Steering Committee of the International Monitoring Operation on the Population and Housing Censuses in Bosnia and Herzegovina

Eighteenth Assessment Report

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Contents

List of acronyms

BiH	Bosnia and Herzegovina
BHAS	Agency for Statistics of Bosnia and Herzegovina
CoM	Council of Ministers of BiH
CMIS	Central Monitoring Information System
CSO	Civil Society Organisation
DB	District Brčko
EA	Enumeration area
FBiH	Federation of Bosnia and Herzegovina
FOS	Federal Office of Statistics (FBiH)
EI	Entity Instructor
EN	Enumerator
EUPHC 2	Technical assistance to Population and Housing Census Phase II
GIS	Geographic Information System
ICEI	Department for International Cooperation and External Information
IMO	International Monitoring Operation
IMO MG	International Monitoring Operation, Management Group
IMO SC	International Monitoring Operation, Steering Committee
IT	Information Technology
LFS	Labour force survey
MCC	Municipal Census Commission (Census Commission of the units of local self-government)
MI	Municipal Instructor
PES	Post Enumeration Survey
Q	Question
RS	Republika Srpska
RSIS	Republic Srpska Institute for Statistics
SA	Statistical Area
SI	State Instructor
TA	Technical Assistance
TAP	Technical Assistance Project
TOR	Terms of Reference

Introduction and Background

1.　A Population and Housing Census shall take place in Bosnia and Herzegovina (BiH) in accordance with the Law on the Census of the Population, Households and Dwellings in Bosnia and Herzegovina in 2013 as adopted by the Parliamentary Assembly of Bosnia and Herzegovina on 3 February 2012. The Council of Ministers of Bosnia and Herzegovina has invited the European Commission to organise the international monitoring of the Census. Therefore, the European Commission, the Council of Europe and the Council of Ministers of Bosnia and Herzegovina signed on 18 April 2012 a Memorandum of Understanding to agree upon the following:

- The general objective of the International Monitoring Operation (IMO) of the Population and Housing Census in Bosnia and Herzegovina is to monitor the compliance of the whole Census exercise, from the preparation to the data dissemination, with:

- International standards on population and housing censuses as defined by UNECE and Eurostat, and as adopted by the Conference of European Statisticians as Recommendations for the 2010 Censuses of Population and Housing;

- Regulation (EC) No 763/2008 on population and housing censuses, and its implementing measures;

- The Fundamental Principles of Official Statistics, adopted by the UN Statistical Commission, as well as the European Statistics Code of Practice, promulgated by the European Commission;

- Standards on data protection and confidentiality, as provided for in the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data of the Council of Europe, and the relevant European Union regulations in force.

2.　The Operation will be carried out by a Committee of International Organisations, the Management Group (IMO MG) assisted by a Senior Census Expert, experts in population censuses, one or more experts in information technology and persons monitoring the census enumeration in the field.

3.　The Senior Census Expert, the Census Experts and the IT Experts will assess the compliance of the Census in Bosnia and Herzegovina with the requirements listed in the Memorandum of Understanding, but they will not provide technical assistance.

4.　Under the guidance of the Committee and the Senior Census Expert, the Census Experts shall:

- Examine the technical preparation of the Census including the pilot Census and post-enumeration survey, in particular the drafting of questionnaires and manuals;

- Monitor the collection, processing and dissemination of Census data, verifying the accordance with the requirements defined above;

- Control the fair and proper computation at all levels and whether the confidential nature of the individual data is fully guaranteed;

- Investigate any other matter with relevance for the Census.

5.　The Management Group has designated Mr. Jean-Michel Durr as Senior Census Expert and Mr. Roberto Bianchini, Mr. Bent Noerby Bonde, Ms. Meryem Demirci, Ms. Kateri-

na Kostadinova-Daskalovska, and Mr. Guido Pieraccini as experts in population censuses. The Senior Census Expert and the Experts in population censuses form the IMO Steering Committee (IMO SC) of international experts.

6.   The first mission of the IMO SC was conducted from 23 to 26 April 2012. The objective of this mission was to assess the preparations for the population and housing census in their main components, including the preparation of the pilot census. The report of the SC was sent by the Senior Census Manager on May 12 to the IMO MG.

7.   The second mission was conducted from 26 to 29 of June 2012. The objective of this mission was to assess the progress made since the first mission in preparations for the population and housing census, including the preparation of the pilot census.

8.   The third mission took place on 17 and 18 of September 2012 and was conducted by two members of the SC, namely, Mr. Jean-Michel Durr and Ms. Katerina Kostadinova-Daskalovska. The objective of the mission was to assess the implementation of recommendations made in previous reports and to assess the preparation of the pilot census, planned for October 15-29.

