

Place as a focal point for census data

By Gunnar Thorvaldsen
Norwegian Historical Data Centre
University of Tromsø

It has always seemed to me that
a close circumspection of space is absolutely
necessary to the effect of isolated incident:
it has the effect of a frame to a picture

Edgar Allan Poe, The Poems of Edgar Allan Poe (1882)

The aim of this paper is to show the major ways in which geographic location is a central issue when digitizing and analyzing census data. Because population size constitutes the denominator in most demographic formulae, a keen sense of space in accordance with the numerator data is crucial. When census data is available, it is normally possible to minimize the problem of mis-specifying the at-risk population (the so-called censoring error) on the condition that the geographic region studied is defined in a precise way. Also, selection bias due to the exclusion of migrants can be reduced by identifying them at their new location in census data (Ruggles 1999).

From a theoretical point of view, administrative boundaries can be viewed as a hierarchic division of an area into smaller units. The divisions are made through a combination of political, administrative and juridical decisions. Previously, the decision-makers were mostly interested in whether the boundaries followed the physical division of the countryside along rivers, mountain ranges etc. Eventually, it became more common to use a greater range of functional criteria for the creation of boundaries: communications and other infrastructure, social and cultural divisions. At the same time, the advent of democracy has to a greater extent forced the authorities to listen to local opinion when settling boundary issues. In areas or periods with dictatorship, the authorities have more leeway, but still traditional divisions based on language, ethnicity, religion or other cultural and historical differences will be influential, so that the boundaries the authorities might regard as most functional cannot be used (Thorvaldsen 1997).

The government of any country faces the time-honoured question of how many levels one needs in the administrative division of the country. With a flat structure and few levels the central level of government might experience problems assimilating all the information from the lower levels. An increase in the number of levels, on the other hand, will transfer power to the lowest levels, since the central agency no longer knows exactly who does what. The use of the resulting administrative areas and boundaries in historical research has been criticised on a principle basis: Bureaucracies first produce definitions to serve their own purpose. Economists come along later to rationalise the definitions. (Tilly 1979). When studying local areas intensively, however, it will be possible for those having access to detailed microdata to redefine the boundaries according to other criteria.

On the national level, the importance of place is shown by its incorporation into the very definition of a census, at least the way it has been defined by the standard reference work in this area (Goyer 1992). A census should be recognized by its:

1. National legal authority
2. Defined enumeration area

3. Complete coverage
4. Simultaneous enumeration
5. Individual enumeration
6. Periodic enumeration
7. Publication of results
8. Dissemination of results

Since the census handbooks are based on aggregate census statistics and our main concern is to work with the nominative microdata, we might disregard the last two points in the definition. However, the concept of place is tied closely to the definition's three first points, the national scope, the exact delimitation of the area and the (attempt at) complete coverage of the population within this space. There are censuses which only covered smaller areas such as a city, but such manuscripts have only rarely been computerized.¹

Enumeration methodology

On the background of the demand for complete coverage, we may be astonished to find the variety of procedures that have been used in different countries and periods in order to enumerate the most transient part of the population, those who were away from home on census day. In principle the population can be enumerated either *de facto* (where a person was present) or *de jure* (at a person's usual residence), but in practice some combination of the two principles is always used. According to the *de jure* principle, those away from home on census day, e. g. sailors, should be enumerated at their usual place of residence. The alternative procedure, called the *de facto* principle, attempts to enumerate everyone at their current residence. Thus fishermen staying for the season in a fishing village away from home, would be enumerated here rather than where they usually live with their families. The third possibility is to combine the *de facto* and the *de jure* principles systematically, with people enumerated both where they normally reside and in their temporary residence. Thus a married sailor would be registered both with his family, and on the ship he sailed with on census day. In order to avoid double-counting, entries such as this must be clearly marked in the census manuscripts and in any digital versions, so that the distinction between the legally resident population and the population present can be taken into account during the compilation of aggregates. In practice, no country has used pure versions of either the *de jure* or the *de facto* principles. In order to capture individuals away from home some elements from both principles have been employed (Goyer 1992, page 12).

