

SYSTEMS OF INFORMATION IN DEMOGRAPHY

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Summary

Observation is a crucial stage in demographic studies and research. Description as well as the causal analysis depend on the type, the nature and the quality of the systems of information. After some generalities about observation in demography, this chapter presents each system of observation : civil registration, register, laboratory of population, censuses and different types and techniques of surveys, with the advantages and inconveniences for each of them.

1. Introduction

Every science is founded on observation that is the collection of new data or the compilation of available data. Demography is no exception to this rule: there is no question in demography without numbers, and there are no numbers available without systems of information. After having described some generalities about observation in demography (history, place and function), we will present and discuss each system of observation: continuous registration (civil registration, population and laboratory registers), censuses (of different kinds nowadays), and surveys (of different types and techniques). Subsequently, brief attention is given to remote-sensing, administrative systems of information and qualitative approaches. For each of these systems, we will describe the advantages and inconveniences, and the “new methods” in the Northern and Southern countries. To conclude, some general remarks will be presented.

2. Place and history of observation in demography

At the beginning of any scientific investigation, the researcher faces a vague reality, the more so if the studied problem or topic is new and recent. As a result of a priori considerations, culture, ideology and personal experiences, the researcher perceives reality in a subjective way. He will, as a privileged and alerted observer, try to understand reality in a way as objective and neutral as possible. To assess reality, the researcher must collect new data or choose from the available sets of data. The strategy of data collection has to be established in function of well-defined objectives, according to the hypothesis that need to be tested. The hypothesis often are derived from a pre-existing theoretical framework, but can also be conceived by the investigator.

The three major stages of scientific research, the collection of raw information, the production and analysis of certain figures (rates, probabilities,...) and causal analysis, continually interact within scientific research, even if they follow one another chronologically. Data collection of course precedes analysis and the analysed topics depend upon the type of data that have been collected. In turn, the type of system of information (a survey for example) or the selected data depend on the hypothesis put forward or on the type of analysis that is foreseen. *Strategies of collection* and *strategies of analysis* must, in other words, be integrated from the start of the research: information is not collected for the sake of collection. As with general statistics, demography is characterised by a relatively short history of scientific observation, even if numerous data sources and collection procedures existed before the development of techniques of analysis (since the beginning of this century). These were often of administrative nature, frequently served taxation purposes and were usually geographically limited.

The first *enumerations* of population go back to the Antiquity (Mesopotamia, China, India,...), to the time of the first great centralising empires. In Europe, the Middle Ages represent a period of regression. The concept of numbers and the need for measurement regain weight due to the following mercantilist wave and the constitution of States or centralised powers: since the middle of the 17th century, the number of surveys and counts multiply, essentially with a fiscal objective. The evolution from administrative observation to scientific observation only appears at the end of the 18th century. In

Europe, the first genuine censuses at the national level take place at the earliest in the beginning of the 19th century. In the Southern regions, the history of censuses is even more diversified and recent: in 1900, 1910 or 1920 for Latin-American countries, after the Second World War for the rest of the countries and even until not the seventies for some French-speaking countries of sub-saharan Africa.

In Christian Europe, parish registers will be the precursors of civil registration. Since the middle of the 16th century, parish priests have been, somewhat everywhere, obliged to conserve registers of baptisms, marriages and funerals, primarily for reasons of bookkeeping and judicial evidence (of religion, of affiliation). In spite of their non-exhaustive character before the 18th century, these registers will constitute the basis for the reconstruction of the local demographic history. Just as for the censuses, the modern civil registration system does not appear in Europe before the end of the 18th century. In particular, the system is first in the hands of the Church and taken over by the State later on. Parallel to this, the first *registers of population* are established in Holland (in 1829) and Belgium (in 1856). In the Southern countries, modern registration will, in general, not be developed before the fifties or the sixties. The completeness is today still very low in some cases (like in Africa or South-Asia).