9.   The fourth mission took place between 10 and 29 of October 2012 and was conducted successively by the members of the SC (5 days each, except the senior expert from 10 to 19 of October). The objective of the mission was to observe the conduct of the pilot census in the field. In addition, a team of four observers, composed of Lidija Naumovska, Gabor Rosza, Jean-Paul Sardon and Per Schöning was present during the whole period of the pilot census. Each of them covered several municipalities, in order to observe the pilot census field operations in all the 60 enumeration areas (EAs) sampled in the pilot.

10.   The fifth mission took place from 19 to 21 of November 2012 (3 days) and was conducted by one member of the SC, Ms. Katerina Kostadinova-Daskalovska. The objective of the mission was to observe the conduct of the Post enumeration survey (PES) of the Pilot census in the field. The expert covered all 6 EAs (in 6 municipalities) sampled in PES sample in order to observe the PES field operations.

11.   The sixth mission took place from 10 to 13 of December 2012 and was conducted by four members of the SC: Mr. Roberto Bianchini, Mr. Bent Noerby Bonde, Ms. Katerina Kostadinova-Daskalovska and Mr. Guido Pieraccini. The objective of the mission was to hear from the Statistical Institutions about the lessons learn from the Pilot Census and to assess whether the preparations are on level that could allow conducting a census in April 2013.

12.   The seventh mission took place from 12 to 15 February 2013 and was conducted by one member of the SC, Mr. Roberto Bianchini. The objective of the mission was to assess the situation on the progress of preparation and implementation of the IMO recommendations in the new context of the postponement of the census, with a focus on the achievement of the deadlines regarding cartographic preparations. A second objective was to collect information and materials for a more detailed assessment on the progress of census preparatory activities to be made by all members of the SC in March 2013.

13.   The eighth mission was conducted by the complete SC from 18 to 22 March 2013. The objective of the mission was to assess in detail progress made in the preparations with regard to the milestones given after the sixth mission in December 2012, when the SC recommended to postpone the census to October 2013.

14.   The ninth mission was conducted by two members of the SC, Jean-Michel Durr and Katerina Kostadinova-Daskalovska from 22 to 25 April 2013. The objective of the mission was to assess the progress made in the preparations with regard to the milestones given in the sixth mission and updated in previous missions.

15.   The tenth mission was conducted by the full SC from 28 to 31 May 2013. The objective of the mission was to assess whether the progress made in the preparations was sufficient to consider that the country was ready to conduct a census in October 2013.

16.   The eleventh mission was conducted by three members of the SC, Mr. Jean-Michel Durr, Mr. Bent Noerby Bonde and Mr. Guido Pieraccini from 16 to 19 July 2013. The objective of the mission was to assess whether the preparations were still on track after the positive assessment of the 10th mission to conduct a census in October 2013. A special focus was put on the preparation of data processing.

17.   The twelfth mission was conducted by four members of the SC, Mr. Roberto Bianchini, Mr. Bent Noerby Bonde, Ms. Katerina Kostadinova-Daskalovska and Mr. Guido Pieraccini from 3 to 6 September 2013. The objective of the mission was to assess the state of play regarding to forthcoming census field activities (including PES) and data processing activities following the field activities as well as the overall census preparations in accordance to the Census milestones and SC recommendations and advices given through the previous missions and SC reports.

18.   The thirteenth mission was conducted by five members of the SC: Mr. Roberto Bianchini and Mr. Guido Pieraccini from 27 September to 4 October, Ms. Katerina Kostadinova-Daskalovska from 4 October to 11 October; and Mr. Jean-Michel Durr and Ms. Meryem Demirci from 11 October to 18 October. The objective of the mission was to monitor the enumeration of the census, including its final preparations and final operations. During this mission, the SC was assisted by a team of 27 international observers, deployed all over the country.

19.   The fourteenth mission was conducted by one member of the SC: Ms. Katerina Kostadinova-Daskalovska from 1 to 3 November 2013. The objective of the mission was to monitor the conducting of the Post-enumeration survey following the Census. During this mission, the SC was assisted by a team of 5 international observers, deployed all over the country from 1 to 10 November.

20.   The fifteenth mission was conducted by one member of the SC: Mr. Guido Pieraccini from 17 to 18 December 2013. The objective of the mission was to assess that the data processing system was functional and in accordance with the SC recommendations.

21.   The sixteenth mission was conducted by five members of the SC from 11 to 14 February 2014. The objective of the mission was to assess the starting of the data processing and the implementation of the SC recommendations.