Nation	Enumeration	Nation	Enumeration
Algeria	Both	Ireland	de facto
Argentina	de facto	Italy	Both
Australia	de facto	Jamaica	de facto
Austria	Both	Luxembourg	de facto
Belgium	Both	Mauritius	de facto
Brazil	Both	Mexico	de facto
Bulgaria	de facto	Netherlands	Both
Canada	de iure	New Zealand	de facto
Chile	de facto	Norway	Both
Costa Rica	de facto	Peru	de facto
Cuba	Both	Portugal	de facto
Cyprus	de facto	Romania	Both
Denmark	Both	Russia	de facto
Denmark	de facto	Spain	Both
France	Both	Sri Lanka	de facto
Germany	de facto	Sweden	de iure
Greece	Both	Switzerland	Both
Guatemala	de facto	United States	de iure
Hungary	de facto	Uruguay	de facto
Iceland	Both	Venezuela	de facto
India	de facto		

Table 1: Enumeration principles applied to censuses taken towards the end of the nineteenth century

As so far as the *de facto* / *de jure* question was concerned, the international statistical conferences from the 1850s onwards failed to reach any lasting agreement. Table 1 shows the differences in enumeration methodology for temporary migrants among a number of the census-taking nations and territories towards the end of the nineteenth century (Goyer 1983; Domschke 1986; Goyer 1992). Three countries stuck to the *de jure* principle, counting their inhabitants where they legally belonged: these were Canada, Sweden and the USA. Their population totals, then, cover only the legally resident population. Canada was the only part of the British Empire to use the *de jure* system from its first dominion-wide census taken in 1871. This could have been due both to French and US influences. The majority of countries, including those in both the British and the Russian empires, mainly used the *de facto* principle, noting the actual whereabouts of their populations, and so based their aggregates on the population present on census day (Woollard Undated). A few countries tried to combine the two principles, e. g. Brazil, Spain and France with their dependencies. Denmark exemplifies the group of countries which shifted back and forth between the three different methodologies.

We cannot explore fully here why the different methods were chosen, but in North America, the census is first and foremost an instrument for apportioning political representation (Anderson 1988), and this called for a legal criterion, as people vote for candidates where they usually live, not where they temporarily work. In Sweden the census from 1860 till 1945 was a secondary source, constructed by the vicar at his desk from his longitudinal parish registers (Sköld 2001). A census based only on population registers must be taken *de jure*, which explains why so many countries are using this principle in their most recent censuses. In the *de facto* nations, the rationale behind the census was more demographic; to find the size of the population and its constituent parts in order to calculate vital statistics in the form of rates of fertility, nuptiality, mortality etc (Woods 2000). Another argument in favour of the *de facto* procedure may be simplicity, perhaps a decisive factor

for British or Russian administrators counting people in vast territories spread across the world. The small population of Norway and the high proportion of itinerant workers such as sailors or fishermen may explain the choice to combine the two principles.

When analysing the 1900 census for Norway, it can be noted that the number of absentees inside the country did not match the number of people temporarily present within the country **B** which, theoretically, ought to have been the case. Although combining the *de facto* and *de jure* methods of census taking could not eliminate the problems, the discrepancy tells us that using either one or the other only, will result in enumeration errors. The group under consideration is volatile, and we must assume that we increase the likelihood of enumerating its members significantly if they are counted both as absentees and visitors. On the other hand, the combined method will increase the chances of over-enumeration if the procedure for marking the records is not clear and implemented strictly (Thorvaldsen 2004). How else can the *de facto/de jure* issue introduce enumeration errors?

