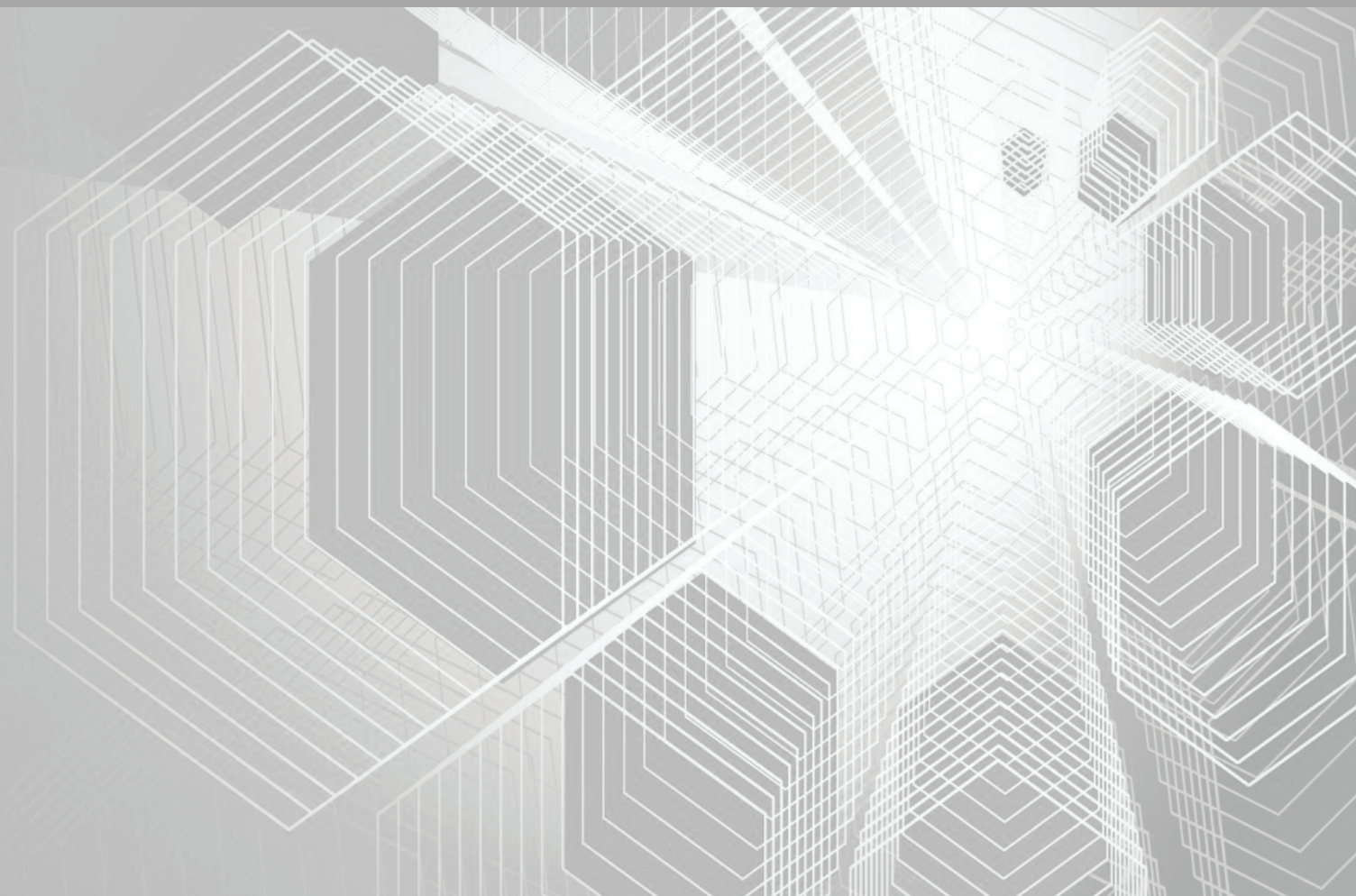


METHODOLOGIES AND STANDARDS

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Labour force survey

LABOUR FORCE SURVEY

METHODOLOGICAL GUIDE

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Preface

This guide contains methodological guidance to carry out the “Labour Force Survey” which is conducted according to the Law on Official Statistics (“Official Journal of the RS”, number 104/09).

The guide contains all necessary methodological explanations concerning the objectives of this survey, related definitions, and units of observations, survey units and their characteristics, as well as data quality.

Statistical standards from regulations and recommendations of the European Statistical Directorate and International Labour Organisations are used to compile this guide.

In Belgrade, 2017

Director
Dr Miladin Kovacevic

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1. LABOUR FORCE SURVEY – BASIC INFORMATION

1.1. Legal basis

The survey is regulated by the Law on Official Statistics (“Official Journal of the RS”, number 104/09).

1.2. Objective of the Labour Force Survey

A survey is an investigation method based on a sample of units of observation, and the questionnaire is the main tool used to obtain responses about the survey subject through interviews.

The data collected in the Labour Force Survey (hereinafter: LFS) serve to monitor, measure and estimate economic and social trends in the Republic of Serbia.

LFS is carried out in line with the standards and recommendations of the International Labour Organisation – ILO, as well as with Eurostat regulations (*COUNCIL REGULATION (EC) No 377/2008*, *COUNCIL REGULATION (EC) No 577/98*, *COMMISSION REGULATION (EC) No 430/2005*), regarding methodology, organization, sampling procedure, questionnaire design and definitions of employment and unemployment. Harmonised methodology, definitions and classifications with international standards allow comparing a large number of LFS data with equivalent data from other countries, particularly European.

The main objective of this survey is to obtain data on three main mutually exclusive population contingents: employed, unemployed and inactive persons. As far as employees are concerned, LFS registers their professional status (self-employed, employees or contributing family workers), type of ownership they work in, rights at work, occupation and activity, number of working hours, additional job (if any), etc. As for the unemployed, LFS scrutinizes the way of seeking work, length of seeking work, previous professional experience, etc. Apart from the aforesaid categories, demographic, socio-economic, educational and other characteristics (age, sex, marital status, place of residence) are also studied.

The results of the survey are published as aggregates, thus securing full confidentiality of information about households and individuals, according to the provisions of the Law on Official Statistics. The data are published on quarterly and annual basis. The users of LFS statistics are the Government of the Republic of Serbia, National Bank of Serbia, ministries, Chamber of Commerce of Serbia, non-governmental organisations, Eurostat, International Monetary Fund, World Bank, International Labour Organisation, United Nations, UNESCO and other international organisations, as well as scientific and educational institutions, press agencies and private users.