22.   The seventeenth mission was conducted by one member of the SC: Mr. Guido Pieraccini from 21 to 23 May 2014. The objective of the mission was to control that the data processing was working smoothly and that the timing for completion of the phase was in accordance with the SC recommendations.

23.   The eighteenth and present mission was conducted by four members of the SC from 3 to 6 June 2014. The objective of the mission was to assess the situation of data capture and

the state of preparation of further steps, editing and dissemination as well as the Post Enumeration Survey.

24.   The experts wish to express their gratitude to the directors and staff of the Agency for Statistics of Bosnia and Herzegovina (BHAS), the Statistical Institutes of the Federation of Bosnia and Herzegovina and Republika Srpska (RS) for their availability and collaboration, and to the staff of Council of Europe for the organisation of the mission.

Executive Summary

25.   The data processing centre continues to be fully operational. The available space at the centre is well organised and the contracted staff well managed. The staff from BHAS, FOS, RSIS ensure daily presence, supervising data capture operations and managing the centre in a collaborative atmosphere.

26.   As recommended by the SC during the previous mission, the organisation of data capture activities has been slightly re-arranged for better optimization. According to the plans of the three statistical institutions, these actions will ensure the completion of data capture by mid-October 2014.

27.   During the mission, the SC performed a quality assessment on a number of captured questionnaires, which showed a high-level of accuracy on the data captured.

28.   Coding of textual variables is prepared and will start soon. The SC recommended to optimize coding and reiterates its strong recommendation to NOT proceed to any aggregation of answers related to the three sensitive questions: ethnicity, religion and mother tongue, other than gender or orthographic variants, and to disseminate the results corresponding to each answer declared by the population. The observance of this recommendation will be assessed in next missions of the SC.

29.   The work on data editing has not really started. Some editing rules are existing, but not yet definite and not yet tested on real census data. Taking into account the activity plan and the fact that 40% of the census material is already captured, the SC strongly encouraged the team to start immediately analytical tabulations of the current database to test the prepared rules in order to finalize them.

30.   The material of the Post Enumeration Survey (PES) has been captured but matching operations have not started. The SC recommends starting as soon as possible to implement matching procedures as the PES and census databases are captured and finalised for the next phase of PES operation.

31.   All Statistical Institutions have decided to take into consideration the SC recommendation to consult users on the dissemination of census results. It is recommended that this consultation takes place before finalising the content of the publication to take into consideration users' requests.

32.   A set of thematic publications is planned to be published. The SC recommends that publications include a short descriptive analysis of the tables presented in order to make the results more accessible to users, and to the media. It is also advised to include comparisons with the previous census and with neighbouring countries.

33.   In conclusion, the SC considers that the data processing phase is progressing well and in accordance with the SC recommendation. However, the SC urges the Statistical Institutes to start preparing the editing phase in order to not delay the dissemination of the census results. In the coming months the SC will continue to closely monitor the census data processing to assess its compliance with international standards and best practices.

Data Processing

DATA CAPTURE

34.   The data processing centre continues to be fully operational according to the organisational structure already described in the 16th and 17th IMO SC reports. The available space at the centre is well organised and the contracted staff well managed. The staff from BHAS, FOS, RSIS ensure daily presence, supervising data capture operations and managing the centre in a collaborative atmosphere. No critical issues were detected by the SC, or reported, on data capture operations during this mission, with the exception of the timeframe which continue to require a close monitoring in order to maintain October 2014 as strict deadline for the conclusion of this first phase of census data processing.

35.   As recommended by the SC during the previous mission, the organisation of data capture activities has been slightly re-arranged by reducing the percentage of questionnaires re-captured for quality assurance review from 100 to 70%, and by increasing the number of operators assigned to OCR activities, from 120 to 126. According to the plans of the three statistical institutions, these actions will ensure the completion of data capture by mid-October 2014.

36.   As pointed out in previous reports of the SC, the contracted staff is organised by task. The main tasks are: manual preparation, scanning, OCR operations, archiving. Each task is technically coordinated and supervised by the staff from the statistical institutions, under a general coordination from the heads of departments of methodology and IT.

37.   The contracted staff for the tasks of manual preparation is divided into 2 daily shifts of 80 operators each organised in teams of 2 operators; the staff for OCR activities is divided into 2 shifts of 63 operators which use personal computers connected to the server; the staff for scanning is organised into 2 shifts of 6 operators using 3 scanners. The first shift works from 8:00 until 14:30 and the second from 15:00 to 21:30 every day. Each operator works continuously for 50 minutes. Each shift break 4 times for 10 minutes and once a day for 1 hour. This work schedule optimizes work efficiency.