Because of census enumerator revisions, the criteria for how to deal with certain groups were inevitably changed. Students are an obvious example. In Norway they were considered permanent residents in the municipality in which they studied in 1900, but in their municipality of origin later in the 20th century. They would then also be entered as temporarily absent from the latter place, but temporarily present where they studied, while in 1900 most students would simply be counted once: where they studied. As the number of students increased after 1960, the authorities in the university cities successfully lobbied for a change in the *de jure* rules in order to receive certain state funds which are distributed according to population size. Thus, for the 2001 census, Statistics Norway again enumerated students where they were living when studying. This meant a considerable formal increase in the number of inhabitants of a few cities, while many municipalities lost accordingly. If combined *de facto / de jure* enumeration is performed, it would be easier to adjust for such changes in definitions over time when comparing a series of census micro-data. The same goes for comparing results based on micro-data from different nations. Relatively speaking, it would also be easier to adjust for differences in census instructions when both the *de facto* and the *de jure* population segments are specified. If big groups such as soldiers, sailors, fishermen or students are treated differently it will affect not only occupational aggregates, but also statistics on family size, urban/rural differentials etc. A special problem with the *de facto* method is that it will tend to underreport the number of extended kin in the households because unmarried family members will be the most likely to work far from home.

Temporary migrants between countries make up a special category. For instance, from around 1900, thousands of people went to work for part of the year in the USA. If the instructions were followed correctly, they were unlikely to be entered into any *de jure* US census, but they should be noted as temporarily absent from their normal residence in Norway. Swedes doing the same would be noted as ordinary citizens in Sweden only. But, again according to instructions, such as wallows@ from countries like Great Britain which followed the *de facto* system of census taking, should not be noted in any census if they were working in the USA on census day. The situation would have been as straightforward as this if the statistical congresses had achieved their aim of synchronizing the taking of censuses in different countries. As we know, they failed even as regards the timing of censuses, with the British and Commonwealth countries sticking to the first year of each decade (1901, 1911, 1921 etc.), while most other nations took censuses in years ending with round numbers (1900, 1910, 1920 etc.). The considerable time difference between census days makes it more likely that a British temporary visitor to the US would be entered into some census than one coming from a *de facto* nation taking its census in years ending with a zero. And it is likely that a

Norwegian working in Britain or on a ship in a British harbour in 1901 would have been entered in the UK census, as well as in the Norwegian census the previous year, without any note about temporary absence.

The cases of under- or over-enumeration because of temporary migration across national borders are probably too few to cause significant problems. More serious errors may arise from under-enumeration *inside* each country because temporary migrants were not noted since they should be counted according to either only the *de jure* or only the *de facto* principle. As we saw in the complete count microdata from the 1900 census for Norway which fully combined the two enumeration principles, significant parts of the population in some municipalities could be away from home or temporarily present on census day. When comparing nations or regions with many temporary migrants, it will be crucial to have access to documentation giving a clear picture of what groups were to be included, where they stayed or where they had come from temporarily, and to compensate for this by reclassification. With combined *de facto* and *de jure* enumeration we can also more easily see to what extent the enumeration rules were followed.

Place of residence

Under a *de facto* enumeration scheme, the ordinary place of residence will be hidden for many temporary migrants, making it difficult to find their address in the census microdata and complicating attempts at record linkage (Taylor 1996). With a *de jure* or combined methodology, the exact address will be given for most citizens who have a permanent home. They can usually be mapped in all detail from street addresses, farm names and numbers etc, provided we have access to complimentary sources with the necessary georeferences.

The main problem with place of enumeration in modern censuses may paradoxically be that it tends to be too precise. Confidentiality rules differ between countries, but in most census data which are younger than 70 to 100 years will be barred from use that can disclose the identity of individual persons. While names and birthdates can easily be removed from the data set in order to anonymize it, the address is a more complicated issue. How much detail that can safely be given about the exact location of the residence depends both on sample size, the number of people within the administrative districts, whether persons are listed just individually or in household groups, and what information is provided in other variables. With a small sample from a large city in a US census, it is most likely impossible to identify a married couple even if their exact occupations are listed (McCaa 2001). In a complete count census for a small parish, on the other hand, it may be possible to identify a person given her age, occupation and civil status. The *Argus* system for deciding what confidentiality rules must apply for unique census records in a geographical area have been developed by Statistics Netherland (Hundepool 2003). Fortunately, for older census data which are exempt from the privacy laws and regulations, we may report the exact address as provided in the census manuscripts.

