

# Methods and Techniques Used for Statistical Investigation

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## Abstract

*Statistical investigation methods are used to study the concrete mass phenomena and diversify according to statistical research stages: data collection, data processing and analysis. All of the operation processes and methods of statistical investigation constitute the methodology of statistics. To capture the exact trends of mass phenomena in the socio-economic area and to estimate their evolution, statistical activity follows a rigorous program with concrete actions named statistical investigation which includes all operations of collecting, systematization, classifying, processing, storage, analysis and interpretation of statistical data.*

**Key words:** census, collective data, investigation methods

**J.E.L. Classification:** C10, J10

## 1. Introduction

A first stage of statistical investigation is represented by the observation of individual data on the studied phenomenon. Data collection can be performed directly by observing, interviewing or based on existing documents in the information system. A large proportion of statistical data can be collected from the information system of economic and social units, from databases of different systems from different statistical publications (yearbooks, periodicals). Also, data can be collected through special investigations (censuses, surveys and monographies) (Biji et al, 2010).

The data collected provides individual information, but for decision making are required collective data and synthetic information which can be obtained by centralizing and systematization of the primary data. An important method of systematization is grouping method by which is identified the composition of statistical population, the location and significance of each group. Based on the homogeneous groups or classes, are calculated the synthetic indicators.

## 2. Census- method of statistical investigation

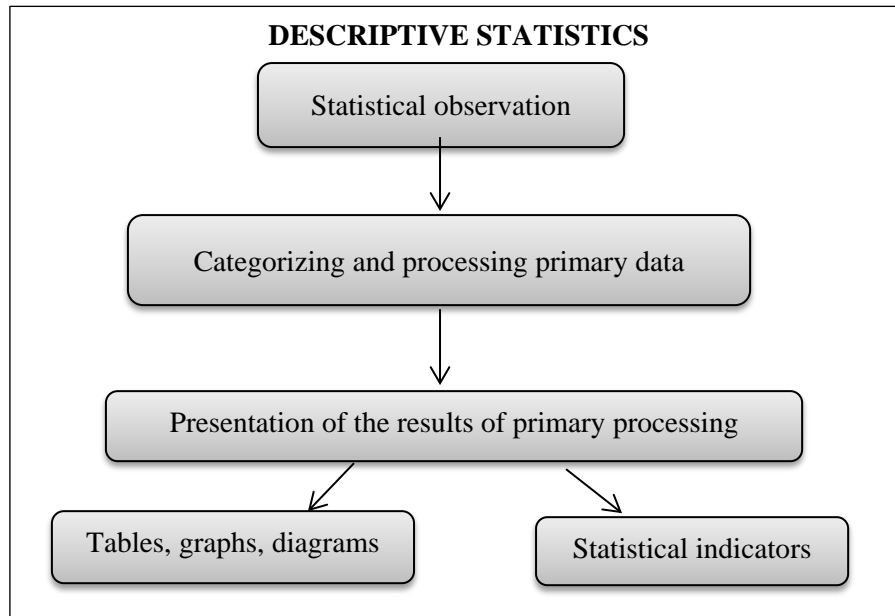
In the operation of data processing, there are used specific methods and techniques of study of the distribution of the series, the regression and correlation methods and the analysis of time series. The final stage of statistical investigation is the analysis and interpretation of results and formulation of statistical conclusions. Complexity of statistical research impose the need for continuous improvement of the methods of observation, processing and statistical analysis. A significant role in the development of statistical methods represents the progress achieved in the theory of probability and mathematical statistics and in computer science.

Depending on the objective, methods and techniques used, the generalizability of the findings, the statistical research is classified as follows:

- Descriptive statistics (exploratory statistics) which aims synthesizing and structuring the primary data in a direct and intuitive manner as well as presenting data processing in the form of charts, tables, graphs, numerical indicators;
- Inferential statistics (decisional statistics) that aims to extend the results obtained from the sample of the data to general population and to confirm or disprove the assumptions made in descriptive statistical research.