38.   OCR activities are also divided into sub-tasks with specific operators assigned to the same sub-tasks. Some of them are semi-automatic operations (character and check-boxes recognition), and some are manual operations (tile, completion, quality assurance, supervision). During the work flow, all captured data is verified and validated. The quality assurance sub-task is performed for 70% of the data. The semi-automatic and manual tasks are able to resolve most of the detected errors due to data capture operations. In the few cases where this is not possible, supervisors analyse the specific errors and decide on how to correct them. Then, data is saved in the server as final captured data.

39.   The activity on manual preparation (classification of questionnaires in compiled, empty, cancelled; consistency checks between P1 and P2 questionnaires; entry of P3 forms) is expected to be concluded by mid-June 2014 (5% remaining at the time of the SC mission, and 30% remaining of P3 forms to be entered); the scanning of questionnaires is planned to be concluded by the end July 2014 (35% remaining at the time of the SC mission); the OCR operations are expected to be concluded in mid-October (almost 40% completed at the time of the SC mission).

40.   The access to the servers and to the archive where census forms are stored is secured by doors with fingerprint recognition. The servers have an internal backup system, and an external backup in Brčko District.

Assessment

41.   The recommendation already provided by the SC in its 15th and 16th reports not to perform any manual modification on the paper questionnaires before scanning was fully respected, and the census data captured fully reflect the data collected during the enumeration.

42.   During its visits to the data processing centre, the SC has performed a quality assessment on a number of captured questionnaires, which showed a high-level of accuracy on the data captured. Several questionnaires, randomly selected, were compared with their corresponding raw data stored in the server after having successfully passed all the phases of data capture and after their final checks and validation.

43.   The assessment was performed with the available data from the municipalities of Central Sarajevo, Tuzla, Trebinje, Travnik, Srebrenika, Orasje, Bosanska Krupa, and a very small number of differences between questionnaires and captured raw data were identified. These differences were mainly related to the recognition of characters of text fields, and, in very few cases of numeric values, mostly for the last 6 digits of the PIN in questionnaire P1. It was observed that often barcodes are not correctly recognised by the scanning process, since they would need special scanners. None of the above mentioned differences between the original questionnaires and raw captured data were considered critical ones.

Recommendations

44.   The SC strongly reiterates the recommendation already made with the previous report, to take all the measures to conclude data capture operations as early as possible. The high-quality standard procedures performed in the overall data capture process are indeed much appreciated, but they risk to delay the beginning of editing operations which may also require considerable time.

45.   In order to mitigate this risk, and taking into account the high-quality of the captured census forms assessed by the SC, it is recommended to make the following steps:

  a) make a quick and immediate quality assessment on a sample of captured questionnaires processed with 70% of the census forms re-processed for quality assurance;

  b) further reduce the percentage of re-processed questionnaires from 70 to 50%;

  c) make a quality assessment on a sample of the captured questionnaires with 50% of quality assurance (with same sample size);

  d) analyse the number and type of errors detected in the two assessments.

46.   If the differences are not significant (e.g. less than 5%), it is recommended to continue to re-process only 50% of the questionnaires, otherwise maintain the percentage of questionnaires that go into quality control at the level of 70%. In this way, the overall quality of the data capture is not hampered, and its period of implementation may be reduced.

47.   The SC welcomed the decision taken by the statistical institutions to increase the number of operators working on OCR, which it was reported was reported to the SC will be further reinforced as soon as the tasks on the manual preparation will be concluded.

CODING

48.   Coding of occupation, industry (economic activity) and educational attainment in the three main international classifications adopted for the census (ISCO, NACE and ISCED) will be performed using an ad-hoc application called g-Code. The coding of Municipality, Settlement, Country, Citizenship, Ethnicity, Religion and Mother tongue will be also performed with the g-code application.

49.   The g-Code application is composed of two parts. A first part is running in background and - on the basis of a thesaurus attempts to automatically code the wording of the answer. A second application is used to manually code the wordings that were not automatically coded. However, it is planned that coders will have to confirm systematically all automatic coding.

50.   For occupation and industry, answers extracted from the questionnaire already captured were sent to subject matter specialists and coded to fill the thesaurus. Occupation will be coded on four digits of the ISCO while industry will be coded only on two digits of the ISIC.

51.   Coding is expected to start in one or two weeks following this mission. Four coders will be in charge of the coding. Coding will be performed by municipality.

52.   For municipalities or settlements split between RS and FBiH, it may be necessary to create an item "without indication of entity" for cases for which the entity is not known.

Recommendations

53.   The SC recommends starting as soon as possible to test the whole coding process, in order to estimate the time and resources needed.