Given the access granted in older census microdata to exact addresses, we do not depend on the administrative divisions used in the census, we are free to rearrange the borders, for instance in accordance with present-day local and regional sub-divisions. Both because of and despite of the rather drastic alterations in municipality boundaries, the four volume *History of Tromsø City* is based on its present-day borders: the old town, the surrounding Tromsøysund municipality as well as parts of three other 19th century parishes are covered in the work. Publishing different volumes for the different parts of the municipality was not a viable alternative both for pedagogical reasons and since several of the parts never constituted meaningful geographic entities. It is simple to find

examples of how the comprehensive area model caused extra work, also with the sources. The author of the 19th century volume used the census microdata of 1801, 1865, 1875 and 1900 to reconstruct the present day boundaries of the municipality (Andresen 1994), selecting the data for the specific farms or places situated in the area that today is a part of Tromsø. These pieces are then put together so that the results become censuses covering present-day Tromsø municipality. In contrast to the printed statistic from the Central Bureau of Statistics where the old boundaries were followed, she can thus make overviews of parts of the area or all of it. Thus, we can for the first time know how many people lived in today's Tromsø-area in 1801, the birthplaces of the inhabitants here according to the three other censuses etc. An extra effort was made to show the ethnic composition of the population.

A similar set of problems relate to attempts to subdivide a municipality into smaller parts for separate analyses. Historical, administrative divisions, such as census wards underwent frequent changes, and it will be necessary to redistrict them in order to make them compatible with complimentary sources or to create wards that are consistent over time. Because virtually no readers are aware of the historic boundaries, a more pedagogical and meaningful solution may be to implement sub-parish divisions according to distinct characteristics in the landscape, thus creating borders that follow a hill, a railway, a major road, or singling out settlements close to the sea (Thorvaldsen 1997). Some population characteristics, however, are not easy to delimit with administrative or other types of borders, but must be tied to specific geographic points, such as blocks of houses in a city or individual farms in the countryside. Thus, when studying the ethnic infant mortality differential in a North Norwegian parish, it was necessary to link each baptism and burial to a specific farm and classify the farms according to their predominating ethnicity in the nearest census (Thorvaldsen 2003). Since the ethnic groups tend to cluster in certain locations, it is still not straightforward to distinguish between space and ethnicity as independent variables, a comment which also applies to the distinction between social status and living quarters in the study of the Spanish pandemic mentioned below.

Place of birth

In most countries a census will specify a person's birthplace to the level of the municipality or parish, which in Norway ordinarily will signify the same territory.² For instance in connection with the study of migration, it is necessary to systematize the places where people lived and where they were born. This is done by assigning a code of four digits to each parish. All parishes in the same province have the first two digits in common, thus making it easy to study migration both at the level of the parish and the province on the basis of the same codes. When the third digit is a zero, it means that the municipality in question is a town. For example 1902 is the town of Tromsø in the province of Troms, 1929 is the parish of Berg in the same province, while 2012 is the parish of Alta in the neighbouring province of Finnmark.

The number of municipalities has changed over time. Parishes are for numerous reasons split, joined together, and areas are transferred from one municipality to the other. To keep track of this, the numbering system is dynamic. Each area that has ever been a parish in its own right, has been given a unique code, and there is a special data base which works as an inventory of all the changes. This also contains the various names that have been associated with a given municipality throughout the last two centuries. To deal with immigrants, the system can easily be extended with country codes for the rest of the world (Thorvaldsen 1995).