Descriptive statistics is also called the statistics without random patterns. It makes assumptions about possible extension of the findings to the entire population, but does not verify the truth of these assumptions. Inferential statistics aims to expand the results based on the sample data to the general population. It is based on the probability theory and has specific characteristics such as: generalization of the results through induction, generalization of conclusions from sample to total population by using specific methods.

Figure no.1 Descriptive Statistical Research



Source: (Adapted from Isaic-Maniu et al, 2004)

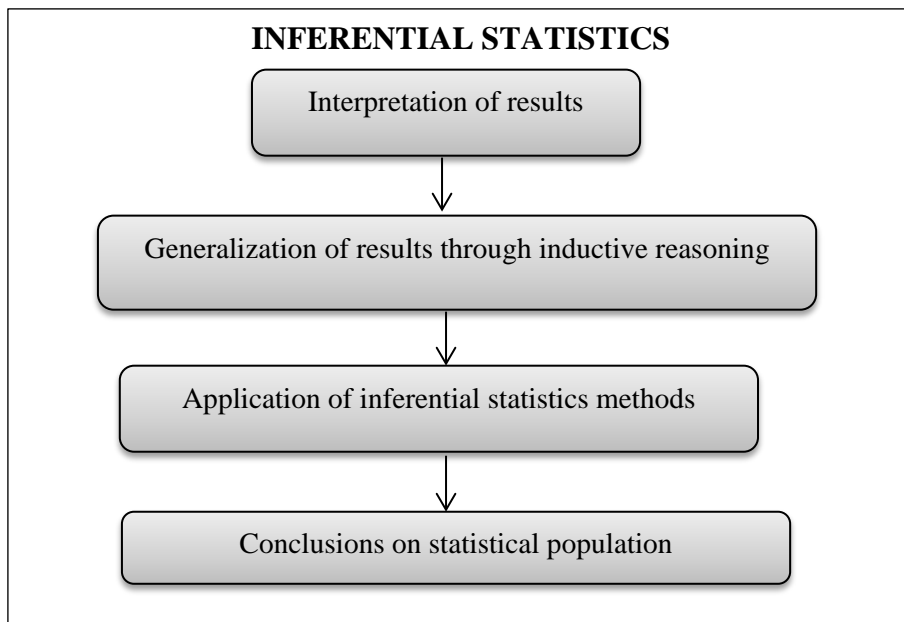
In practice, statistical observation of social and economic phenomena is realized in different ways, depending on the type and nature of phenomena, the objective pursued, as well as the organization of economic and social activity. In statistical information system, statistical forms reported by economic agents represent the main method of observation and data collection, named statistical research.

Statistical surveys represent official documents that economic agents with public or private capital are obligated to prepare in a specific form, using a uniform methodology for calculating pursued indicators. Statistical surveys are prepared for small periods of time (monthly, quarterly) or for extended periods of time (semester, annual).

The census is the oldest method of statistical observation and is basically an overview of the phenomenon at a moment of time, by uniformly and simultaneously criteria to all units of the population surveyed. Census is a total observation, characterizing static phenomenon, with adequate periodicity according to the set objective. The period of the census preparation is great, because of the consulting of the similar methodologies for conducting censuses in the past, on national or international level. Definitions, classifications, nomenclatures align the recommendations made in this respect by international organizations, bringing them the experience gained by the national statistics of each country.

Census is a broad statistical operation that occurs at regular intervals (usually 10 years) representing the counting of official population within a country and the smallest sub-geographic territories, together with a selected number of demographic characteristics and social needs of the population. The purpose of the census is to provide detailed and reliable information necessary for planning and implementing economic and social development policies, at national and local level, for administrative activities or scientific research.

Figure no.2 Inferential Statistical Research



Source: (Adapted from Isaic-Maniu et al, 2004)

The most recent census in Romania was conducted between 22 and 31 October 2011. The Population and Housing Census from 2011 was the first held after Romania joined the European Union. Compared to previous censuses, it has provided the European Union data and information necessary to know the human potential of the entire European community, with relevant information on the migratory movement of the population between different member states and outside, with a particular focus on the working age population.