54.   The SC considers that confirming all automatic coding is unnecessary and resource consuming, especially if coding is performed municipality by municipality. The SC recommends to propose to coders only the uncoded items and to organise coding globally and not by municipality.

55.   The SC also recommends to consider specialise coders by topic in order to obtain the highest quality.

56.   Finally, the SC reiterates its strong recommendation to NOT proceed with any aggregation of answers related to the three sensitive questions: ethnicity, religion and mother tongue, other than gender or orthographic variants, and to disseminate the results corresponding to each answer declared by the population. This recommendation will be observed and assessed in next missions of the SC.

DATA EDITING AND DATA CORRECTION

57.   The objective of the data capture phase is to reflect the original data collected during the enumeration in an electronic format. However, the data originally collected can have inconsistencies due to errors made by the enumerators or due to inconsistent response of the household. Additional inconsistencies can be introduced during the capture phase due to the errors in optical character recognition (OCR), if not corrected during following phases of validation, completion and quality assurance (QA).

58.   Editing is a part of data processing as a step following the data capture aiming at removing the main inconsistencies. Data inconsistencies may occur within one individual record or among records (for example among household and household members).

59.   Basically, activities related to the editing phase can be done in two steps. The first step is to define a group of rules that will serve for identifying the inconsistencies; and the second step is to use a statistical method for correcting the identified inconsistencies and for imputing the missing values.

60.   In the phase of Census preparation, the methodologists from the BHAS, FOS and RSIS had prepared part of the editing rules so called "Control of contingents" (KK). The list of KK rules are still only a draft version and refer to:

- Control the accuracy of the identifications of the census forms (code of entity, municipality, EA, dwelling, household, and person), whether they are within the defined rank and whether they are logically consistent within a set of records (for example within a dwelling);

- Control on question 1 to 7 in the P-1 form (individual for persons) that are basic for identifying the persons' residence status;

- Control on household structure through number of persons within the dwelling and household and relationship of the household members towards the reference person;

- Controls on age, sex and unique personal ID number;

- Control on family structure, possible family members and position of the person within the family.

61.   In addition, the draft document defines the logical sets and derived variables. Some of the derived variables are required only for performing the controls and as auxiliary ones will not be saved in the census data base. After performing the KK, the inter-record inconsistencies are supposed to be removed and identification data, data on person's sex and age and the derived data on person's residence are considered as fixed and will serve as such for further controls on other variables.

62.   Within the EUPHC project, phase II, methodology experts prepared a list of consistency rules called "Logical controls" (LK) for controlling data within the P-1 form. The rules are based on the assumption that with KK editing, sex, age and persons residence are already fixed. The list of LK rules refers to all other data within the P-1 form (data on education, migration, women fertility, activity, school attendance, disability). The list of LK rules is deterministic and so far the rules are intended only for identifying the inconsistencies. At

the time of SC mission, the IT specialists were transferring the LK rules in SQL language. An application to support performing these rules was already prepared before the census.

63. Regarding the second step of data editing phase, the method of correcting detected inconsistencies and imputation of missing values is not decided yet. As BHAS, FOS and RSIS have no practical experience in this field, there is still no plan on how to do the corrections of errors and imputation of missing values. Statistical Institutions are expecting technical assistance in this field. Unfortunately, a first tender launched by the EU Delegation was not fruitful and a revised one had been issued at the moment of the SC mission.

64. As 40% of the census material was captured at the time of SC mission, the SC asked for a report on missing values. Although the report gives only a rough indication, it is encouraging since the percentage of missing data on sex is about 1.1%, year of birth 0.4% and on other variables between 1% and 2%.

65. So far no tabulation of data was performed to test the draft rules. The main issue is the definition of derived field on residence status. Namely, during enumeration, there were cases where persons not usual residents in BiH were enumerated as such. Thus the methodology group wants to perform more controls and to possibly include additional questions than the first seven ones to determine residence status. Thus, the list of deterministic editing rules is still not finalized.

Assessment

66. Work on data editing has not really started. The list of editing rules (KK and LK) exists, but not yet definite and not yet tested on real census data. Taking into account the activity plan and the fact that 40% of the census material is already captured, the activities referring to editing are delayed.

67. BHAS, FOS and RSIS have enough skilled methodologist and IT staff to finalize and test the list of editing rules, but they need support to define the method of corrections of errors and imputation of missing values.

Recommendations

68. The SC strongly encouraged the responsible staff not to wait for TA expert and to start immediately analytical tabulations of the current database to test the prepared rules in order to finalize them. Even if the set of rules is not finalized before the arrival of the TA expert, the tabulations will provide information on whether the set rules is well structured and comprehensive enough, as well as indications about the quality of the captured census data.