Even if the coding system is dynamic, extensive and well documented, some problems arise in actual use. Quite a few parish names are ambiguous in the sense that several municipalities are called the same. If the two alternatives are far apart, this ambiguity can be resolved by choosing the code for the place that is closest to where the census was taken. Where this criterion is not effective, or in order to avoid migration bias, the code for unknown must be used. This is also the case when only the name for a smaller area, such as the name of a farm is given, since many place names can be found in several parishes. Sometimes the name of a territory that comprises several parishes is given. If the whole territory lies within a province the code for that province can be given, leaving two zeros for the parish part of the code. 1900 would thus mean somewhere in province number 19, which is called Troms.

With the amount of international migration towards the end of both the 19th and 20th centuries, the need for an international, historically dynamic classification system for birthplaces is obvious. The modern system used by the UN is not adequate, and the best available is likely to be the one used by the IPUMS census databases.³ Unfortunately its level of detail is most appropriate for late 19th century US censuses where birthplace is specified only to the national level except for the US and Germany where the sub-federal states are used. For other countries, local encoding systems for provinces and parishes should be adopted or developed. Also, it would alleviate the use of historical census data in digital mapping, if we had access to historically dynamic vectorized maps for the national and other administrative levels. To the extent that individual farms, blocks and houses could be georeferenced, it would be possible to create maps showing the detailed population distribution, without the inexactness shown in choropleth maps where a whole mountain plateau is highlighted due to the many persons born in e.g. a city at the end of a fjord.

The many different place names reported for a variety of administrative and other geographic entities make it difficult to trace persons by the name of their birth place. For this reason we have developed an Internet user interface which enables our users to search for persons by using the birth place codes, either for individual parishes, a range of numeric codes or the negation of certain codes. It is also possible to retrieve only the in-migrants to the parishes. This can be tested for the entire Norwegian 1865 and 1900 censuses at http://www.rhd.uit.no/folketellinger/folketellinger_avansert_e.aspx. A systematic, statistical analysis of the birthplaces of the Norwegian population according to the 1865 and 1900 censuses has shown that the net migration flow during the last part of the 19th century shifted direction from predominantly going northwards to mainly going southwards (Thorvaldsen 2000).

In some censuses, such as the 1801 for Denmark, Iceland and Norway, birth place information is not included among the fields in the manuscripts. Then it may sometimes be recommendable to use a proxy, it could be the personal names or information on ethnicity. Neither of these are foolproof, the census provides no information on when a Sami or his ancestors moved from their core areas. But even if unprecise, it is of value to know the origin of in-migrants with special names and where they settled. The surnames in the 1801 census for Norway have been used to classify the origins of 25 000 inhabitants with foreign surnames, telling us that most of them originated in Denmark and Germany, and mainly settled in the towns, by the mines and along the coast including many in Northern Norway (Sogner 2001).

Retrospective places of residence

In most censuses migration can only be assessed by comparing the place of birth and residence for all individuals. Provided that birthplace is reported at the level of the parish, even short distance

migration can be measured meaningfully. The more serious limitation when using census data for this purpose is, however, that we really only have access to two points within each person's migration history, so that only net migration can be measured. Research based on the Swedish longitudinal records, where gross migration is reported, show that a majority of the population, especially in cities, moved every year (Thorvaldsen 1995). To the extent that the children in a family were born in different locations as they step migrated from place to place, their migration history can be mapped in greater detail. For the highly mobile group of young, unattached migrants, this method will usually not work. Then it is a great asset that some censuses include retrospective variables providing information on previous places of residence. For instance the US 1940 and 1950 censuses contain information on the residence status of each person five and one year previously. This enables us to study to what extent migration had taken place within the county, the state or between countries during the said periods.⁴

Since most censuses provide birth place data for each person, this information can only be figured out easily about a person's relatives when they are living in the same household. The US censuses for the period 1900 through 1930 make the multi-generational study of national and ethnic background feasible by providing birth place data not only for each person, but in addition for his or her father and mother. By combining these variables, it could be found that Minnesotans of Scandinavian origin married almost exclusively within their own ethnic group and even national group as it was reported as late as in the 1920 census. This result was consistent whether origin was defined by first or second generation immigrant status (Thorvaldsen 1998). Since the US census lacks birth place information below the state or national levels, it is unfortunately difficult to establish to what extent this result pertains also to intermarriage between partners with a background in the same province in their country of origin.