Even if the theoretical principles of *surveys*, the observation of a representative sample of a population, date from the 18th century and the 19th century, their application in social sciences will, in general, not take place before 1920. In demography, it is only after the fifties that surveys are actually used as genuine instruments of data collection in the Northern countries, as complementary information sources to the civil registration system. Thereafter, surveys are progressively introduced in the Southern countries, either as a substitute for deficient civil registration or for censuses, or as an autonomous source of information on practices and opinions, especially about fertility. Nowadays surveys constitute the primary source of data and of demographic research in many countries.

Demography is characterised by a historical particularity: observation is essentially in the hands, or has long time been in the hands, of administrative organisations (Institutes of Statistics, Ministries), without much association with universities or with scientific research. There is or there used to be a kind of monopoly of observation. This situation is not present in other sciences, in which theoretical thinking, analysis and teaching are generally closely connected. Demographic research and teaching have been developed in universities and thus isolated from the observation systems, or in any case with little influence on these systems. Things have of course changed and the situation is less monopolistic as it used to be: because of their nature, national censuses, civil registration and registers of population continue to depend on the Administration, but in modern research the less costly and less time-consuming surveys have gained considerably in importance. Surveys constitute in this way a privileged instrument for the researcher.

Every Northern country governs his own system of demographic information, determines the budgets, the priorities of the collection activities ... At this level, there is much heterogeneity, even in a region like Europe. In the South the situation naturally varies, but in general few countries, and especially few poor countries, have the means

to perform relatively large collection activities. In these countries, data collection often (entirely) depends on international funds or on bilateral partners, on international programs of data collection (as the World Fertility Surveys in the seventies or the Demographic and Health Surveys in the eighties and nineties). This financial and thus scientific dependency increases with the cost of the collection and with the present economic crisis.

3. A general classification of systems

In total, six broad systems can be distinguished, which differ from several points of view.

For the most important systems (continuous registration, censuses and surveys), there are some specific approaches:

- *Continuous registration systems*: the civil registration system, the register of population or the laboratory of population, characterised by instantaneous (or almost instantaneous) registration of the basic demographic events, apart from migration in the civil registration system.
- *Censuses*: their main objective is to provide information on demographic, social and economic distributions, although they also include questions on migration somewhat everywhere and questions on fertility and mortality in the South. The most common censuses still are the classic ones, although some countries prefer micro-censuses (a census of a sample of the population), as it has been the case since recently in countries of Northern Europe, with the registers as sample base.
- *Surveys*: these are characterised by an extreme diversity in objectives, observation techniques and costs. From the point of view of observation techniques, five categories can be distinguished: single-round household surveys (observation based on a reference period of 12 months), single-round retrospective surveys (reconstitution of fertility, matrimonial or migration histories), multi-rounds household surveys (observation of all the entries and exits between the successive waves), follow-up surveys of new-borns or individuals, and finally older dual record system (confrontation of two sources of data).
- *Aerial photography and remote-sensing*: geographers provide these techniques that are useful to study urban and rural population distribution, but also for the constitution of
 - samples.
 - *Administrative registers* of schools, health centres, social security...These registers are omnipresent sources of data, but are rarely exhaustive.
 - *Qualitative approaches*, rather anthropological and covering small populations. The main objective is not to measure but to understand.

4. The continuous registration systems

The civil registration, the register of population and the laboratory of population have only one point in common: the relative short time between the event and its registration.

4.1 Civil registration

We define civil registration as *a continuous, permanent and compulsory system of registration of civil events (births, deaths and marriages), of their characteristics and of the events able to change the situation of a person (divorce, separation, cancellation, adoption)* This system constitutes a national and legal instrument and its responsibility rests with public authority. It represents specific interests for demography, but is also characterised by drawbacks for research and by functional gaps in the Southern countries.