69. Regarding the determination of the residence status, the SC strongly encourages the census team to test two different ways:

- based only on the first seven questions;

- based on the first seven questions plus a few additional related topics, such as the place of work.

70. The test results can serve as a base for decision. If there is no significant difference in the number of residents calculated by the two different methods, the residence should be based on the first 7 questions.

71.	It is recommended to decide the method for corrections and imputations with the TA expert.

72.	When designing the editing phase, to avoid over-editing in order to limit the changes of the original data.

73.	The editing phase should be designed with a clear order and logic in the succession of the controls, corrections and imputation of variables (for example, first to control and fix age and sex, as already elaborated in the draft document on KK).

VALIDATION

74.	Following data editing and imputation, the outcomes of this process are evaluated to ensure imputation rules are set and applied correctly. It was explained in the meeting that the methodology group will perform this task. The methods for validation of imputed data will be developed in coming days.

75.	During the mission, the plan for evaluation of census results using demographic methods and other sources of data was discussed with the methodology group. The methodology group will prepare a plan for possible demographic techniques and possible other sources which can be consider for evaluation of census data.

Recommendations

76.	Tabulation plans for validation of data as the last phase of data processing should be prepared as soon as possible and tested together with editing and imputation rules to establish with agreeable plans for validation. It is suggested to evaluate the impact of imputation rules on the pattern of original data (captured data) to understand if the imputation rules significantly change statistical outputs and if these outcomes are consistent with the expected pattern. It should be noted that a validation phase of data processing usually takes more time than expected as there are always some exceptional or unforeseen problems that are discovered in the last phase of data processing.

77.	The SC suggests starting discussion on possible demographic techniques that would be used for the evaluation of census results and availability of data required for application of these techniques. Also, the team should consider to what extent previous census results can be used for evaluation of current census results, such as the possibility of using previous censuses for evaluation of age-sex structure and cohort analysis should be examined well in advance not to delay releasing final results of the census.

78.	The SC also suggests working on other sources of data which can be used for evaluation purposes. It is important to analyse in advance if these sources are reliable and comparable with the census regarding definitions and classifications. The SC also considers benefits of setting up a working group for evaluation of census results consisting of subject-specialist experts such as on education, labour force, demography, housing characteristics, migration, etc.

79.	The SC highly recommends publishing the results of evaluation with special attention to informing users on possible discrepancy between the census and other sources and the reasons.

Post Enumeration Survey

80.   Data capture for the PES EAs has been completed with double data capture method to ensure high quality of data which is very important for a successful matching operation. The PES team compared the two manually captured datasets and solved all inconsistencies comparing with original questionnaires of the PES. The PES and census databases are finalised for matching the records.

81.   Matching the PES records with the census records will be performed using the following cycles:

- First: matching all enumerated units (persons, households and dwellings) within selected PES EAs;
- Second: application of definition of usual residence for the selected PES EAs in both databases (the PES and the Census);
- Third: matching the un-matched persons in the PES database with the EAs (except the PES EAs) in the Census database ;
- Fourth: application of usual residence definition to the persons matched in the third cycle (only persons matched in the census database as usual residence status are already assigned to all persons in the PES database in the second cycle).

82.   The steps of matching are described in the methodological document (Manual for Linking Data). Matching operation will start with matching individuals and followed by matching households and dwellings respectively. For matching persons, PIN, date of birth with some combinations of first name, surname, building-identification code, and addresses will be used. For households, number of linked persons in PES or Census, number of persons in PES and Census, data about head of household, the floor and address and finally for matching dwellings, number of household, building-identification code, building address and data about the dwelling will be used.

83.   Matching the two databases – the PES and the census – will be performed by automatic method matching followed by the semi-automatic matching for the remaining cases. For this purpose, the PES team requested an application from the IT team.

84.   The methodological document has been updated based on the lessons learned from the pilot census and shared with the SC.

85.   No decision has been taken regarding reconciliation visits. The PES team explained that the census law does not cover this field work and no budget is allocated for this activity. It was also mentioned that revisiting some households one year after the enumeration might pose a problem.

Recommendations

86.   The SC recommends starting as soon as possible to implement matching procedures as the PES and census databases are captured and finalised for matching operation.

87.   As usual resident population is determined from enumerated population, it is necessary to ensure that the PES evaluates the same population as the census. Therefore it is very critical to ensure that the same rules are used to determine the residence status of each enu-

merated person. Therefore, the SC suggests building validation procedures for ensuring the rules for residence status are applied correctly to the databases used for PES.

