# Register-based census Statistical processing
## Case of Slovenia

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# Statistical process – general scheme

- 1. Defining content, structure and sources of basic and auxiliary productional census tables
- 2. Preparation of input datasets
- 3. Integration of datasets
- 4. Editing
- 5. Data warehousing

# Defining content, structure, sources (1)

- Three basic ORACLE tables are created
  - POPulation, DWelling, BUILding
- Several auxiliary ORACLE tables for specific domains or variables are created
  - HOUsehold, EDUcation, ACTivity_status, MIGration, FERtility….

# Defining content, structure, sources (2)

- Six types of variables determined:
  - Input identifiers
  - Output (final) identifiers
  - Census topics
    - Could be more than one variable for a topic
  - Working (processing) variables
  - Derived variables
  - Territorial metadata

# Defining content, structure, sources (3)

- Obligatory metadata for every variable
  - Data source (name of input dataset)
    - The same name of the variable
  - Editable or not
  - Format and lenght
  - Classification used
    - Stored in our classification server
      - Publicly available

# Defining content, structure, sources (4)

- Timeliness of sources
  - Most refer to census reference day (1 January)
  - Some refer to another reference day
  - Few refer to previous calendar year
  - Also some historical / longitudinal / previous census data are used
- Availability of sources

# *Data sources (1)*

| **Data source content** | **Ref. day / period** | **Availability in months** |
|---|---|---|
| Central Population Register | 1.1.Y | T+3 |
| Household Register | 1.1.Y | T |
| Real Estate Register | 1.1.Y | T / T+12 |
| Statistical Register of Employment | 1.1.Y | T+2 |
| Business Register | 1.1.Y | T+1 |
| Registered unemployed persons | 1.1.Y | T+1 |
| Primary and secondary enrolment | 30.9.Y-1 | T+5 |
| Tertiary enrolment | 1.10.Y-1 | T+5 |
| Scholarship recipients | 1.1.Y | T+5 |
| Pension recipients | 1.1.Y | T+3 |

T = 1 January (reference day)

# *Data sources (2)*

| Data source content | Ref. day / period | Availability in months |
|---|---|---|
| Persons in health insurance | 1.1.Y | T+1 |
| Social transfer recipients | Y-1 | T+6 |
| Income tax payers | Y-1 | T+10 |
| Tertiary education graduates | 1989+ | T+6 |
| Matura graduates | 2002+ | T+6 |
| Previous census | 1.1.Y-3 | T |
| Statistical survey on migration | 2002+ | T+7 |
| Statistical survey on birth | 2002+ | T+6 |
| Population one year before | 1.1.Y-1 | T |

T = 1 January (reference day)

# Preparation of input datasets (1)

- More than 30 datasets
  - Most common - .txt or .csv
  - Direct connection to another ORACLE database
- Datasets prepared by:
  - Subject matter methodologists
    - Statistical (final already edited data)
  - Persons responsible for administrative sources
    - Administrative raw data (not changed)
    - Administrative edited data

# Preparation of input datasets (2)

- Basic rules for input datasets
  - No duplicates of key identifier
  - Only valid identifiers used
  - Re-coding (if necessary) to prescribed classification
  - Full coverage

# Preparation of input datasets (3)

- Statistical data (example)
  - Usual population quarterly derived from CPR four months after reference day
    - Input – 2.6 million records
    - Output – 2,084,301 (1 April 2019)
  - Usual population = census population

# Preparation of input datasets (4)

- Administrative raw data(example)
  - Household Register data
    - No sense to edit data before data integration
    - Usual residence should be derived before using household data

# Preparation of input datasets (5)

- Administrative edited data(example)
  - Income Tax Payers
    - Used for labour force status
      - Derived on the basis of type of income

# Data integration

- Integration of datasets using unique identifiers in ORACLE
  - Fundamental principle for each variable – number of sources foreseen
    - One source – direct load to basic tables
    - Two or more sources – load to auxiliary tables
      - After data integration and editing – load to basic tables
- Data integration is the most important step in register-based census processing

# Editing

- Four main procedures employed
  - Automated correction / derivation of missing identifiers by using tailor-made programmes
    - To link tables
  - Manual corrections using interface
    - Only household / family data
  - Automated corrections using generalised own developed metadriven application in SAS
  - Imputations using generalised own developed metadriven application in SAS

# Data warehouse

- Setting up four final databases for dissemination
  - PERSONS
  - HOUSEHOLDS
  - FAMILIES
  - DWELLINGS
- Variables from basic ORACLE tables
  - PERSONS - 79
- Derived variables
  - PERSONS - 47

