Advancing the Data Modernization Initiative through Data Linkages

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NCHS Board of Scientific Counselors

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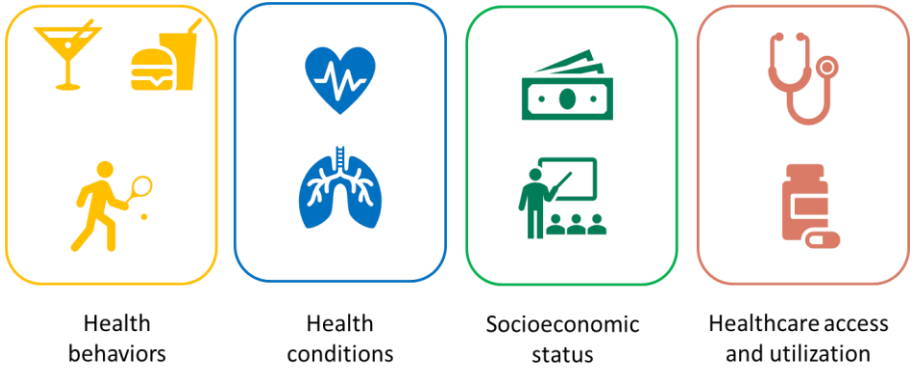
Overview

- NCHS Data Linkage Program
- Data Modernization Initiative
  - Linking to New Sources of Data
  - Evaluating Linkage Methodologies
  - Implementing Privacy Preserving Techniques
    - Privacy Preserving Record Linkage
    - Synthetic Data
- Summary
- Questions for the Board

NCHS Data Linkage Program: Sources

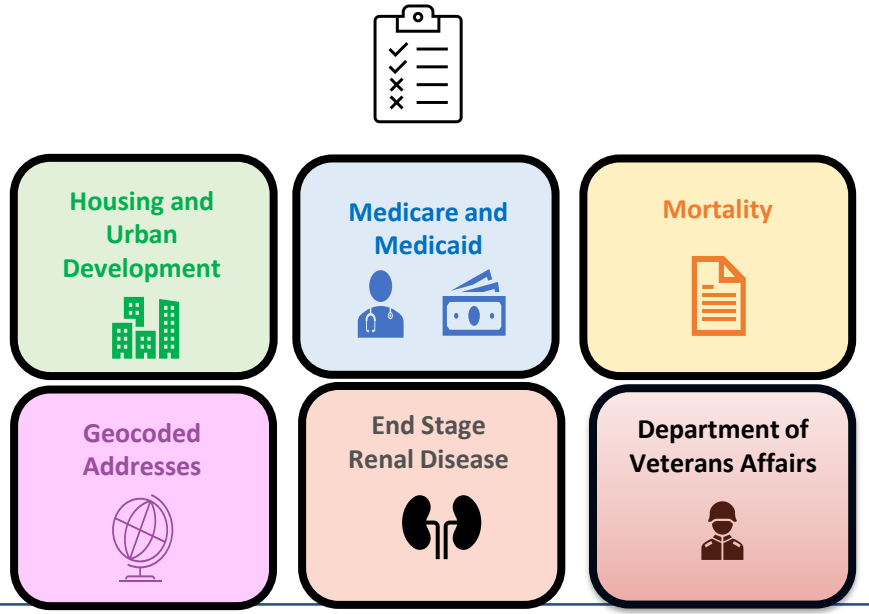
Survey Data

Sampling frame
Known inference



Administrative Data

Program participation/vital status
Not meant for research purposes



Linking NCHS Survey Data to Two New Sources of Data

Veterans Affairs (VA) data

Transformed Medicaid Statistical Information System (T-MSIS)

Both of these new data sources:

- Use enhanced linkage methodologies
- Will be available for researchers in summer 2022
- Can be used to answer key policy questions, such as:
  - ✓ VA: What are the health characteristics, outcomes, and health care utilization for Veterans within and outside the VA health system?
  - ✓ T-MSIS: How do health policy changes affect the health of Medicaid recipients?

T-MSIS PII data quality assessment will be included in linkage documentation.

Evaluating Linkage Methodologies

- NCHS Data Linkage Program developed state-of-the-art methodologies to link data (including machine learning)

- Comparison of NCHS enhanced algorithm to open-source linkage software

  - Exploring Match*Pro
  - Could be utilized enterprise wide

Initial Match*Pro Comparison to Standard Methods

- Random sample was compared
- Preliminary results are promising for total number of possible pairs
  - P(>0.95)→ concordance 87%
  - P(>0.85)→ concordance 89%

		Gold Standard		
Match*Pro P(>0.95)		Did not link	Linked	Total
	Did not link	n/a	988	988
	Linked	10	6,908	6,918
	Total	10	7,896	7,916

		Gold Standard		
Match*Pro P(>0.85)		Did not link	Linked	Total
	Did not link	n/a	792	792
	Linked	22	7,104	7,126
	Total	22	7,896	7,918

Next Steps for Comparison Analysis and Future Use

- Explore off diagonals
- Assess impact on secondary analysis
- Resolve computing capacity issues for larger datasets

		Gold Standard		
Match*Pro P(>0.85)		Did not link	Linked	Total
	Did not link	n/a	792	792
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Implementing Privacy Preserving Techniques: Evaluating Privacy Preserving Record Linkage (PPRL)

- PPRL could expand linkage opportunities to new sources of data
- Assessed how PPRL compared to standard linkage methodologies (using NHCS-NDI linkage for comparison)

✓ Precision ranged from 93.8% to 98.9%

✓ Recall ranged from 98.7% to 97.8%

A methodological assessment of privacy preserving record linkage using survey and administrative data

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Implementing Privacy Preserving Techniques: PPRL Next Steps

- Assess different PPRL tools, using NCHS linked data as gold standard
  - Supported with OS-PCORTF FY 22 funding
  - Open source and commercial products
  - Evaluating sub-populations and linkage quality
- Collaborate with ASPE to inform other HHS OPDIVs considering PPRL implementation going forward
- Participate in CDC's PPRL Community of Practice

Implementing Privacy Preserving Techniques: Synthetic Linked Data

Piloting innovative methods to create public-use linked files that increase data accessibility while maintaining analytic utility and protecting privacy

File Development

- Conducted expert interviews: 9 federal partners, 3 non-federal
- Focus on health equity and SDOH
- Selected variables, now testing
- Three proposed files
  - NHIS linked to HUD, CMS Medicare (two files: one for ages 18+, one for ages 65+)
  - NHCS linked to HUD and NDI (all ages)

File Dissemination

- Data will be available for researchers in summer 2023
- Creation of a validation service
  - Analyses will be run on synthetic data and then validated on the true linked data
  - Homomorphic encryption vs. manual validation
- Interactive data tables

Summary: DMI and Data Linkages

- Strengthening the exploration of new technologies for data linkage
- Creating opportunities to:
  - Expand linkages beyond traditional federal data sources
  - Create files that protect privacy and increase data accessibility
- Developing new resources to address emerging public health issues
- Supporting the objectives of the Foundations Evidence Building for Policymaking Act of 2018 and for CDC to respond to public health emergencies

Questions for the Board:

- What are some innovative strategies we should consider for outreach about the new linked files?
- Are there concerns with synthesizing variables that have been brought in at the zip code level (e.g., percent of zip code residents that are uninsured) for a person level file?
- Do you have suggestions on how to set up a sustainable validation service for the synthetic data?

Questions?

Thank you!