88.   In addition, if any question between the questions 1 to 7 in the P-1 form is imputed for the missing fields or for correcting inconsistent information (including inconsistencies among the questions 1-7), the same imputation rules should be applied to the PES database and the census database before application of matching individuals according to usual residence status.

89.   The SC also recommends that for measuring content errors, the un-edited database should be used to compare the characteristics of population (such as age, sex, marital status, occupation, etc.) collected by the PES and the census database. It should be noted that content errors are calculated based on only matched individuals and households.

90.   Reconciliation interviews[1] are suggested for non-matched units and doubtful cases in order to achieve definitive match status of each unit of enumeration.   This field work can be conducted in sampled EAs and adjacent areas following the initial matching phase. In this regard, the SC suggests reconciliation visit to finalize the matching procedures. However, revisiting some households to check the status of the individuals and/or households might be sensitive. In that regard, the decision on reconciliation visits can be taken after finishing the initial phase of matching procedures to consider the extent of the field work. It should be kept in mind that more time between the enumeration and revisiting the field will create more difficulties to collect reliable information referring to the census time. Therefore the initial phase of matching should be completed and the results should be analysed as soon as possible.

91.   The order of matching cycles seems complicated and would be simplified in a way of first running all the procedures regarding the enumerated population and then the procedures regarding application of usual residence status.

92.   The methodology of matching persons does not explain the final matching status of usual resident population. It is particularly important for persons whose usual residence status are not matched between the PES and the Census databases although their enumeration status are matched. In this regard, the methodology should be improved to clearly explain matching status for enumerated persons and matching status of usual resident population separately. And the results of matching procedures for the enumerated persons and matching procedures for usual residence population should be determined with a unique code for all possible conditions.

93.   The latest version of the methodological documents still needs to be improved with regards to the details of matching results. There should be clear identification for the results of matching for those persons either matched within EA or outside the EA. Also, the matching rules should cover the rules for in-movers and out-movers collected through the PES questionnaires. Finally, the conditions for assigning code 98 (for excluded persons from PES for different reasons) should be explained in the methodological document.

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[1] For more information, see the United Nations, Post Enumeration Surveys Operational Guidelines, Technical Report, April 2010.
http://unstats.un.org/unsd/demographic/standmeth/handbooks/Manual_PESen.pdf

94.   Regarding matching households and dwellings, the document does not provide clear instructions for the matching rules and the codes as it is given for matching codes for persons.

95.   The SC strongly suggests updating the work plan and methodological document as soon as possible.

Dissemination of the census results

96.   Both entity SIs have established a working group on dissemination, in addition to the inter-institutions working group that includes also methodologists. RSIS and FOS adopted the recommendation of the SC to conduct user consultations. Several options are still considered, one is to hold a joint meeting with all kind of users and the other to hold a series of meetings with specific categories of users. User consultations will be conducted by the end of the year in both entities.

97.   A proposal of dissemination strategy has been prepared by the Agency and will now be sent to RSIS and FOS, before adoption by the three directors. The proposal will be sent also to the SC.

98.   As described in previous reports, 15 thematic publications are planned to be published. The Agency and the two entity statistical offices have shared the work to define the content of each book. It is expected that the content of all books would be adopted by the end of the year. Each publication will contain a preface, methodology, maps, graphs and tables, but descriptive analysis and comparisons with previous census and neighbouring countries are not planned to be included.

99.   Each publication will be published in four versions: one at national level down to municipalities, and one for each entity down to the settlement level. BHAS is responsible for the national version and the one related to District Brcko, and each SI is responsible for its corresponding version. BHAS will publish in the three national languages, FOS in Bosnian and Croatian and RSIS in Serbian. English versions will be systematically available in parallel in each publication.

100.   The first publication is expected to be published by the end of April 2015, under the assumption that the data processing phase will be completed by 31st of December.

101.   Publications will be printed in the minimum number necessary for legal purpose and will also be posted as PDF files on the website of each SI.

102.   The IT team of BHAS will extract the tables from the database and provide Excel tables to be integrated in the publications and posted on the websites.

103.   The online dissemination of the final results will be done using PC-AXIS and PX-web software provided with support of Danish and Swedish national statistical offices (NSOs). The The Danish NSO provided a license for one year of software use and held 4 trainings for the software use (including participants of the three statistical institutions). The Swedish NSO provided an upgrade of the software that will allow dissemination of the results not only in English, but also in Bosnian, Croatian and Serbian language. Just before final conversion of the data in PC-AXIS, the data will be controlled using Argus (a free software) that will detect the possible individual data disclosure i.e. cells in the tables where there are less than 3 households and less than 10 persons. The software hides automatically such cells and other

respective cells in the table, so that no individual data can be disclosed. Census data available on line will be accompanied with metadata.