Since the first surveys of labour force in the world, the definitions used in LFS, questionnaire content, periodicity, interviewing method and estimation have been subject to constant improvement.

1.3. LFS background

LFS was first introduced and carried out in 1994 as a pilot survey. Starting from 1995 it was conducted regularly once a year till 2008, when it was conducted twice a year (in April and October). In 2014 it was carried out quarterly, in February, May, August and November. Then, in 2015 it switched to a **continuous periodicity**, which led to an enlargement of the number of households in the sample and modification in the method of estimation.

In the period from 1994 to 2003, the sampling frame was the Census of Population, Households and Dwellings from 1991, and the sample comprised approximately 3 900 households. In 2004, the sampling frame was the Census from 2002 and 6 500 households was included in the sample. During the following years the sample was enlarged, covering 44 660 households in 2014 and 54 578 in 2015. Since 2016, the planned sample includes approximately 68 640 households. Since 2014, 2011 Population Census has been used as the sampling frame.

In addition to the paper questionnaire (*Paper Assisted Personal Interview – PAPI* method), in use from the very beginning of the survey, telephone interviewing (*Computer Assisted Telephone Interview – CATI* method) was introduced in 2009 for households selected in the sample for the second, third or fourth time. Since 2015, the paper questionnaire has been replaced by an electronic one, i.e. the survey has been conducted using laptops in fieldwork (*Computer Assisted Personal Interview – CAPI* method).

Table 1. Review of the changes in the sample size and LFS periodicity

	1994	1995–2003	2004–2007	2008–2012	2013	2014	2015	2016	2017
Periodicity	First time as a pilot survey	Annual periodicity – survey in October		Semi-annual periodicity – survey in April and October		Quarterly	Continuous	Continuous	Continuous
Size of the planned annual sample	3.900	3.900	6.500	20.000	22.196	44.660	54.578	68.640	68.640
Sampling frame: censuses	1991	1991	2002	2002	2002/2011	2011	2011	2011	2011
Data collection methods	PAPI	PAPI	PAPI	CATI (from 2009) and PAPI	CATI and PAPI	CATI and (switch from PAPI to CAPI)	CATI и CAPI	CATI and CAPI	CATI and CAPI

In the process of producing survey tools in 2004 the content of the questionnaire was modified, thus allowing more precise definition of the population contingents which are obtained in this survey. In 2008, the questionnaire was subject to substantial revision which enabled, among other things, a more comprehensive coverage of the contingent of employed population. The following years the questionnaire has been continuously harmonised with Eurostat standards.

1.4. Determining the status of labour force

In LFS every individual household member aged 15 and over is regarded as employed, unemployed or inactive. Consequently, persons who worked at least one hour in the reference week are considered employed, while those who were not employed but actively searched for a job in that period and are available to start within two weeks are classified as unemployed. The rest of the population, which does not fall into the group of employed or unemployed persons, are counted as inactive (out of the scope of labour scope).

“Work” means any work for pay, profit or payment in kind or in form of services even if the work lasted only one hour. It is not important whether it was performed by a person in formal employment or not because the concept “employed” in this Survey does not imply only persons who are in formal employment, but also those under any other form of employment for pay, profit or payment in kind (in goods or services). Consequently, employed persons are also persons who upon agreement give exclusively private instructions, as are those who carry out this activity in regular employment, whether in a public or private school. A person who works in own enterprise, person working under service contract, author contract or performing occasional jobs mostly paid in cash, but without written agreement, is regarded as employed as is a worker employed in a public or private enterprise. An employed person is also a farmer cultivating land solely for own needs and contributing thus to significant cut of the total household expenses, as well as the one who trades own products on the market.

Persons who perform exclusively minor agricultural work in free time, thus not contributing significantly to reducing the total household expenses, without carrying out any other work for pay, profit or payment in kind or in form of services, are not counted as employed persons.

Unpaid homework (e.g. homemaker’s work) and volunteering **are not considered work**.



The use of the criterion “**at least one hour** in the reference week” allows including all types of employment (full-time and part-time, occasional and temporary jobs, etc.).

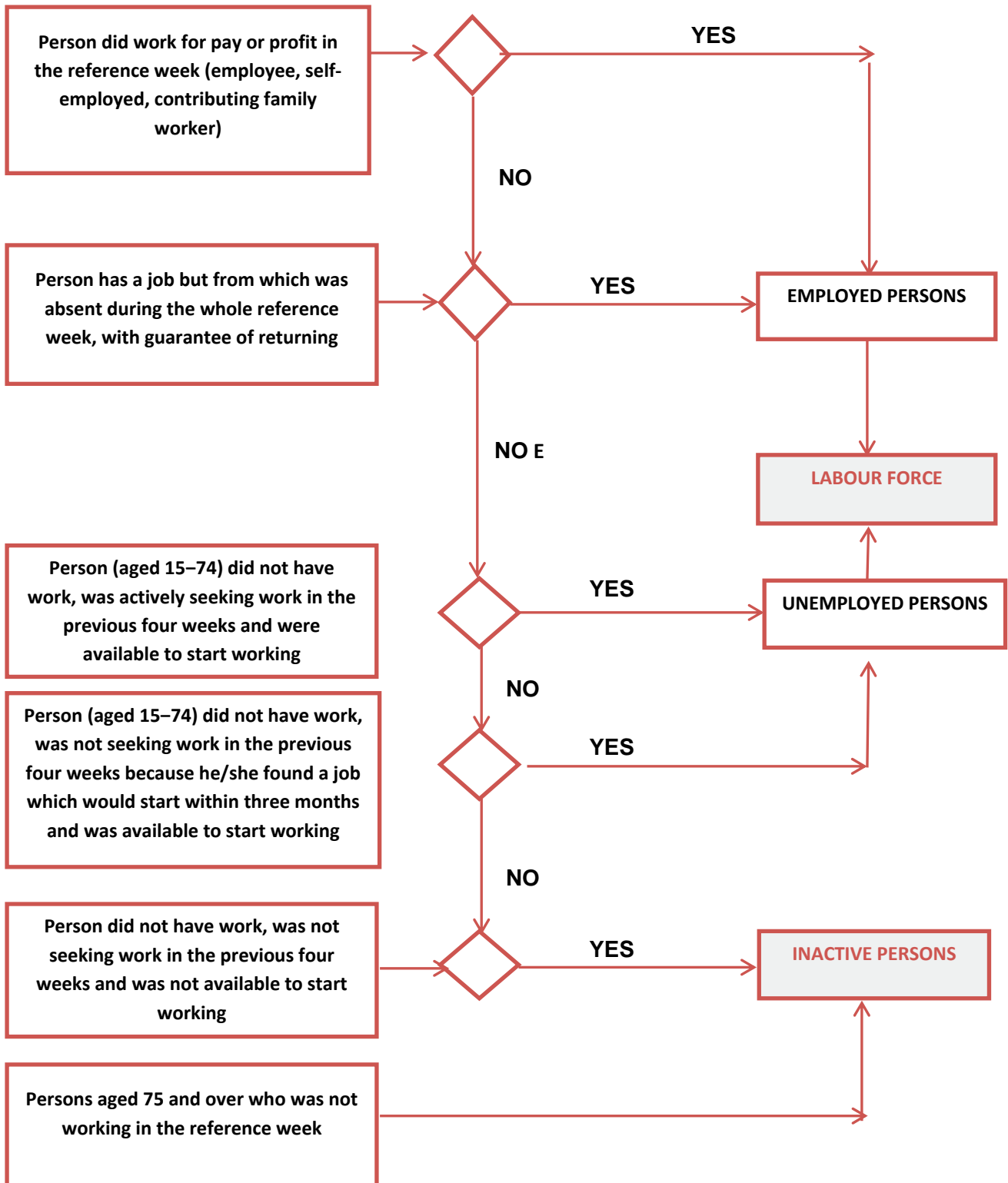
Unemployed are only those persons who actively search for a job (through ads, recorded in the National Employment Service, ask relatives/friends about vacancies) and are available to start within two weeks following the reference week if offered an adequate job.