# Basic principles of data processing

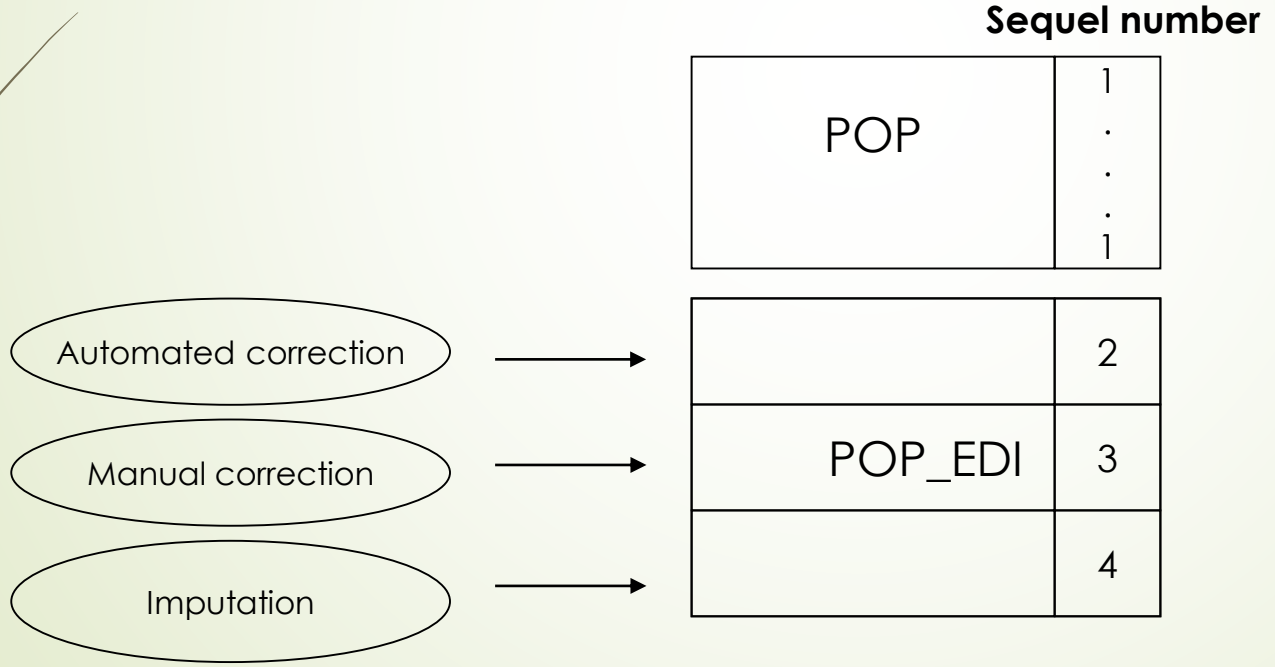
- Gradual (step by step) data processing
  - All data sources are not available at the same time - integration of the input data had to be adapted to the timeliness of the sources
- Traceability
  - Corrections did not replace the old values - new version of the record is created
- Repeatability
  - Each step in the process is repeated as many times as necessary with the same outputs

# Gradual data processing - steps

- Basic population data – T + 4 months
- Household / family data – T + 9 months
- Migration, fertility and socio-economic characteristics – T + 11 months
- Housing data (occupied and non-occupied dwellings) – T + 18 months
- **No change of data after every step**

# Traceability (1)

- Basic table (POP) created – initial input data
- Auxiliary table (POP_EDI) – new version of the record created in case of editing
- Any change of record is labelled by sequel number



# Traceability (2)

- Another ‘‘mirror‘‘ table (POP_STATUS) is created to trace the status of the change of each variable

**POP**

| ID | V1 | V2 | … | Vn |
|---|---|---|---|---|
| | | | | |

**POP_STATUS**

| ID | V1_s | V2_s | … | Vn_s |
|---|---|---|---|---|
| | | | | |

# Traceability (3)

- The status gives information on the type of the change in the process

**Initial data**

| ID | V1 | V2 |
|---|---|---|
| 111 | 300 | 01 |
| 112 | 2 | Null |

| ID | V1_s | V2_s |
|---|---|---|
| 111 | 21.11 | 31.11 |
| 112 | 21.12 | Null |

**Automated correction**

| ID | V1 | V2 |
|---|---|---|
| 111 | 3 | 01 |
| 112 | 2 | Null |

| ID | V1_s | V2_s |
|---|---|---|
| 111 | 22.13 | 31.11 |
| 112 | 21.12 | Null |

**Imputation**

| ID | V1 | V2 |
|---|---|---|
| 111 | 3 | 01 |
| 112 | 2 | 04 |

| ID | V1_s | V2_s |
|---|---|---|
| 111 | 22.13 | 31.11 |
| 112 | 21.12 | 41.14 |

# Traceability (4)

- Relation between tables and views
- The key: statistical identifier of person