

AN ANALYSIS OF URBAN POPULATION STRUCTURE  
AND DYNAMICS THROUGH THE AUTOMATED MANAGEMENT  
OF THE REGISTRY OFFICE (\*)

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1. The issue of limitations in generating information in current public demographic documentation has been repeatedly raised by experts for a long time, with regard to experimental researches on population structure, movement and territorial distribution which, besides presenting their own independent scientific content, most of the time represent a basis and a necessary condition for every modern socio-economic survey.

To the purpose of such surveys, the lack of a reference to municipal units as a maximum term of specification for demographic data, has been particularly stressed several times.

In fact, while this criterion prevents from tracing back the analysis of population phenomena to homogeneous geo-economic areas, which are identifiable within a borough or partially belonging to several boroughs, at the same time, in comparison to big cities, it makes it completely impossible to make an in-depth and systematic study of urban population's settlement and demographic behaviour.

Rather than being caused by flaws in scientific research, these limitations and insufficiency of demographic data sources have so far mainly originated from practical factors, which are linked to the elaboration and classification, in main offices, of a large mass of data deriving from censal surveys or obtained through current data collection. However, nowadays it seems urgent to reconsider from a technical and organizational point of view the issue of statistical-demographic records, whose generation has to be done in time scales and forms that are in line with scientific research requirements and with the operational demands of our times.

The way to be followed is an effective use of modern computers in order to adapt the management of public statistical services to the new opportunities they have opened in terms of fast time scales and affordable costs for the processing of large quantities of data and basic information.

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(\*) Long abstract of the paper published in "Statistica", n. 4, 1969, pp. 535-548.

After all, it is easy to notice how the creation of statistical sources has progressed, in its historical development, in a tight connection with the use of technical tools which have gradually become available in the course of time.

But the qualitative “leap” we need to make with the introduction of current electronic devices has a broader scope than the transformations and improvements which once were made possible by the first mechanical systems and, more recently, by electronic calculators. *Omissis*

2. Though these brief notes are not exhaustive, they can be a basic introduction to the specific subject of this comment, in which we are going to show, not from a programmatic standpoint but based on an actual practical experience, the possibilities opened to demographic survey via the automated management of a Registry Office.

The reference to the Registry Office as the central element of a new administrative organization system, of documentation and management based on computers, has already been suggested not many years ago by Bruno de Finetti, in terms of an operational prompt whose conceptual scheme currently still preserves complete validity. To this scheme it may be traced back, albeit considering different practical conditions, the functioning of the computer operating at Bologna’s municipal offices, to which we refer in this text.

Initially this system has been studied and was born to meet administrative needs, with the purpose of increasing the executive and management possibilities of the administrative groups in every different divisions in which the local authority operates. *Omissis*

On a technical side, we just need to mention that Bologna’s Electronic Center works with an IBM 360/40 system, which is linked by telephone cable with 30 IBM 2740 “teleprocessing” terminals for remote data processing and transmission. These terminals, placed at every neighbourhood’s municipal office, are used for real-time emissions of Registration and Civil Status Certificates requested by citizens.

A prerequisite for the functioning of the whole system was obviously an integral recording on magnetic memory of the population’s Registry, that is the directory of citizens’ names sorted by family units and cohabitations, with the address information and all the elements that individually define the registered position and the civil status (date and city of birth, date of marriage for conjugated people, date of arrival and city of origin for immigrants etc.).

The second issue is the need of a continuous updating of Registry’s records through data entry on magnetic memory of every change which continuously occurs in the number and composition of territorial settlements of population, due to the effect of births, deaths, marriages, relocations, aggregation and disaggregation of family units and migrations, in relation to other boroughs or foreign countries.

The procedures followed allow to achieve this updating automatically, in order to get almost daily a perfect correspondence between the population’s Register and the electronic memory.

The production of certificates at the peripheral units is therefore made on the basis of a database continuously updated. At the same time, the computer can apply any selection and any sorting of the population recorded.

For the purpose of our topic we are particularly interested in demographic statistical processing. *Omissis*

By combining the information connected with the “record” name of each citizen we can get countless sortings.

So, we are just going to focus briefly on sorting schemes that reflect the most significant and the most essential aspects of the demographic survey, in particular the structure and territorial distribution of the population, natural movement events, internal and external displacements in relation with the municipal area.

3. As regards the documentation relative to the amount and composition of population it is important to underline that data can be produced with reference to any moment in time, therefore integrating a kind of data which are currently only available on the occasion of the ten-yearly census and limited only to the global population in the municipality. *Omissis*

In addition to demographic data based on an individual enumeration of the inhabitants in a municipality, through an electronic register it is always possible to obtain the number of family units and of their members, identifying their territorial distribution and settlement according to the various schemes of classification by sub-municipal areas. *Omissis*

5. The systematic entry on electronic memory of the substantial elements of civil status documents, and the possibility to refer the absolute frequency of births, deaths and of marriages to the population determined at a every time considered half-time interval, is a technical condition for the documentation and analysis of the most significant manifestations of natural movement.

Also in this case we report in a totally synthetic way the major data classification schemes which the computer, in the system we are referring to, is able to produce on the basis of appropriate programs.

As regards births, the fundamental classifications concern the date of the event, gender and legitimacy of births, age, and the mother’s marital status and municipality of birth.