To determine the status of unemployment in LFS the reference period for the duration of work seeking is taken to be the **four weeks** before the reference week.

Note: *The reference period for work seeking (four weeks) is longer than the reference period concerning the questions about employment (one week) due to certain activities undertaken in searching for work (e.g. awaiting the outcome of a job competition).*

Persons who **do not fall into labour force** are those persons who during the reference week did not perform any paid work, did not actively search for a job or were not available to start within the two weeks after the end of the reference week.

Diagram 1. Classification of labour force



2. CONCEPT AND DEFINITIONS

2.1. Basic concepts and definitions

Household

A household is:

a) any family or other community of persons who declare sharing living accommodation and income to satisfy basic subsistence needs (housing, food, etc.), whether all the members are at the household location or outside during the survey;

b) any person who lives alone (one-person household) and does not have own household at another location, who lives in separate or shared dwelling or as a single person-tenant, whether living in the same room with another single person or with landlord's household members, and does not pool income but pays own housing.

Target population

Target population involves:

- Persons who reside or intend residing one year or longer in the territory of the Republic of Serbia;
- Persons who are members of the interviewed household, but are absent or intend being absent from the household less than one year.

The target group is not composed of persons who reside or intend to reside less than a year in the Republic of Serbia neither persons who are absent or intend being continuously absent from the interviewed household one year or longer (live and/or work abroad, permanently moved out from the household, etc.).

Head of household

Head of household is the household member recognised as the head by the other members of the household. This can be a person with the highest income, the oldest person, the person who owns the housing unit, etc. Household members can select any criteria they want to determine the head. Any private household must have a head of household, and the latter can be only one person. This person cannot be under the age of 15 and must belong to the target population. LFS records the relationship of every member with the head of the household.

Reference week

LFS is carried out as a continuous survey where interviews take place every week during the year. The reference week is the week coming before the interview and includes the whole calendar week (from Monday to Sunday). The labour force status is determined to the reference week so the latter is also called the week of observation. The first reference week in the year must cover the first Thursday in the year, and the first quarter includes 13 reference weeks.

2.2. Employment – concept and definitions

Employed persons

Persons who performed a paid job (for cash or in kind) at least for one hour in the reference week as well as persons who had an employment, but were absent from it during that week (with a guarantee of returning to it) are considered employed persons.

Employed persons are persons who have a formal employment in an enterprise, institution or in another type of organization, persons who work by their own (unincorporated private enterprises, individual farmers, persons who performed any job they had found and made agreement by themselves – orally or in written). Apart of the mentioned, employed persons are also contributing family workers in a family business owned by a household member and defined as unpaid work that directly contribute to the functioning of the observed family business.

LFS does not take into account the formal status of the interviewed persons. The labour status is determined on the basis of the actual activity performed in the reference week.

According to the Classification of professional status of employed persons, they are classified into **self-employed, employees and contributing family workers**.

Self-employed

Self-employed are the persons who work as sole proprietors of enterprises, in institutions, private shops or agricultural holds, as well as persons who perform a professional activity or some other activity for their own account. Self-employed are those persons who define by themselves the conditions of their work (as well as their employees' work) and bear the risk for their work.

Employees

Employees are the persons who work with an employer in any ownership sector, whether having a formal contract of employment or based on a verbal agreement. Household members who help in running the family business and who are paid for their work are considered employees.

Contributing family workers

Contributing family workers are the persons who help another family member in running the family business or agricultural holding, however do not receive any remuneration for it. Those persons are considered employed even though not being paid for their work because their profit from their work in form of benefits such as accommodation, food, etc.

Active population (labour force)

Active population includes all employed and unemployed persons.

Formal employment

Formal employment includes persons who have a formal contract on employment, i.e. an employee-employer relationship for a definite or indefinite time, persons who perform independently an activity in registered ownership or are founders of registered enterprises or entrepreneur's shops, as well as persons who undertake an agricultural activity registered in official government institutions.

Informal employment

Informal employment includes employees without written contract, self-employed in unregistered business, as well as contributing family workers.

Employment of unlimited/limited duration

Paid employment can be broken down into permanent or temporary. This classification concerns employees (employed with an employer).

Permanent employment means the existence of a fixed-term employment contract (even when it is known in advance that lay-off or enterprise's shutting down is to happen in the near future).

Temporary employment means the date of work cessation fixed in advance.