Current and future developments

The need for data to follow groups of persons over time has spurred several attempts to merge together records from several censuses (and other types of sources) with record linkage methodology. The first individual level study of the Spanish influenza pandemic has interestingly established the social discrimination profile of the disease by linking the 1918 census, 1919 census and church records from Oslo (Mamelund 2005). In practical terms, this can only be done when at least one of the censuses has been completely digitized, since finding many persons in the original manuscripts is too time-consuming, and the probability of linking records across census samples is unrealistically small.⁵ During such attempts it is important to *not* use place of residence as a criterion for linkage, since this will bias the resulting set of linked individuals towards the non-migrants, a group which may, or may not be representative in terms of age, marital status, social status etc. Especially when manual or interactive linkage techniques are being used, it may be tempting to use the place names, and users are warned that they should check to what extent the linked group is representative for the whole census population. Interesting experiments to establish not as big a group of linked persons as possible, but rather a set of representative census records, have been performed with the complete count US 1880 census as a point of departure (Ruggles 2003). Attempts to follow an urban population over time by linking together persons who lived at the same address, is an interesting way of getting around some of the major identification problems in cities, but it will hardly yield results which are representative for the whole population (Johansen 1999).

Another development that holds much promise for the illustrative and analytical use of census material is the existence of digitized map coordinates for a growing number of countries. In Europe a

continuous series of maps for much of the 19th and 20th centuries are now available for the parish or municipality levels in Great Britain, Sweden and Norway. Corresponding maps are available for other countries, but only for more limited time ranges. The project to digitize the census tract coordinates for the US during the whole 20th century adds a whole new dimension which will enable us to see to what degree using the parish or municipality level data hides local differences due to the social segregation of the housing market.⁶

References

- Anderson, M. J. (1988). The American census: a social history. New Haven., Yale University Press.
- Andresen, A. (1994). Handelsfolk og fiskerbønder: 1794-1900.
- Domschke, E. a. D. S. G. (1986). The handbook of national population censuses: Africa and Asia. New York, Greenwood Press.
- Goyer, D. S. G. E. D. (1992). The handbook of national population censuses - Europe. New York, Greenwood Press.
- Goyer, G. S. a. E. D. (1983). The handbook of national population censuses: Latin America and the Caribbean, North America, and Oceania. London, Greenwood Press.
- Hundepool, A. (2003). "The ARGUS software and the CASC project." Retrieved 01-07, 2005, from <http://neon.vb.cbs.nl/casc/ISIBerlin/Hundepool.pdf>.
- Johansen, H. C. (1975). Befolkningsudvikling og familiestruktur i den 18. århundre. Odense.
- Johansen, H. C. (1999). "Urban social and demographic reconstitution. The case of eighteenth century Odense." History and Computing **11**(1-2): 115-128.
- Kelly Hall, M. a. T., Ed. (2000). Handbook of International Historical Microdata for Population Research. Minneapolis, International Microdata Access Group.
- Mamelund, S.-E. (2005). "A socially neutral disease? Individual social class, household wealth and mortality from Spanish influenza in two socially contrasting parishes in the Norwegian capital 1918-19." Social Science & Medicine **Forthcoming**.
- McCaa, R. a. S. R. (2001). The Census in global perspective and the coming microdata revolution. The 14th Nordic Demography Symposium, Tjøme, Nordic Demographic Society.
- Ruggles, S. (1999). "The limitations of English Family Reconstitution: English population history from family reconstitution 1580-1837." Continuity and Change **14**(1): 105-130.
- Ruggles, S. (2003). "Linking Historical Censuses: A New Approach." IMAG workshop, from <http://www.nappdata.org/imagpapers/ruggles.pdf>.
- Sköld, P. (2001). Kunskap och kontroll: den svenska befolkningsstatistikens historia. Umeå, Almqvist & Wiksell Int.
- Sogner, S. a. G. T. (2001). Surnames as proxies for place of origin in the 1801 census for Norway. Nordic Demographic Symposium, Tjøme.
- Taylor, I. C. (1996). Liverpool's institutional and quasi-institutional populations in 1841 and 1851. Local communities in the Victorian Census Enumerators Books. D. a. K. S. Mills. Colchester, Local Population Studies: 42-46.
- Thorvaldsen, G. (1995). Longitudinal Sources and Longitudinal Methods - Studying Migration at the Stockholm Historical Database. Swedish Urban Demography. A. a. L.-G. T. Brändström. Umeå, Umeå University: 219-250.