4.1.1 General interests and problems

Civil registration not only still fulfils its initial and primary function of legal proof (of an event, identity, affinity ...), but also has a statistical function. It is of course this function which is most apparent to the demographer. Civil registration constitutes the only data source regularly providing the numbers and the general characteristics of births, deaths, stillbirths, marriages and divorces for all geographic subdivisions (from the local to the national level). Civil registration also allows the study of the evolution of the population (size and structure) and an analysis of fertility and mortality, from the transversal and the longitudinal perspective, given that its existence is secular. The system does not account for internal migration and thus restricts the analysis of demographic movement to the natural growth. Finally the system does not constitute a good basis for the analysis of marriage and divorce, as it does not include non-official unions (or cohabitation).

The civil registration system nevertheless represents, somewhat everywhere in the world, the essential basis for knowledge about demographic movement, about the causes of death (in this field the civil registration system is really irreplaceable), the general characteristics of childbirth, of the new-borns (sex, legitimacy, weight, kind of delivery, birth order...) and of the parents (age, occupation, education ...). In this way, civil registration allows numerous analysis and provides information on the factors of biological or social risks... This is important, but not at all sufficient for modern demographic research, which is shifting from the elaboration of classical indices to the understanding and explanation of demographic events. This requires a considerable amount of information on economic and social characteristics of the individual, his/her partner, his/her family or environment, but not all these variables can be included in a simple statistical bulletin of civil registration.

Besides, there are some *problems of data quality*, even in the countries with an ancient tradition in civil registration and particularly in the field of original and “explanatory” variables. The registration of causes of death, for example, is characterised by a general lack of clarity, many missing values, confusion between initial and immediate causes, changes of codification... These problems often oblige the investigator to analyse groups of causes of death. Another example concerns the weight at birth, a variable which is increasingly present in European bulletins, but which is too often rounded off. Or the information on the professional activity of the parents (for a birth) or on the professional activity of retired individuals (for a death), which is often too vague and too general. This of course varies through time and space.

Another fundamental problem concerns the different official definitions of events, particularly in the field of stillbirths and live births. The registration criteria for these events vary considerably, despite the recommendations by the WHO. The recommendation is that a birth should be classified as a live birth in the case of any sign of life. In 1991, however, 10 out of 27 European countries restricted this criterion by imposing specific signs of life or a minimal duration of life (which leads to seven different definitions). The situation is similar for stillbirths. This leads to problems of international comparability and calls for much prudence when making comparisons.

4.1.2 The situation in developing countries

These problems, inherent to all systems of civil registration, can be qualified as “less problematic” compared to the difficulties in the majority of the Southern countries.

In the South, the problems differ in nature and magnitude depending on the region:

- *The coverage of the system*: the civil registration system is often incomplete and it usually does not reach a coverage level of 90%. The situation is particularly bad in South-Asia and in sub-Saharan Africa where the rural zones are not at all covered in some cases. The coverage rate is anyhow higher in cities than in rural areas, for births (30 to 80% in Africa) than for deaths (15 to 60%) or especially for marriages. In some countries, the coverage level is increasing (like in North Africa or in Latin America for example), while in other countries it is stagnating or probably even regressing.
- *The kind of data*: the registered data vary of course from one country to another, but they are in general limited to some specific variables: sex, date of event (or date of registration of the event), place of event, age of the mother or the deceased person. Other elements registered, less frequently, are marital status and nationality or profession of the father. Variables such as educational degree of the mother, duration of the pregnancy, weight of the child at birth or number of children ever born, are rarely taken into account.
- *Exploitation, publication and analysis*: civil registration is in general under-exploited and under-analysed. At best, there are publications on some basic data (number of events, sex and age of the mother or the deceased). Numerous elements are not studied at all or are analysed with considerable delay (of 2 to 5 years).