Temporary employment concerns also employees engaged by an employer to perform a certain work, the duration not being defined in advance, i.e. depends of the time needed to do the work. The collected information about the temporary work is classified in three groups: work for fixed time, seasonal and temporary work. Seasonal work is done during a season, most often in construction, tourism, catering, agriculture, etc.

Ownership

Ownership sector in which the person works (private, public, other).

Working time

In Serbia the working time is 40 hours a week. In certain cases full-time work can be less than 40 hours a week, but not less than 36 hours a week.

Part-time employees are persons who work less than 36 hours a week.

Hours usually worked

Hours usually worked are the number of hours that a person spends at work per week. A longer period of time is used to determine the usual number of hours (at least the last 4 weeks), excluding weeks in which a person was absent from work (such as: holidays, sick/maternity/parental leaves, annual leave). They are defined on the basis of an agreement with the employer, usual volume of work or some other criterion.

Hours actually worked

Hours actually worked are the number of hours that an employed person actually spent at work in the reference week. Those hours can be distinguished from the hours usually worked due to overtime, absence from work for various reasons, reduced volume of work, etc.

Overtime

Overtime is the number of hours that an employee actually worked but surpasses the number of working hours defined by contract between the employee and employer.

Main job

When a respondent has several jobs, she/he must decide by herself/himself which is the main one. The main job can be the job that a person performs in an enterprise where her/his employment booklet is, the job in which she/he spends most of the time or in which she/he earns the highest pay or profit.

The person who in the reference week changed job should count as the main job the one she/he performed at the end of the reference week. A person who was absent from work in the reference week should provide data on the job from which she/he was absent.

Occupation

Occupation is a set of tasks and duties that an employed person carries out (whatever the field of attained education). According to the Classification of Occupations from 2011, occupation is “a set of jobs that are from their content, technological and organizational point of view similar and mutually connected”. For the persons who are not currently employed, the information about the occupation refers to the job a person performed previously.

Occupations are coded according to the Classification of Occupations (*ISCO-08*). The occupation code is a four-digit one.

Economic Activity

The economic activity refers to the production or services performed/provided by a local unit of an enterprise where the interviewed person is employed. For those who are not currently employed, the information on the economic activity concerns the work that the persons had performed previously.

The activities are coded according to the Classification of Activities of the European Union (NACE, rev. 2), which is comparable with the UN classification of activities (*ISIC, rev. 4*). The code of activities is a three-digit one.

Local unit

A local unit is a geographical location where the work is performed, which is usually made of one building, part of one building or several buildings. Thus, a local unit is made of one employed persons or a group of employed persons in an enterprise (Ltd., JSC) or in another legal entity (government body, non-profit organisation, etc.), which are located at the same territorial location. This can be a property, laboratory, shop, garage, bar, café, hotel, restaurant, office, warehouse, school, hospital, health centre, house, etc. where the person performed the work.

For the person who works in an enterprise (Ltd. JSC) or in another legal entity (government body, non-profit organization, etc.), who rent premises from another enterprise for conducting her/his activity, indicate the economic activity of the enterprise in which the person works, whatever the economic activity of the enterprise in which premises she/he works (e.g. a person works in a shop that is registered for photocopying, binding operations, and goes out on the market independently, and is located in the premises of a faculty, indicate “photocopying and binding” instead of the economic activity of education, i.e. “faculty”). For local units of an enterprise that perform an economic activity other than that of the mother enterprise, and that are **not located** at the same site as the mother enterprise, indicate the economic activity they perform.

Wages and salaries

The information on employees’ wages and salaries (employed with an employer) earned at their primary place of work is also obtained through this survey. The respondent is firstly expected to say to the interviewer her/his monthly wages and salaries. In case of refusal, she/he is offered to choose an interval that suits her/his monthly wages and salaries. The respondent has the right not to answer this question.

Additional job

An employed person can have apart of the main job an additional, supplementary or honorary job, which she/he performs in return for remuneration in cash or another remuneration.

Information referring to respondent’s additional job is limited to hours of work spent on the additional job, status on this job and economic activity of the additional job.

2.3. Unemployment – concept and definitions

Unemployed

Unemployed persons are persons who did not perform any paid work in the reference week, sought actively work during four weeks before the reference week and were available to start working within two weeks following the reference week. This category also includes persons who did not seek work during the four weeks because they found a job that should start after the end of the reference week, at the latest within three months and are able to start working within two weeks following the reference week.

Duration of search for employment

The duration of search of employment involves the period of the last continuing active search for employment without significant interruptions (significant interruptions are interruptions of more than four weeks). For persons who found an employment, counted is the period starting from the moment when the person started searching for employment, including the day when employment was found.

Long-term unemployment

Long-term unemployment is the uninterrupted unemployment lasting one year and more. Uninterrupted unemployment is the period of the last continuing active search for employment without significant interruptions (significant interruptions are interruptions of more than four weeks).

Method of search for employment

LFS identifies different methods of search for employment that unemployed persons used during the four weeks before the reference week. The methods can be active (applied directly to employer, registered to the National Employment Service, contacted friends or relatives; placed or answered advertisements...) and passive (awaiting the results of an application for a job previously sent, waiting the call from the National Employment Service, awaiting the results of a competition to a public institution...). The interviewer records every method used by the respondent in seeking a job.

Only the person who took one of the active steps in the previous four weeks to find a job is to be counted as an unemployed person.

2.4. Inactive – concept and definitions

Inactive population

Inactive population includes all persons aged 15 and over who are not classified into employed and unemployed population. Inactive population covers students, retired persons, homemakers, as well as persons who did not perform any work in the reference week, did not seek actively work or were not available to start working within two weeks following the reference week.

Potential active population (potential labour force)

Potential active population includes the persons who take active steps to find a job but cannot start working immediately, i.e. within two weeks, as well as persons who can immediately start working but did not take active steps to find a job. This contingent includes also so-called discouraged persons, i.e. persons who do not undertake steps to find a job because they are convinced they cannot find one although they could start working immediately in the case a job was offered.

2.5. Other concepts

Subjective employment status

Subjective employment status is the employment status of the interviewed person according to her/his own opinion and not according to her/his actual activity in the reference week.

Active rate

Activity rate is the percentage share of active population in the total population aged 15 and over.

Employment rate

Employment rate is the percentage share of employed population in the total population aged 15 and over.

Unemployment rate

Unemployment rate is the percentage share of unemployed population in the total active population.

Inactivity rate

Inactivity rate is the percentage share of inactive population in the total population aged 15 and over.