Recommendations

104.   All Statistical Institutions have decided to take into consideration the SC recommendation to consult users on the dissemination of census results. It is recommended that this consultation takes place before finalising the content of the publication to take into consideration users' requests.

105.   It is also recommended to develop a plan for control and verification of the tabulations prepared for publishing. This part still has to bedeveloped together with the methodologists and IT staff.

106.   Publications shall contain a short descriptive analysis of the tables presented in order to make the results more accessible to users, and to the media. It is also advised to include comparisons with the previous census and with neighbouring countries. Despite some differences of methodology between the current census and the previous one that may prevent from comparing absolute figures, relative distributions can probably be compared.

107.   Classification used in the tables should be adapted to the size of the geographical level: for example age structure may be presented in annual year of age at national and entity level, and in quinquennial age groups at smaller level and in three age groups at very small level.

108.   It is recommended to publish a quality report including the results of the PES and other information such as rates of missing values, and number of inconsistencies detected by the the editing rules. Examples of such report can be found in neighbouring countries and in the EU regulation on population and housing censuses.

109.   It is also recommended to publish the complete methodology of the census, including the editing procedures.

110.   It is advised to follow the changes in the data processing activity plan, to adjust the dissemination time table accordingly and to make efforts for publishing the final census results much earlier than in the tentative dissemination plan.

ANNEXE

International Monitoring Operation Steering Committee

Date: 3 - 6 June 2014

Tuesday, June 3, 2014, Data Processing Centre, East Sarajevo		
09:00 – 13:00	**Meeting with the management of Data Processing Centre** - Finalisation of the agenda of the mission - Progress in data processing - Main issues Nora Selimović (BHAS) Sulejman Hasanović (BHAS) Hidaeta Čolović (FIS) Jasmina Velić (FIS) Bogdana Radić (RSIS) Rajko Vranješ (RSIS)	Data Processing Centre, East Sarajevo
13:00 – 14:00	**Lunch break**	
14:00 – 17:00	**Observation of the data processing** - Observation of processing - Control of questionnaires	Data Processing Centre, East Sarajevo

Wednesday, June 4, 2014, Data Processing Centre, East Sarajevo		
9:00 – 13:00	**Observation of the data processing** - Observation of processing - Control of questionnaires	Data Processing Centre, East Sarajevo
13:00 – 14:00	**Lunch**	
14:00 – 17:00	**Observation of the data processing** - Observation of processing Control of questionnaires	Data Processing Centre, East Sarajevo

Thursday, June 5, 2014, Agency for Statistics of BiH (BHAS), Sarajevo		
9:00–13:00	1. Meeting with Methodology and IT Team on editing strategy: 2. Nora Selimović – Methodology (BHAS) 3. Vladimir Mijović - Methodology (BHAS) 4. Radoslav Ćorović - Methodology (BHAS) 5. Rajko Vranješ – Methodology (RSIS) 6. Dara Petković – Methodology (RSIS) 7. Muamera Idrizovic – Methodology (FIS) 8. Konakovic Jasmina – Methodology (FIS) IT representatives 9. Sulejman Hasanovic (BHAS) 10. Sevala Abaz (BHAS) 11. Amer Koric (FIS) 12. Nermina Sarajkić (FIS) 13. Bojan Stanković (RSIS) 14. Darko Gajić (RSIS)	BHAS, Sarajevo (or Data Processing Centre)
13:00 – 14:00	**Lunch**	
14:00 – 17:00	**Observation of the data processing (part of SC)** - Observation of processing Control of questionnaires	Data Processing Centre, East Sarajevo
14:00-17:00	**Meeting with Dissemination Team (part of SC)** 1. Ivona Bulić (BHAS) 2. Zehra Kaba (FIS) 3. Vladan Sibinovic (RSIS)	BHAS, Sarajevo

Friday, June 6, 2014, Agency for Statistics of BiH (BHAS), Sarajevo		
09:00-10:00	**Meeting with PES Team** 1. Edin Šabanović 2. Jasna Isaković **3.** Vladimir Mijović **4.** Darko Marinković **5.** Arijana Amina Muhic	**BHAS, Sarajevo**
10:00-11:30	**Debriefing with Dr. Daviddi, Deputy head of EU Delegation and Team of EU Delegation (JM Durr + Ana Rusu).**	**EU Delegation, Sarajevo**
12:00-15:00	**Videoconference with the Directors of Statistical Institu-**	**BHAS, Sa-**

	tions (BHAS, FIS, RSIS)	rajevo
15:00 – 15:30	Lunch	
15:30-17:00	Debriefing meeting of the SC	BHAS, Sa-rajevo