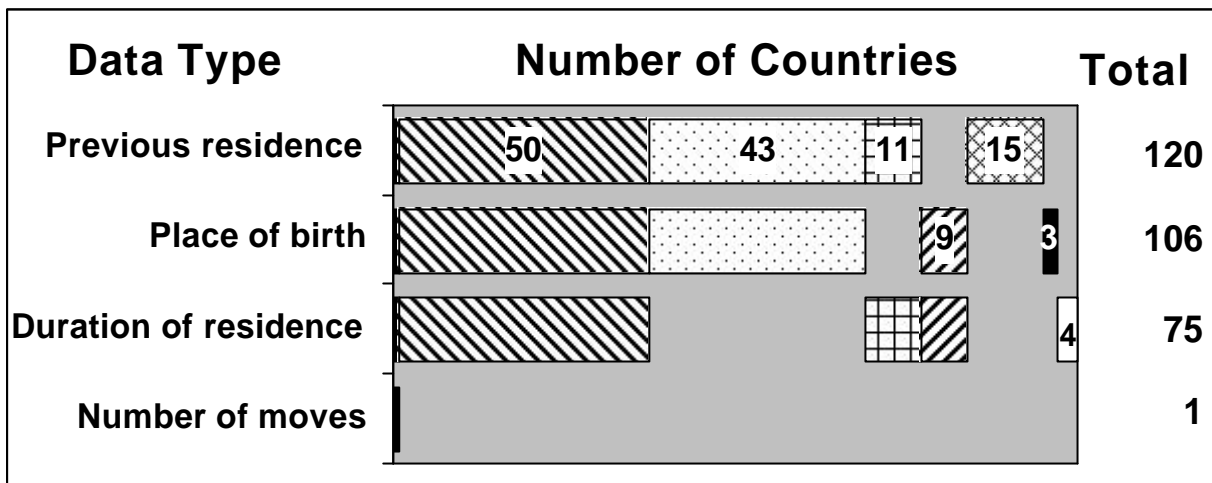
Source: University of Queensland Survey, 2002

Table 8 Countries collecting duration of residence data at the Census by continent

Continent	Space to which data refer			Total countries collecting duration data	Total countries collecting data via a Census
	Same dwelling	Same locality	Not specified		
Africa	6	14	5	25	28
Asia	6	14	5	25	30
Europe	6	5	0	11	26
Latin America	1	8	0	9	23
North America	0	0	0	0	2
Oceania	1	4	0	5	11
TOTAL	20	45	10	75	120

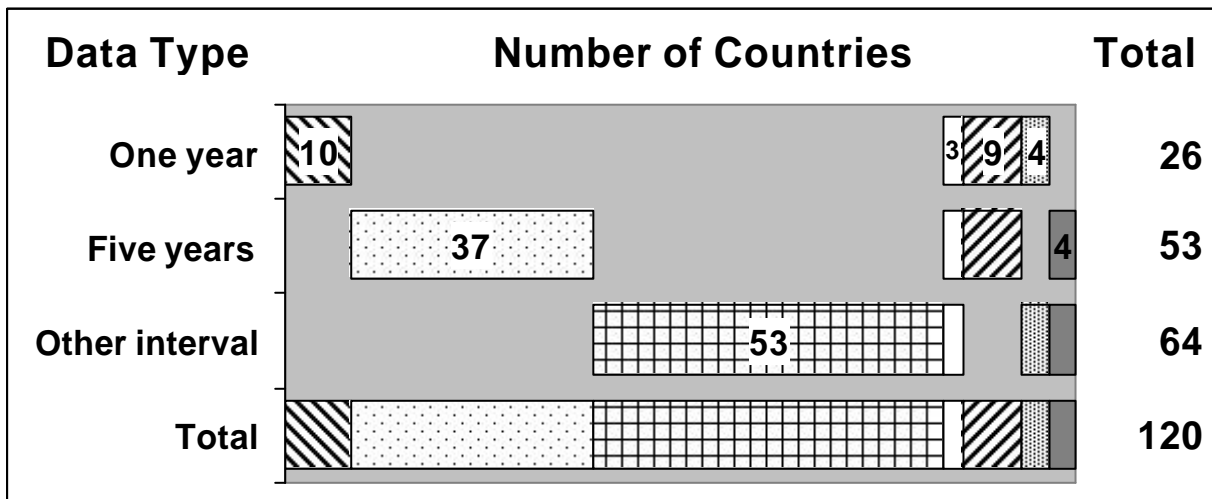
Source: University of Queensland Survey, 2002

Figure 1 Countries collecting multiple types of data at the Census by data type




Source: University of Queensland Survey, 2002


Figure 2 Countries collecting transition data at the Census by transition interval



Source: University of Queensland Survey, 2002

Figure 3 Facsimile of University of Queensland Internal Migration Inventory Query Page


Queensland Centre for Population Research
Survey of Internal Migration Data Collected around the World



Australia	
Is Internal Migration Data Collected?	Yes
Is a Census a source of internal migration data?	Yes
Is a Register a source of internal migration data?	No
Is a Survey a source of internal migration data?	No

Census	
Date of Last Population Census	06/08/2001
Date of Next Population Census	2006
Place of Usual Residence	Yes
1 Year Question	Yes
5 Year Question	Yes
Other Transition*	No
Duration of Residence	No
Number of Moves in 'n' Years	No
Place of Birth	No
Data Available by Sex	Yes
Data Available by Age	Yes
Comments	No Data

Other Transition refers to questions such as place of usual residence at time of last census etc. which can not be classified as 1 year or 5 year questions

Register	
Register Name	Not Applicable
Purpose of Register	Not Applicable
Length of Register Operation	Not Applicable
Characteristics Collected	Not Applicable
Data Available by Sex	Not Applicable
Data Available by Age	Not Applicable
Comments	Not Applicable

Survey	
Survey Name	Not Applicable
Purpose of Survey	Not Applicable
Survey Sample Size	Not Applicable
Place of Usual Residence	Not Applicable
1 Year Question	Not Applicable
5 Year Question	Not Applicable
Other Transition	Not Applicable
Duration of Residence	Not Applicable
Number of Moves in 'n' Years	Not Applicable
Place of Birth	Not Applicable
Data Available by Sex	Not Applicable
Data Available by Age	Not Applicable
Comments	Not Applicable

See: <http://www.geosp.uq.edu.au/qcpr/Homepage/imresults.htm>