Long-term unemployment rate

Long-term unemployment rate is the percentage share of the unemployed for one year and more in the total active population.

Informal employment rate

Informal employment rate is the percentage share of informally employed persons in the total number of employed persons.

Lifelong learning

This indicator includes persons aged from 25 to 65 who received in the last four weeks education or training.

Early school leavers

This indicator includes persons aged from 18 to 24 which highest educational level is primary school or less, who were not receiving education or training in the last four weeks.

„NEETs“

The indicator ‘NEETs’ involves persons aged between 15 and 24 who are not employed, but are not receiving education or training.

3. DATA COLLECTION

3.1. Interviewing

Field and telephone interviewers are engaged in the collection of data. They are the main stakeholders in LFS conducting and the success of the survey depends on their work. The realization of LFS is dependent on how they make interviews, are acquainted with the essence of the questions in the questionnaire and on how they interpret them. Their diligence and efforts are also important.

Since 2015, the change in periodicity, interviews have been conducted every week (from Monday to Sunday), where in one week only one subsample is interviewed, and in the following one another subsample, and so on. The respondents provide answers about their employment activity in the week which is the reference week for them.

The first interview is made through personal contact, i.e. interviewer's visit to the household. The interviewers have laptops with an installed electronic questionnaire. During the first visit, the interviewers record household's contact telephone in order to carry out the next three interviews through the call-centre. The interviewer collects first socio-demographic information for each household member, and then information about employment status of members aged 15 and over. In the next round, the interviewer checks the socio-economic information collected in the first interview, and then she/he gathers information about the employment status for the current quarter. The interviewer must make sure that the person providing information for other household members has correct information.

3.2. Supervision and quality control

Supervisors and trainers, who play an important role, oversee interviewers work. Supervisors are the primary link between the survey management team (trainers) in the Statistical Office of the Republic of Serbia and the interviewers themselves; they are responsible for the field work, call centre and work quality. All the participants have clearly defined tasks and duties within a timetable. Every one of them should do their best and secure the realization of quality field work, in the scope of their duties.

Supervisors should oversee and control interviewers' work, inform the trainers about potential problems on the field and in the call-centre, as well as report regularly about each interviewer's work. Supervisors are under trainers' supervision.

To do additional control of conducted surveys supervisors re-call at a later date the households. This way a certain percentage of interviewed households of each interviewer are checked, incorrect data are corrected and the work of each interviewer is evaluated.

Supervisors and trainers, who oversee interviewers' work and the materials, are provided with a web application that is up-dated every three hours, and which allows controlling the reception of field materials, interviewers' output and other data that can be indicative of potential problems during the conduction of this Survey.

3.3. Non-response

The co-operation of households with the interviewer, i.e. the percentage of response is a very important element of the Survey and has a direct impact on data quality. In case of a greater percentage of non-response one obtains a false picture of the labour force market. This is due to unequal representation of certain population categories.

In order to secure co-operation between households and interviewers visiting the former, all selected households receive a **letter of information** mentioning the: objective and purpose of the survey, timeframe of interviewer's visit, protection, i.e. secrecy of data, way of handling information collected by the interviewer. This is how an interviewer's visit is announced.

The interviewer goes to the household to obtain its agreement to participate to LFS. Whether the household will accept immediately to co-operate depends a lot on how the interviewer introduces the survey. One of the main tasks of the interviewer is to establish good relationship with the respondent. Interviewers must make their best to obtain answers from every members of the observed household.

If the time of interviewer's visit or call is inconvenient, household members may agree with the interviewer another more adequate appointment. In case that there is nobody at home, the interviewer leaves on the door a note on the next visit with the date.

However, despite all the attempts there are always a few households that did not give answers, including those that refused to co-operate, do not want to be disturbed, temporarily vacant dwellings, as well as other reasons.

4. DATA PROCESSING

The tool for data collection in LFS is the electronic questionnaire, which is both used by interviewers doing the telephone interview (*CATI*) and those working on the field (*CAPI*). Utilising the electronic questionnaire saves time and money needed for data entry and processing. All the interviewers use the same questionnaire, but **logical control** (implemented to reduce as much as possible the number of errors in data entry) is not the same for telephone interview and field work. Logical control for *CAPI* is lighter because it is reckoned that an interviewer should stay on in the household as little time as possible, thus they do not enter the codes of occupations, economic activities and field of education, but only describe the requested information. Coding and complete logical control of field work materials are performed after data entry in the central database located on the server of the Statistical Office of the Republic of Serbia in the Computer Centre. The data collected by telephone interview are directly registered in the central database, and then coded. Full logical control is applied for them during data entry. The data collected by interviewers on the field are to be entered locally in the portable computer during the interviews as there is no equally good Internet access on the whole territory of the Republic of Serbia. Field interviewers, upon completed interview, send as soon as they can have stable connection to the Internet through a supporting application the gathered data to the unique database for data reception from the field, which is also located in the Computing Centre of the Statistical Office of the Republic of Serbia. Once the time for data entry for the reference week elapsed, one checks whether all the materials for that reference week have arrived from the field, and if need be, one contacts the interviewers whose materials are missing. Upon gathering the materials for the reference week, those are transferred to the central database for coding and additional checking.

Before the implementation of the electronic questionnaire the interviewer collected information on a paper questionnaire. The data from the latter were entered by regional offices and head office in Belgrade, directly in the central database. The application that was used for the input of those data is the old version of the electronic questionnaire now being in use for telephone interviews.

4.1. Data editing

Data can be modified and edited in the course of the survey/interview. If an interviewer wants to modify the initial respondent's answer when she/he sees there has been an error, she/he can do it on site.

Upon the arrival of data in the head office, additional control is to be done, as well as the coding of occupations, economic activities and fields of education. Editing and processing phases refer to detecting logically incompatible information, as well as to their modification. Logical control in data entry is incorporated in the application, thus disabling the interviewer to enter illogical data and as such limiting such cases to the minimum. Logical control recognizes obvious incompatibilities (e.g. a respondent aged 15 who worked for the last time in 1940). If the value is suspicious but reasonable, the programme will alert the interviewer to check the entered data and confirm them if they are correct. This way error in data entry is prevented.

