Balancing Respondent Confidentiality and Data User Needs

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What is the Issue?

- Conflicting goals
  - Maximize data access
  - Protect respondents identity
Why is Confidentiality Important?

- Ensure trust of respondents for their cooperation
- It’s the law
What is Title 13?

- U.S. Code: Title 13 allows the Census Bureau to take a survey and provides directives for its administration and enforcement.
- People who took the oath who wrongfully disclose information protected under Title 13 are subject to a fine of up to $250,000 or up to 5 years in prison or both.
- Census and CE staff need Title 13 clearance.
Title 13 Training

- CE staff gain access to internal data after completing 2 steps:
  1. Pass a background check by Census
  2. Take the Title 13 training

- CE staff are required to annually retake Title 13 training and pass a knowledge check to maintain Special Sworn Status
Who Determines Disclosure Threats?

Disclosure Review Board of the Census Bureau
How Could Microdata Reveal Respondents’ Identity?

Unique data points

- Names
- Addresses
- Extreme income
How to Protect Respondents’ Confidentiality?

Conceal revealing information

- Census removes *direct* identifiers, i.e. names
- BLS suppresses *indirect* identifiers, i.e. high income
How to Conceal Indirect Identifiers?

- **Topcode**: Average numerical values above threshold
- **Recode**: Change item or CU characteristics
- **Suppress**: Delete numerical value or delete entire record
How do we Topcode?

- Determine critical value
- Average values exceeding critical value
- Replace exceeding values with top-coded values
Topcoding Example
Topcoding Example
Topcoding Example

Extreme values
Topcoding Example

Topcoded values

[Graph showing topcoded values]
How to Determine Critical Values?

- Critical value is any value by a consumer unit above the specified percentiles:
  - Expenditures: 99.5 %
  - Income: 97.0 %
How do we Recode?

- Find metadata that meet criteria
- Determine method:
  - Generalize information
  - Change information
- Replace original metadata with recoded metadata
Re-coding: Generalize Information

- From Toyota Corolla 1999
- To Toyota 1990s
Re-coding: Change information

- Change states to comparable states

New Jersey

Delaware
How to Conceal Indirect Identifiers?

- **Top-coding**: Provide average of expenditures above a threshold
- **Re-coding**: Change item or CU characteristics
- **Suppression**: Delete numerical data or entire record
Suppression

- Erase aspect of the record
  - Example: Boat purchase
  - Example: State suppression

- Exclude entire record
  - Example: Airplane purchase
Reverse Engineering

What’s X?

5 = 3 + X
How to Prevent Reverse Engineering?

Prevent users to deduce protected information within files and across files

1. Find protected values
2. Protect them in all locations
3. Protect related values
Reverse Engineering: Within File

- Income = Wages + taxes
- 1000 = 800 + 200
- 1000 = 750 + 200
- 950 = 750 + 200

Critical value: 700
Topcode value: 750

Wages exceeds the critical value
Reverse Engineering: Within File

- Income = Wages + taxes
- 1000 = 800 + 200
- 950 = 750 + 200
- Critical value: 700
- Topcoded value: 750

Wages match the topcoded value
Reverse Engineering: Within File

- Income = Wages + taxes
- 1000 = 800 + 200
- 1000 = 750 + 200
- 950 = 750 + 200

Critical value: 700
Topcode value: 750

Wages and taxes match the income
Reverse Engineering: Across Files

**Income:** Topcoded income in FMLI
- Topcode associated UCCs in ITBI

**Expenditure:** Topcoded expenditures in EXPN and FMLI
- Topcode associated UCCs in MTBI
How Do We Document?

Flag values

- **T**: Topcoded value
- **D**: Valid value, unadjusted
Impact of topcoding

- CE topcodes few observations
- Most affected data slices:
  - Geographic data non-self representing cities
  - Income for high earners
Impact of Suppression of Geographic variables, Percent

- Almost 60% of suppressed PSUs
- Below 15% of suppressed states, divisions, and regions

Source: FMLI and FMLD files for 2015.
Need more data?

- Visiting researcher program
  - Access to pre-topcoded CE microdata
  - Requires application process
  - [www.bls.gov/rda/home.htm](http://www.bls.gov/rda/home.htm)
Additional Information

- Protection of respondent confidentiality
  (www.bls.gov/cex/pumd_disclosure.htm)

- PUMD documentation
  (www.bls.gov/cex/pumd_doc.htm)

- Title 13
  (www.census.gov/history/www/reference/privacy_confidentiality/title_13_us_code.html)
Thank you!

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