Finding and Mapping Data About Your Community

Do More with Digital Scholarship Series
February 7, 2019

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Agenda

Data

Census of Canada Data and Geography

Demo: Stat Can’s Census Program website and Canadian Census Analyser

GIS

Intro to GIS (what is it, data types, and coordinate systems)

Demo: Mapping median income across Hamilton

Q & A
Data
Census of Canada

- Census is a “snapshot” of the Canadian population at one moment in time
- All data collected on a single day
- Conducted every 10 years between 1851-1956
- Conducted every 5 years since 1956 (limited questionnaire)
Census of Canada

- 100% Sample
  - Question answered by every household
  - Includes variables such as age, sex, family characteristics, language
  - The “short form”

- 25% Sample (20% Sample)
  - Question answered by 1 out of every 4 households
  - Questions about ethnic groups, religion, income, employment, education
  - The “long form”
Census of Canada

- The last Census was conducted in May 2016.
- 2011 Census was conducted differently; it consisted of the same eight questions that appeared on the 2006 Census short-form questionnaire, with the addition of two questions on language.
  - The information previously collected by the long-form Census questionnaire was collected as part of the new voluntary National Household Survey (NHS 2011). This questionnaire covered most of the same topics as the 2006 Census.
Census Data

- A variable is a subject about which information can be retrieved from the Census data
  - 59 questions are listed in the Census 2001 questionnaire, yet the Census dictionary lists over 200 variables

- This is because some questions yield a number of variables, while other variables are derived from the response to a number of questions
Census Data

• **Profile Data**
  
  • Provides a statistical overview of various geographic areas based on a number of detailed variables.
  
  • Flat table structure → easier to use with GIS application
  
  • Download Profile data in Excel, CSV and IVT formats

*Census 2011 Profile data for Hamilton CSD*
Census Data

• Topic Based Tabulations / Data Tables
  • Present a portrait of Canada based on the various census topics.
  • Crosstabs of one or more variables with Census geography in a multi-dimensional file structure
  • Not a friendly format for any GIS application
  • Download TBT data in Excel, CSV and IVT formats

Census 2006 TBT showing crosstab of Education and Labour Force variables for Canada
Census Data

• **Public Use Microdata**
  
  • PUMFs provide access to non-aggregated data covering a 2% sample of the Canadian population.
  
  • It is a comprehensive social, demographic and economic database about Canada and its people and contains a wealth of characteristics on the population.
  
  • PUMFs available in SPSS, SAS, Stata etc. formats.

Census 2006 Individual PUMF
Census Geography

- Various levels of Census geography
  - Canada
  - Province
  - Census Division (CD)
  - Census Subdivision (CSD)
  - Census Metropolitan Area (CMA)
  - Census Tract (CT)
  - Aggregate Dissemination Area (ADA) – **New for 2016**
  - Dissemination Area (DA)
  - Federal Electoral Districts (FED)
  - Forward Sortation Areas (FSA)

Geographical definitions and concepts are listed at:
https://www150.statcan.gc.ca/n1/pub/92-195-x/92-195-x2016001-eng.htm
Census Geography

- **Administrative areas** are defined, with a few exceptions, by federal and provincial statutes and are adopted for purposes of the census. Administrative areas are legal entities.

- **Statistical areas** (CMA, CT, DA) are defined by Stat Can to support the collection and dissemination of data in order to maintain statistical consistency over time. SAs are not legal entities but were created by Stat Can according to a set of rules based on geographic attributes and one or more characteristics of the resident population.
Census Geography - Census Metropolitan Area (CMA)

- One or more adjacent Municipalities situated around a major urban core (over 100,000 people)

- Hamilton CMA *includes part* of Burlington and *part* of Grimsby
Census Geography - Hamilton CMA

Lake Ontario
Census Geography - Census Division (CD)

- Similar to counties
- Group of neighbouring municipalities joined together for the purposes of regional planning and managing common services (such as police or ambulance services)
- **1996 Census** – Hamilton CD was the Regional Municipality of Hamilton-Wentworth (Ancaster, Dundas, Flamborough, Glanbrook, Hamilton and Stoney Creek)
- **2001 Census** – Hamilton CD is the New City of Hamilton
Census Geography - Hamilton CD

Lake Ontario
Census Geography - Census Subdivisions (CSD)

- Similar to a municipality or an area that is deemed to be equivalent to a municipality for statistical reporting purposes (e.g., as an Indian reserve or an unorganized territory)
- 1996 Census
  - Hamilton CD = 6 CSDs
  - Hamilton CMA = 8 CSDs
- 2001 Census
  - Hamilton CD = 1 CSD (New City of Hamilton)
Census Geography - Hamilton CSD 1996

Lake Ontario
Census Geography - Hamilton CSD 2001
Census Geography - Census Tracts (CT)

- Located in CMA and CAs that have a core population of 50,000 or more
- Small, relatively stable areas representing neighborhood-like areas
- Size varies between 2500 – 8000;
  - preferred average is 4000

  - 1996 Census – Hamilton CMA = 163 tracts
  - 2001 Census – Hamilton CMA = 172 tracts
  - 2006 Census – Hamilton CMA = 178 tracts
Urban versus Rural Areas

- **Urban Area or Population Centre (POPCTR)**
  - Area with a population of at least 1,000 and no fewer than 400 persons per square kilometre.
  - Starting with the 2011 Census, the term 'population centre' (POPCTR) replaces the term 'urban area' (UA). Population centres are classified into three groups, depending on the size of their population:
    - small population centres, with a population between 1,000 and 29,999
    - medium population centres, with a population between 30,000 and 99,999
    - large urban population centres, with a population of 100,000 or more.
Urban versus Rural Areas