5. SAMPLING PLAN

5.1. Target population and population covered by the survey

The target population is all private (non-institutional) households and persons on the territory of the Republic of Serbia, without the region of Kosovo and Metohija, which represents a usual population. Excluded are persons in collective households (students' and pupils' dormitories, homes for children and youth with developmental disabilities, homes for socially vulnerable children, retirement homes, homes for disabled adults, monasteries, etc.). The survey population is restricted to all households living in the 2011 Census enumeration areas which had at least 20 households at the time of the 2011 Census. The survey population has been reduced by 1.5% in relation to the target population.

5.2. Sample type and size

The LFS uses a two-stage stratified cluster sampling approach. The sample of enumeration areas (cluster of households) was selected at the first stage. A sample of households was selected in each enumeration area at the second stage.

Enumeration areas as primary sampling units are stratified according to the type of settlements (town and other) and territory at NSTJ 3 level (25 areas: Beogradska oblast, Zapadnobačka oblast, Južnobačanska oblast, Južnobačka oblast, Severnobačanska oblast, Severnobačka oblast, Srednjobanatska oblast, Sremska oblast, Zlatiborska oblast, Kolubarska oblast, Mačvanska oblast, Moravička oblast, Pomoravska oblast, Rasinska oblast, Raška oblast, Šumadijska oblast, Borska oblast, Braničevska oblast, Zaječarska oblast, Jablanička oblast, Nišavska oblast, Pirotska oblast, Podunavska oblast, Pčinjska oblast and Toplička oblast).

The planned sample size for 2016 is 68640 households in 6864 enumeration areas. The sample was increased from 2016 due to the transition to the continuous periodicity of the survey in 2015 and the requirement that the precision of the estimates for the quarter should be in accordance with the EU regulations.

5.3. Rotation scheme and sample allocation

The LFS is based on the rotation panel design, by which each household participate in the sample for four times.

The rotating scheme 2-2-2 was applied. For each quarter four subsamples (rotating groups) are allocated. Each quarter (Q) in the sample is included: one new rotating group, two rotating groups from the previous quarter (Q-1) and one rotating group from Q-3 quarter. Based on the applied rotating scheme, each household and person selected in the sample will be interviewed 4 times within 18 months, i.e. each household and person is in the sample for two consecutive quarters, then for two quarters out of the sample and again for two consecutive quarters in the sample.

The applied rotation scheme based on the overlapping of the sample for two consecutive quarters, as well as for the same quarter in two consecutive years enables an efficient sampling plan for measuring the changes to the previous quarter and for measuring changes to the same quarter of the previous year. Proportional sample allocation according to the number of persons aged 15 and over, within the type of settlement and territory, has been slightly corrected in order to obtain more precise estimates on the level of areas.

The transition to the continuous periodicity of the survey required the sample distribution over time. Every subsample allocated for a quarter is uniformly and randomly distributed into 13 weeks, and exceptionally, which happens once in four years when are observed 53 weeks, the sample for one quarter (first or fourth) is distributed to 14 weeks. This was the case in the fourth quarter of 2015.

5.4. Sampling Frame and Sample Selection

The 2011 Serbian Population Census, was used as the frame for the selection of enumeration areas and households. It was formed by excluding all enumeration areas with 19 or less households. This way, the frame was reduced by 1.5% in relation to the target population.

The annual sample consists of nine independent subsamples, which are selected according to the same sampling scheme. The first stage units (enumeration areas) are selected systematically with a probability proportional to the number of persons aged 15 and over. Within each stratum enumeration areas were sorted according to the municipality they belong to and the order number within the municipality. This systematic selection provided high level of implicit geographic stratification and ensured effective sample distribution. The second stage units (households) were selected with equal probabilities (simple random selection).

5.5. Estimation system

In order to obtain representative results of the observed general population, sample weights were appended for each household and person in the sample. The major component of the weight is the reciprocal value of the product of the probabilities of selection at every stage in each sampling stratum and represents base weight (design weight). The second component of the weight takes into account the level of non-response for the household. After the completion of fieldwork, response rates were calculated. These were used to adjust the design weights calculated for each enumeration area.

In 2016 the system of estimation was changed by introducing more conditions that need to be met when calculating final weights. The final weight for a person and household is calculated on the basis of the corrected weight for a household by calibration.

Calibration is a procedure which adjusts the sampling weights by factors (calibration factors) so that the obtained estimates agree with known totals. Calibration is a practical approach of incorporating auxiliary information in the phase of estimation, which serves to correct deviations of certain contingents of sample that cannot be avoided during field work. For every quarter, the data obtained on the basis of current demographic estimations are used as auxiliary information.

Requirements which have to be met at in calculation of calibration factors are the following: distribution of population according to gender (two groups), by five-year age groups (14 groups), at the level of territory (level NUTS 3) and distribution of household according to number of household members (six groups), at the level of territory, provided that a household and each person from the relevant household have the same final weight, which assures consistent estimates on the basis of households and on the basis of persons.

Calibration weights are calculated by the “logit” method in ReGenesees software, which is the advanced R package for calibration, estimation and calculation of sampling errors for complex samples, created by Diego Zardetto from the Italian National Institute of Statistics.

Estimates of totals, proportions, as well as errors thereof, are calculated for various indicators.

5.6. Sampling Errors

The sample drawn for LFS is only one of the samples that could have been selected from the same population, using the same design and size. Each of these samples would yield results that differ somewhat from the results of the actual sample selected.

Sampling errors are a measure of the variability between the estimates from all possible samples. The extent of variability is not known exactly, but can be estimated statistically from the survey data. To estimate sampling errors calculated are standard errors, coefficients of variation and confidence intervals for parameters, as a precision measures.

In the dissemination phase it is not possible to publish each estimate with its sampling error. In order to provide users to evaluate the precision of the estimates, approximate values of sampling errors have been calculated based on regression model (Generalized Variance Function method), which parameters are obtained through ReGenesees software. Tables with approximate values of sampling errors for totals and means, method of using the tables and calculation of the CVs for rate and change was prepared according to the “Guide to the Labour Force Survey” of Statistics Canada.

5.6.1. Approximate sampling errors for Serbia and Regions (NSTJ2)

Approximate values of the coefficients of variation (hereinafter CV), for the quarterly estimates of totals and annual averages are provided in tables 1 and 2. The size of estimates expressed in thousands is presented as a function of the territory and the coefficient of variation. The territory for which the estimate is observed is indicated in table columns, and the corresponding precision level, as CV, is specified in the rows for the size of the estimate.