European Commission Statute (document under which are organized national censuses) decided that all member countries to conduct census in the same year (2011) to provide premises for comparability at European Union level. The slogan of the census "Because everyone counts" indicates the idea that each person registered and every information obtained from the census are crucial in supporting the programs and projects of development both at European Union level and at national and local levels.

Being a complex and expensive action, in terms of financial and human efforts, Census 2011 involved over 120.000 persons employed only for recording operations in the field and spending over 193 million lei. According to census outcomes, Romania's population was 20.121.641 persons, of which 10.333.064 women (51.4%).

Table no.1 The evolution of Romanian population according to census results from 2002 and 2011

<b>Population</b>	<b>Total</b>	<b>Male</b>	<b>Female</b>	<b>Urban population</b>	<b>Rural population</b>
2002	21.680.974	10.568.741	11.112.233	11.435.080	10.245.894
2011	20.121.641	9.788.577	10.333.064	10.858.790	9.262.851
Growth rate (%)	-7.19	-7.38	-7.01	-5.04	-9.59

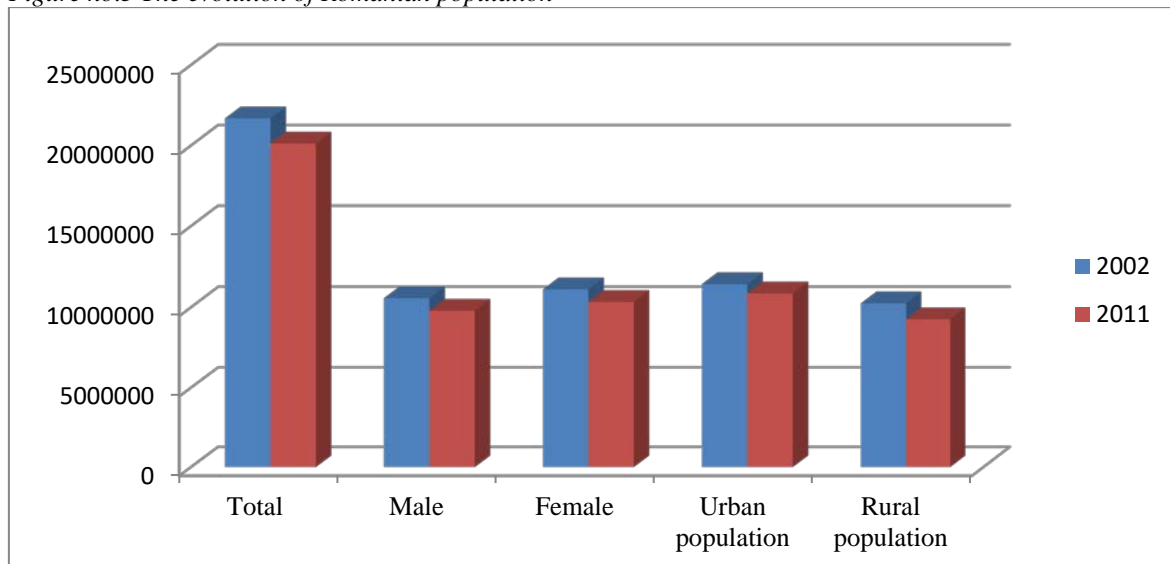
Source: National Institute of Statistics, Statistical Publications, available at : [www.insse.ro](http://www.insse.ro)

Compared to the situation at the previous census (2002), the resident population dropped by 1.559.333 persons, mainly due to external migration. The first six counties, except Bucharest (1.883.400 persons) by the number of resident population are: Iasi (777.300 persons), Prahova (762.900 persons), Cluj (691.100 persons), Constanta (684.100 persons), Timis (683.500 persons), Dolj (660.500 persons).