- **Rural Area**
  - Rural areas (RAs) include all territory lying outside population centres (POPCTRs). Taken together, population centres and rural areas cover all of Canada.
  - Rural population includes all population living in rural areas of census metropolitan areas (CMAs) and census agglomerations (CAs), as well as population living in rural areas outside CMAs and CAs.
Beware! - “Lies, Damn Lies, and Statistics”

- Geography can make a difference in comparisons!
- If comparing to the City of Hamilton, do not use Hamilton CMA

<table>
<thead>
<tr>
<th></th>
<th>Average individual income</th>
<th>Median individual income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamilton Census Division</td>
<td>$29,489</td>
<td>$22,927</td>
</tr>
<tr>
<td>(Ancaster, Dundas, Flamborough, Glanbrook, Hamilton, Stoney Creek in 1996 = New City of Hamilton in 2001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hamilton Census Metropolitan Area</td>
<td>$32,379</td>
<td>$24,987</td>
</tr>
<tr>
<td>(includes all of the above plus parts of Burlington and Grimsby)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Remember!

Do not put faith in what statistics say until you have carefully considered what they do not say.

--William W. Watt
DEMO TIME
Statistics Canada’s Census Program Website

- **Data Products (1991 - 2016):** Access to latest and historical Census data sets including tabulations, profiles, microdata and data visualizations for various Geographical areas.
- **Analytical Products:** Analysis of Census of Population Program topics.
- **Reference materials:** Supporting documentation to assist users with understanding and interpreting Census of Population Program information.
- **Geography:** Information on various geographic areas, access to thematic/reference maps and spatial information products.
- **Data Visualization:** A collection of charts, infographics, videos and thematic maps providing 2016 Census highlights in a visual context.
- **Custom Services:** Custom tabulations of various years of data (1971 to 2016) from Census are available. Custom services allow for products and services to be tailored to more demanding and complex requests.
The Canadian Census Analyser provides access to Canadian Census Data (both long and short form) at various levels of Geography.


You can tailor your output by selecting which data categories you are interested in, from the full list of categories. Output formats include html, text, spreadsheet, SAS and SPSS.
GIS
What is GIS?

- **Geographic Information Systems**
- A system to assemble, store, manipulate, analyze, manage and present *geographically referenced data*
  - Data associated with, or identified by, their location
- A digital representation of real-world geographic attributes:
  - Location
  - Attributes
  - Spatial relationships
- Allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends
Components

1. Hardware
2. Software
3. Data
4. Analysis - applications and methods
5. People - developers and users
Spatial data

- Vector and raster data models used to represent the real world
Vector Data

- Features are represented by:
  - Points - x,y locations
  - Line - connected x,y locations
  - Polygon (area) - connected x,y locations forming a closed figure

- File format - *shapefile* (.shp)
- Good for clearly-defined objects
Raster Data

- Grid of cells
- Numbers assigned to each cell representing data
  - Categorical - Land use, e.g.
  - Continuous - Temperature, elevation, e.g.
- Good for representing continuously changing attributes
Attribute data

- Tabular data appended to spatial data providing contextual information
- The spatial data is the where, and the attribute data is the what, where, and why (GIS Lounge)
Coordinate Reference Systems (CRS)

- Referencing the location of features on the earth’s surface
- Two methods - **Geographic** Coordinate Systems or **Projected** Coordinate Systems
Geographic Coordinate Systems

- Locations expressed as angles from a point
- Network or intersecting lines - meridians (longitude), parallels (latitude)
- Reference system for a curved earth based on a geodetic datum
- Many datums exist - World Geodetic System (WGS) 84, North American Datum (NAD) 83
Projecting the round earth onto a flat surface causes distortion. Different projections preserve shape (conformal), area (equal area), distance (equidistant), or direction (true direction). Locations are referenced as distance from a reference point.

Projected Coordinate Systems

Origin (0 m E, 0 m N)

500 m E, 1000 m N
Why is this important?
Spatial data sources
Where can I get data?

- McMaster University Library
  - [https://library.mcmaster.ca/collections/geospatial-data](https://library.mcmaster.ca/collections/geospatial-data)

- Scholars GeoPortal
  - [http://geo.scholarsportal.info/](http://geo.scholarsportal.info/)

- City of Hamilton
  - [http://open.hamilton.ca/](http://open.hamilton.ca/)

- Ontario’s Data Catalogue
  - [https://www.ontario.ca/search/data-catalogue](https://www.ontario.ca/search/data-catalogue)

- Canada’s Open Data Portal
Exercise

- Before we begin...
- Create a new folder on the desktop
  - OR
- Create a folder on a USB key
GIS Software

- Many, MANY types of software
- Different tools for different purposes
  - Full-featured vs. specialized
  - Open-source vs. Closed-source
  - User-friendly vs. technical
QGIS

- Free and open-source GIS software
- Fully-functional; relatively lightweight
- Product of the Open Source Geospatial Foundation (OSGeo)
- Written in C++ (allows python plugins)
- Version 1.0 released in 2009; Currently 3.4
- Rapidly gaining in popularity
- QGIS downloads, user guide, and training manual
QGIS Tutorials and Resources

- QGIS Tutorials
  - http://www.qgistutorials.com

- QGIS video tutorials with Klas Karlsson
  - https://www.youtube.com/channel/UCxs7cfMwzgGZhtUuwhny4-Q

- QGIS Documentation
  - User guide and training manual
QGIS

1. Menu bar
2. Toolbars
3. Panels
4. Map view
5. Status bar
Questions?
Hands-on exercise

- Map median income across Hamilton by dissemination area (DA)
Thanks!

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Next workshop -

*Turning paper maps to interactive layers: Georeferencing and digitizing maps with GIS*

Thurs. Feb. 28th, 1-4pm