These are the necessary specifications to establish, in addition to generic birth rates, general legitimate and illegitimate fertility rates and specific fertility rates by age. However, we must keep in mind that the information stored allows specific surveys on differential fertility according to the distinction between native and non-native women and in reference, for the latter, to the year of immigration and the area of origin.

Concerning territorial analysis, it is enough to recall what was said previously. The establishment of birth and fertility rates compared to neighbourhoods and census sections, in addition to acquire an immediate informative scope, also allows the application of specific demographic analysis techniques, of which it has already been possible to provide some significant example.

Concerning deaths, the essential terms of reference are of course date, gender, age, marital status, for the purpose of the calculation of generic and specific rates and of the creation of urban population life tables. It would also be interesting to explore the investigative validity of the distinction between urban native people and population from other more or less distant areas. As regards the territorial analysis of mortality, all observations are similar to those that we have made above.

The information recorded on magnetic memory regarding marriages allow for their easy classification according to the age of the spouses and the calculation of average age. Of considerable interest for the study of urban marriage dynamics is also the distribution of marriages according to the district of residence of the bride and groom or to their area of origin (municipality, province, region, etc.) before marriage. In this case too we can get from the computer, for the entire town and its different territorial divisions, generic and specific marriage rates with regard to the population and its distribution by gender and age.

6. Taking into account what was said previously are also obvious the possibilities of documentation provided by computers as regards the phenomena of migratory movement. In relation to each subsequent period of time it is immediately identifiable, according to cancellations and registrations, the quantity of immigrants and emigrants, their composition by gender, age, marital status, their distribution related to areas of destination and origin and related to districts or other sub-municipal areas of settlement.

Of particular interest, using the capabilities of information of an automated registry, are also the possibilities of researching the forms of internal mobility of the urban population. These are phenomena of which there is no experimental knowledge, but which play a major role in the demographic and socio-economic dynamics of modern cities. *Omissis*

As regards internal mobility, the documentation provided by the computer first of all establishes the quantity – for individuals or families – of citizens who during the reference period have changed their residence. Once identified the population that gave rise to the phenomena of territorial mobility, it is of primary relevance its classification according to urban area of origin and area of new settlement – district or other territorial divisions – with or without an analysis of the structure by gender, age and marital status. The data thus obtained, integrated with those related to external migratory movement, provide all the elements for calculating the population mobility index referred to the whole urban area and the sub-urban areas in which it can be divided.

7. At the end of this report we can still point out some general considerations regarding the future prospects of demographic research. Such prospects, it is clear, cannot be disassociated from problems concerning the reorganization of governmental statistical services, as they may become through a widespread use of modern computers.

From this point of view, there is no doubt that the automatic management of

population registers appears objectively as one of the basic conditions for a systematic documentation of demographic phenomena, the only one that allows us to follow the population events occurring in the intervals between successive census surveys, pushing analysis much beyond the limits of current sources.

It may be argued, perhaps, that the registry office records imperfectly reflect the true population amount and its quantitative and qualitative changes. However, even excluding the fact that census surveys are certainly not immune to lacunes and flaws, it must be said that, in an averagely efficient administration, discrepancies are not usually significant, at least on a mass survey. And, above all, it must be recognized that the discrepancies that occur are due, as well as to the current bureaucratic and administrative procedures, to the archaic and rudimentary systems with which Registry offices are still managed. For example, we could just think about the ways and time-scales in which we manually update the population registers using census data.

The fundamental problem remains, therefore, to substantially change the technical and organizational level, a set of administrative services on which necessarily depend the basic documents for the scientific study of population phenomena.

#### *Omissis*

In order to keep the argument limited to our subject, one may demand whether the system, whose functioning and performance we have briefly described, is suitable to be applied to the entire country, to the extent of automatically making available a complete record of demographic phenomena at the territorial level and almost continuous in time.

The answer we should give, as an indication of a prospect gradually achievable, is yes. It is obviously not to equip each municipality with its own computer. However the characteristics of current computers and in particular the techniques of transmission by a remote terminal operating alternately or simultaneously on "input" and "output" and of "time-sharing" use, allow you to realistically configure a system of interconnected centres, territorially structured from the periphery to the centre, and capable of ensuring, to varying degrees of competence and detail, the systematic production of statistical information and, at the same time, the discharge of a comprehensive set of services and administrative functions.

At present this is how what in current terminology is generally called "information system" looks: and in this way we can find a solution, in the forms made possible by technological progress, for the problem of public statistical services' peripheral organization, on which the debate has been open for a long time.

Medium-power electronic systems of the type currently used in Bologna, are able to automatically manage the registers of the entire population in each province. They are the basic elements of a network that passes through the regional centres, operating as databases supplied and updated by the peripheral centres, and connected to a national centre responsible for statistical documentation for the country's entire territory.

The structure has a purely conceptual scope and indicates just one of several possible alternatives. However, it is useful to underline the fact that, in today's scientific and technological progress, there is no technical preclusion to the im-

plementation of a generalized system for the automated record and analysis of demographic events.

In practice, the problems are numerous and very complex. But they originate exclusively from the need to change the bureaucratic-administrative organization at all levels, to make it compatible to work with the most advanced technical tools. Sometimes these problems are made even more complicated by the resistance of scientific communities that hide behind a scepticism of circumstance their lack of commitment or their inability to work outside a traditional research "routine". However, deferring the solution not only would further aggravate the general backwardness of the public administrative system, but would also have the effect of increasing the conditions for a scientific delay whose symptoms and consequences are already apparent today in the areas in which we operate.

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