To determine the CV for the estimate of a size X in a region R, one should find in column R the first estimate that is less or equal to X, and the title of the given row will give the approximate value of the CV. For example, to determine the CV for an estimate of 121 500 of unemployed in Region Beograd, we find the closest but smaller estimate of 112 600, giving a CV of 4.5%. Therefore, the estimate of 121 500 unemployed in Region Beograd has a CV of roughly 4.5%.

Tables 1 and 2 contain rough estimates of sampling errors. The sampling variability is calculated based on a model so that, given an estimate, approximately 75% of the actual CVs (estimated by a complex method for the calculation of sampling errors in ReGenesees software, for example), will be less than or equal to the CVs derived from tables 1 and 2. There will, however, be 25% of the actual CVs that will be higher than the ones given in the tables 1 and 2.

The CV values given in Table 1, are derived from a model based on quarterly survey data in 2016. The CV values given in Table 2, are derived from a model based on annual LFS data for 2016. Tables 1 and 2 can be used for 2015 data, as well. It is important to bear in mind that those values are approximations.

5.6.2. Approximate sampling errors for proportions

The estimates of proportions or percentages are subject to the sampling variability that is related to the variability of the numerator and denominator of the ratio. Different values of proportions are not treated the same way because some values of the denominator are obtained by calibration and as such do not have an associated sampling error (e.g. the estimated number of persons aged 15-64 in Beogradski region).

5.6.2.1. Unemployment rate

The unemployment rate is the ratio X/Y , of the total number of the unemployed in a group, to the total number of active persons in the same group. The group may be, for instance, region or some group by sex and age. For example, in the second quarter 2016 the estimated number of active persons in Beogradski region was 791 900 individuals, and the estimated number of the unemployed was 121 500, with an unemployment rate of 15.3%.

The CV for the unemployment rate can be estimated with the following formula:

$$[CV(X/Y)]^2 = [CV(X)]^2 + [CV(Y)]^2 - 2\rho[CV(X)][CV(Y)],$$

where in the observed group: $CV(X)$ is the coefficient of variation of the estimated total number of the unemployed, and the $CV(Y)$ is the coefficient of variation of the estimated total number of active persons. The correlation coefficient, denoted ρ , measures the amount of linear association between X and Y , and its value ranges between -1 and 1 . Based on the formula, it is clear that we can expect a larger CV for the unemployment rate when ρ is negative. When ρ is not available, we will take the value $\rho = -1$, which simplifies the formula, but lead to an overestimation of the $CV(X/Y)$:

$$CV(X/Y) = CV(X) + CV(Y) \quad (1)$$

In our example an approximate value of the CV for the unemployment rate, based on Table 1, and the value of the CV for the unemployed of 4.5% and the value of the CV for the active persons of 1.5%, for Beogradski region, will be:

$$4.5\% + 1.5\% = 6\%$$

Obtained approximation for a CV of 6% is above the CV of 5.1%, calculated by a complex method for the calculation of sampling errors in ReGenesees software. Although, applied method leads to the overestimation of the CV, the users are provided with approximate value of the CV when analysing the data.

5.6.2.2. Activity rate and employment rate

The activity rate (participation rate) is expressed as a percentage and represents the share of active population in the total population aged 15 and over. The employment rate represents the share of employees in the total population aged 15 and over. For both rates the numerator and the denominator represent the same geographic and demographic group.

Population estimates of Serbia total and for regions (NSTJ2), by age group and sex, are based on the current demographic estimates, thus are not subject to sampling variability. Therefore, the coefficient of variation for activity rate and employment rate, obtained as the rate of the number of active/employed and the total population aged 15 and over in a certain geographic or demographic group, is equal to the corresponding coefficient of variation of the numerator. On the other hand, to determine the CV for the rate of informal employment in agriculture has to be taken into account the variability of both the numerator and denominator because the denominator is no longer a controlled total and is subject to sampling variability, i.e. is calculated similarly to the CV for the unemployment rate.

For Serbia totals, region totals (NSTJ2) and certain groups by sex and age, population estimates are not subject to sampling variability as they were calibrated on the independent source (data based on the current demographic estimates). Therefore, the CV is equal to the corresponding CV for the numerator in the case of the activity rate and employment rate for related geographic and demographic groups.

Subgroups for Serbia, regions by sex and age, for example persons employed in agriculture, represent domains. To determine the CV of rates for the domain, the variability of both the numerator and the denominator has to be taken into account because the denominator is no longer a controlled total and is subject to sampling variability, i.e. it is calculated similarly as the CV for the unemployment rate.

5.6.3 Variability of estimates of change

The estimates of the differences for two time periods is the estimate of change that is also subject to sampling variability. The estimate of change, to the previous quarter or to the same quarter of the previous year is based on two samples containing a certain number of same units (households and individuals). The CV of difference (change) depends on the CV of the estimates for both periods and correlation coefficient ρ , between the periods.

The value of ρ ranges between -1 and 1, with 1 being the perfect positive linear association. Generally, to approximate the value of the correlation coefficient ρ , the sample overlap (rate of the same units in two periods) can be used as follows:

- take $\rho=1/2$ for quarter-to-quarter changes;
- take $\rho=5/13$ for year-to-year changes;

the analysis of the calculated actual values of the CV and corresponding ρ shows that the value $\rho=1/2$ is a good approximation for estimates of unemployed, but for the estimates of employment a value of $\rho=0.8$ would yield a better approximation for quarter-to-quarter changes.

The CV of estimate of change can be calculated from the following formula:

$$CV(Y_2-Y_1)=\sqrt{1-\rho}\sqrt{Y_1^2 CV(Y_1)^2+Y_2^2 CV(Y_2)^2}/(Y_2-Y_1) \quad (2)$$

where Y_1 and Y_2 are the estimates of the totals for two periods. The value ρ is the correlation coefficient between Y_1 and Y_2 . When multiplying the CV, obtained by the formula (2), by the estimate of change (Y_2-Y_1), where Y_1 and Y_2 are the calculated values based on the survey, we obtain the standard error (the CV should be expressed in decimals for this calculation), more information in section 5.6.4.

With the standard error, we can see which changes (differences between estimates) are statistically significant and which are not. If the standard error of Y_2-Y_1 is larger in magnitude than the value of Y_2-Y_1 then the difference is not statistically significant.