These insufficiencies of civil registration in the Southern countries, varying from country to country, result from a large number of interrelated factors: the registration system itself (lack of infrastructure, of means, of skilled staff), the population (misunderstanding or lack of motivation), the politics (no priority)... Numerous “external” projects tried to improve the functioning of the civil registration system, as in Sub-Saharan Africa for example, but the majority of these efforts led to poor results: the civil registration system can only operate correctly in the context of a strong and well organised territorial administration, with legal obligations and sanctions, and of a conscious-raising in the population. In the near future, the civil registration system will probably not be able to supplement the demographic surveys in many countries.

4.2 The registers of population

From the 19th century on (1749 in Sweden, 1847 in Belgium, 1850 in the Netherlands), some European countries have set up a register of population. This register can be defined *as a permanent and continuous system of demographic and social information concerning each individual residing in a specific territory*. The register, initially local, nowadays national (one uses the expression National Register), represents a primary source of information with, of course, its specific advantages and constraints. Actually, nine out of the fifteen members of the European Community have a register at their disposal.

4.2.1 Communal registers of population: philosophy and interests

The principle of registers consists in the collection of specific information about each individual in all households of the community. In the majority of countries, the register records the following variables: names and surnames, sex, date and place of birth, address, nationality, occupation, date and place of death, date of marriage and former place of residence. All changes are captured by compulsory declaration or by a link procedure with other sources. Concerning migration for example, the Belgian register records the date of entry into the district and the place of origin, or the date of exit and the place of destination.

The functioning principle is relatively simple: an initial census of the legal population operates as the starting point; the information is subscribed for each individual in a register (formerly in a manual way, nowadays with computers), which is updated regularly and rapidly by a recording of changes. The register applies to the households and to the units of housing. The updating takes place at the time of each population census (for example every ten years in Belgium since 1866).

In addition to the different administrative applications, the registers represent obvious interests for statisticians and demographers:

- The register continuously generates figures concerning the legal population of each community, the structure of the population (size and characteristics) and the movement of population (fertility, mortality and especially migration, national or international). It is, in other words, a permanent system of registration.
- The register constitutes a kind of follow-up system of observation, a type of biographic observatory since information is collected and conserved about all the different demographic events of each individual (and household) throughout his/her entire life.
- The register not only facilitates the preparation and the evaluation of the population censuses, it also represents a good sampling basis.

4.2.2 Organisational and qualitative diversity

Nowadays, about thirty countries have a register of population at their disposal, based on approximately the same basic principles. These registers are nevertheless

characterised by a diversity in their content, organisation and quality. Simplifying, there are very reliable and well organised registers (in the Scandinavian countries, in Belgium and in the Netherlands), and there are more “loose” systems (in Germany and Italy for example) where the data are updated with some delay or with omissions, sometimes still manually, or where the register does not yet constitute a central axe of the information systems and the communal administration. In this context, it is convenient to distinguish the *centralised systems* at the level of the entire country (Benelux and Scandinavian countries) and the *local systems*, whether computerised or not, in which the information does not go beyond the community level. Centralisation, leading to a kind of super-register covering the entire country, favours without doubt the quality of the information (detection of double counts, improved verification...), and allows for a procedure to link the central register of population with other administrative databases (on housing, social security...).

4.2.3 Some constraints

The registers have several constraints.

- *The nature of the data*: registers will, by definition, only contain the information that is interesting for the communal administration services. They do of course include the majority of the demographic variables, but do not provide detailed economic or cultural data. Registers thus constrain demographic studies.
- *The quality of the data*: the quality will depend upon the means, the skills and the motivation of the community staff and upon the people declaring. International emigration and changes in the professional situation for example are often poorly measured.
- *The access to the registers*: in the light of the protection of private life, access to the registers has to be strictly regulated and thus limited. In general, access is difficult and the laws are strict.

To conclude, it can be stated that a solid register of population represents a unique source of information to the study of the local or national demographic dynamic and the internal migrations. The register can in fact threaten the classical censuses, but will, on the other hand, never be able to replace the need for surveys.

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