- Thorvaldsen, G. (1995). Migrasjon i Troms i annen halvdel av 1800-tallet. En kvantitativ analyse av folketellingene 1865, 1875 og 1900. Registreringsentral for historiske data. [Tromsø], Universitetet i Tromsø.
- Thorvaldsen, G. (1997). On Boundaries and Areas in Local Historical Research. Festskrift til Sivert Langholm - web version in English at <http://www.rhd.uit.no/art/boundaries.html>. J. E. o. K. Myhre, Knut. Oslo, The Norwegian Historical Association.
- Thorvaldsen, G. (1998). "Marriage and Names Among Immigrants to Minnesota." The Journal of the Association for History and Computing **1**(2).
- Thorvaldsen, G. (2000). "A constant flow of people? Migration in Northern Norway 1865-1900." History & Computing **11**(1-2): 45-59.
- Thorvaldsen, G. (2003). Infant mortality in multiethnic Lyngen in the 19th century. Umeå.
- Thorvaldsen, G. (2004). "Borte fra heimen. Om midlertidig fraværende og tilstedeværende i seint 1800-tall." Heimen **XLI**(4): 387-300.
- Tilly, C. (1979). Migration in modern European history. Sundin & Søderlund Time, Space and Man. Essays on Microdemography. Umeå: 175-198.
- Woods, R. (2000). The demography of Victorian England and Wales. Cambridge., Cambridge University Press.
- Woollard, M. (Undated). The International Statistical Congresses and their influence on the taking of the nineteenth century censuses. Colchester: 17.

Notes

¹. Before 1950, Finland only took censuses for its major cities, these have not been digitized. However, the municipal 1912 census for Bergen as well as the 1918 and 1919 for Oslo have been computerized. Cf the overviews at http://ipums.org/international/microdata_inventory.html and in Kelly Hall, M. a. T., Ed. (2000). Handbook of International Historical Microdata for Population Research. Minneapolis, International Microdata Access Group.

² A Norwegian "parish" will as a rule be bigger and more populous than the English variant, but smaller than an English county. The Norwegian "province", which consists of several parishes or municipalities, will mostly be bigger than a county

³ Cf <http://www.ipums.umn.edu/usa/pethnicity/bpldb.html>

⁴ Cf <http://ipums.org/usa/pmigration/migrate51a.html>

⁵ There have been made attempts to link only persons whose name start with a certain letter or the population in randomly selected parishes in order to limit the size of the source material which must be digitized before linking Johansen, H. C. (1975). Befolkningsudvikling og familiestruktur i den 18. århundre. Odense.

⁶ For Norway cf <http://www.nsd.uib.no/english/data/regional.html>; for Great Britain cf <http://www.gbhis.org/>; for the US cf <http://www.nhgis.org/>. A GIS component is also part of the Canadian Century Research Infrastructure Project, cf http://www.canada.uottawa.ca/ccri/index_eng.html