Also, we should note, that for the change between estimates Y_2-Y_1 , the CV_s can be very high, and sometimes negative (which is expected when the difference Y_2-Y_1 is negative). The quality of a negative CV is the same as that of an equal, but positive, CV value.

5.6.4 Approximate values of the standard error and the confidence limits

Standard error of the estimate (SE) is the square root of the variance of the estimate. The approximate value of the standard error can be obtained by the calculated approximate value of the CV (expressed in decimals), multiplied by the estimate (Z) calculated on the basis of the survey.

$$SE(Z)=CV(Z)\% / 100 * Z \quad (3)$$

In order to determine the approximate confidence interval with a specified level of confidence, within which the true value for the population can be reasonably assumed to fall, we have to determine the margin of error (MG). Margine of error is calculated by the standard error and level of confidence, as follows:

- for the 95% confidence interval $MG=2*SE$. The value of the estimate will fall within a range of plus or minus two times the standard error ($z - 2*SE$, $z + 2*SE$) in 95 percent of samples;
- for the 90% confidence interval $MG=1.6*SE$. The value of the estimate will fall within a range of plus or minus 1.6 times the standard error ($z - 1.6*SE$, $z + 1.6*SE$) in 90 percent of samples;
- for the 68% confidence interval $MG=1*SE$. The value of the estimate will fall within a range of plus or minus one standard error ($z - SE$, $z + SE$) in 68 percent of samples.

5.6.5 Data reliability

When analysing the data and interpreting the CV values, as a measure of the precision of the estimates, the following guidelines is provided:

- estimates where $CV \leq 15\%$ are data of satisfactory accuracy that no special warnings to users or other restrictions are required;
- estimates where $15\% < CV \leq 30\%$ are less precise estimates, which are potentially useful for some purposes and should be used with caution;
- estimates where $CV > 30\%$ are not published and not recommended for use, because the data contain a level of error that makes them misleading for the users. If users insist on data from this category, and despite the warning, they should be aware of it and should not present or publish those data directly or indirectly without the warning.

Approximate estimates of the coefficients of variations (CV) in tables 1 and 2 can be used for data starting with year 2015.

Table 1. Coefficient of variation (CV) for estimates of quarterly totals for Serbia and Regions (NSTJ 2)

CV%	Serbia	Beogradski region	Region Vojvodine	Region Šumadije i Zapadne Srbije	Region Južne i Istočne Srbije
0.8	3155.4	2236.4	2382.4	2387.8	2353.3
1	2086.9	1520.1	1615.6	1609.7	1584.8
1.2	1488.7	1108.8	1176.3	1166.3	1147.3
1.5	984.6	753.7	797.8	786.2	772.6
2	577.8	458.1	483.5	472.9	464.1
2.5	382.1	311.4	327.9	318.8	312.5
3	272.6	227.1	238.7	231.0	226.3
3.5	204.9	174.0	182.6	175.9	172.2
4	160.0	138.1	144.7	138.9	135.9
4.5	128.6	112.6	117.9	112.8	110.3
5	105.8	93.9	98.1	93.7	91.5
6	75.5	68.5	71.5	67.9	66.3
7	56.7	52.4	54.6	51.7	50.4
8	44.3	41.6	43.3	40.8	39.8
9	35.6	33.9	35.3	33.1	32.3
10	29.3	28.3	29.4	27.5	26.8
11	24.5	24.0	24.9	23.2	22.6
12	20.9	20.6	21.4	19.9	19.4
13	18.0	18.0	18.6	17.3	16.8
14	15.7	15.8	16.4	15.2	14.8
15	13.8	14.0	14.5	13.4	13.1
16.5	11.6	11.9	12.3	11.4	11.0
17.5	10.4	10.7	11.1	10.2	9.9
19	8.9	9.3	9.6	8.9	8.6
20	8.1	8.5	8.8	8.1	7.8
21.5	7.1	7.5	7.8	7.1	6.9
22.5	6.5	7.0	7.2	6.6	6.4
24	5.8	6.2	6.4	5.9	5.7
25	5.4	5.8	6.0	5.4	5.3
26.5	4.8	5.2	5.4	4.9	4.8
27.5	4.5	4.9	5.1	4.6	4.5
29	4.1	4.5	4.6	4.2	4.1
30	3.8	4.2	4.3	3.9	3.8

Table 2. Coefficient of variations (CV) for estimates of annual averages for Serbia and Regions (NSTJ 2)

CV%	Serbia	Beogradski region	Region Vojvodine	Region Šumadije i Zapadne	Region Južne i Istočne Srbije
0.8	936.4	703.0	814.9	829.0	749.5
1	615.7	478.3	539.1	545.3	498.3
1.2	437.1	349.2	384.7	387.3	357.0
1.5	287.3	237.6	254.5	254.8	237.3
2	167.3	144.6	149.4	148.5	140.2
2.5	110.0	98.4	98.8	97.7	93.2
3	78.1	71.8	70.5	69.4	66.8
3.5	58.5	55.0	53.0	51.9	50.4
4	45.5	43.7	41.4	40.4	39.5
4.5	36.5	35.7	33.3	32.4	31.8
5	29.9	29.7	27.4	26.6	26.2
6	21.2	21.7	19.5	18.9	18.8
7	15.9	16.6	14.7	14.1	14.2
8	12.4	13.2	11.5	11.0	11.1
9	9.9	10.8	9.2	8.8	9.0
10	8.1	9.0	7.6	7.2	7.4
11	6.8	7.6	6.4	6.1	6.2
12	5.8	6.6	5.4	5.1	5.3
13	5.0	5.7	4.7	4.4	4.6
14	4.3	5.0	4.1	3.8	4.0
15	3.8	4.5	3.6	3.4	3.5
16.5	3.2	3.8	3.0	2.8	3.0
17.5	2.8	3.4	2.7	2.5	2.7
19	2.4	3.0	2.3	2.2	2.3
20	2.2	2.7	2.1	2.0	2.1
21.5	1.9	2.4	1.8	1.7	1.8
22.5	1.8	2.2	1.7	1.6	1.7
24	1.6	2.0	1.5	1.4	1.5
25	1.5	1.8	1.4	1.3	1.4
26.5	1.3	1.7	1.2	1.2	1.2
27.5	1.2	1.6	1.2	1.1	1.2
29	1.1	1.4	1.1	1.0	1.1
30	1.0	1.4	1.0	0.9	1.0

Methodologies and standards: Labour Force Survey – Methodological Guide

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