Counties with the lowest number of people are: Covasna (210.200 persons), Tulcea (213.100 persons), Salaj (224.400 persons), Mehedinti (265.400 persons), Ialomita (274.100 persons) and Giurgiu (281.400 persons). Depending on the residence, in municipalities and cities lives 54.0% of the total population, the share increased by 1.3% over the last census.

On October 20, 2011, children (0-14 years) had a share of 15.9% of the total resident population, young population (15-24 years) represented 12.3%, adult population (25-64 years) formed the majority of 55.7% and persons aged 65 and over accounted a share of 16.1% of the population. Persons aged 85 years and older registered a share of 1.3% of the population. By the completed level of education, 44.2% people had low level of education (primary, secondary or no education), 41.4% had medium level of education (high-school, vocational school) and 14.4% people had higher education.

Figure no.3 The evolution of Romanian population



Source: made by the author based on data provided by National Institute of Statistics, Population and Housing Census, available at: <http://www.recensamantromania.ro/en/>

On October 20, 2011 there were registered 254.400 illiterate people. The number of persons gone abroad for a period of at least one year, which are not part of resident population, was 727.500 people, which are only a part of the total foreign immigrants. This under-registration was due to the fact that at the time of the census, most of these people have left with their families abroad and there were no other people in the country to declare the required information about them.

Compared to 2002, the distribution of population by age clearly shows the aging of the population. Thus, the age group 10-14 years, 15-19 years and 20-24 years have decreased as a share of total stable population, due to the continuous decrease of births after the year 2002. Age groups 25-29 years, 30-34 years, 35-39 years registered a higher share than in 2002 due to the aging of generations of 15-29 years. Age group named "decrees" (40-44 years) has the highest rate of 8.7%. However, age groups 75-79 years, 80-84 years, 85 years and over account 7.2% of the resident population, compared to 4.9% as it had in 2002.

Age group 25-64 years represents the labor resources of a country and a premise for economic development of the counties. Not incidentally, the counties with economic potential have the largest share of this age group in the stable population. These counties are: Bucharest (61.1%),

Iflov (58.3%), Constanta (58.2%), Brasov (57.9%), Timis (57.4%), Arges (57.5%), Tulcea (57.1%).

Compared to 2002, it is noticed an increase in the level of education of the stable population. Thus, the share of people with higher level of education increased from 7.1% to 12.6%, of the people who graduated high-school increased from 21.4% to 24.4% simultaneously with the decrease of the share of persons with primary education from 20.1% to 14.2%. People with no education represent 3% of the resident population, while in 2002 they had a share of 5.6%.

Women with university studies have a higher proportion than in 2002 (the share was two times higher). A quarter of men have completed secondary education. Higher education is more common among people in rural areas (22.4% of the stable population living in cities have a university degree, compared to 4.7% of the villagers). Instead, in rural areas are more common people with secondary education (36.6% compared to 19.0% in urban area) and with primary education (20.9% compared to 8.5% in urban area).

### 3. Conclusions

An important role in the gathering and learning process about observed phenomena has the statistical investigation methods and techniques. The ultimate goal of statistical investigation is to research a real world situation and to expand the body of contextual knowledge. Census method refers to the complete information about a population. This population may be a place, a group of people, a specific locality or country through which the data is collected. The census method is suitable when the population is not vast, when there is enough time to collect data. Some of the disadvantages of census method are: is a costly and time consuming method, requires a lot of people involved in data collection.

The success of the census depends essentially on two factors:

- Clear and accurate working materials (questionnaires, manual guide) which depend on the professionalism and quality of the census employees, especially statisticians who developed these materials in accordance with international methodological standards;
- The availability of people to give sincere answers to census questions, which can be achieved only by an appropriate promotional partnership with the media. While receiving the reviewer and dialogue with him is a legal and civic obligation, the answers depend exclusively to the free declaration of the respondent, not requiring providing any document, except the personal identification number. All information to be provided shall enjoy the protection of confidentiality guaranteed by law that it cannot be used for any other purpose than statistical.

### 4. References

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