Assessing Linkage Eligibility Bias in the National Health Interview Survey (NHIS)

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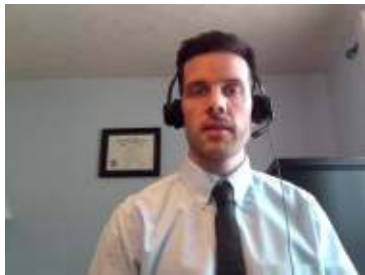


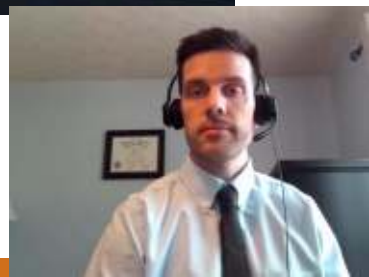
Overview

This presentation will cover 6 topics:

1. Background
2. Linkage eligibility bias as defined in the NHIS
3. Motivation and methods for “linkage eligibility bias” assessment
4. The extent of linkage eligibility bias in the NHIS
5. The relationship between eligibility rates and bias
6. Mitigating linkage eligibility bias through weight adjustment

1. Background

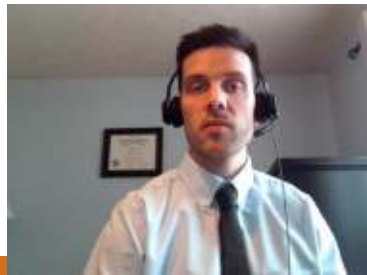
- National Center for Health Statistics (NCHS)
  - Nation’s principal health statistics agency
  - One of 13 federal statistical agencies
  - **Mission:** To provide timely, relevant statistical information that can be used to guide actions and policies to improve the health of the American people



1. Background

National Health Interview Survey (NHIS)

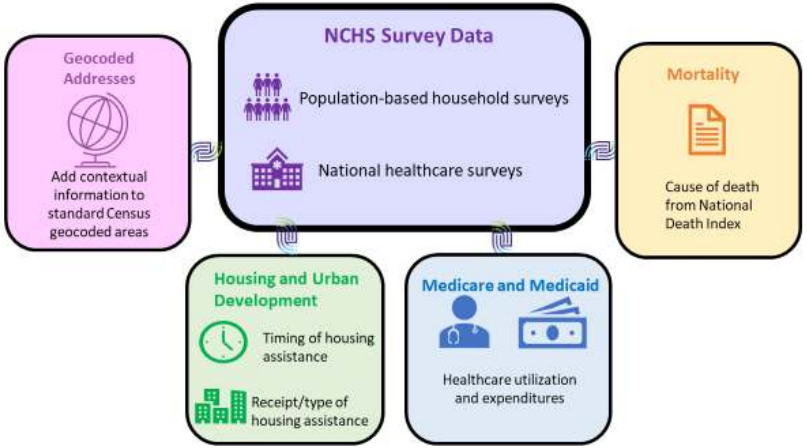
A nationally representative, cross-sectional household interview survey that serves as an important source of information on the health of the civilian noninstitutionalized population of the United States

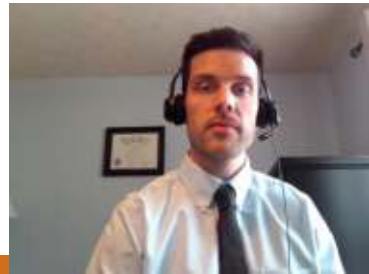


1. Background

- Linking data is a powerful mechanism to provide policy relevant information in an efficient way

- NCHS currently links data from its surveys to administrative data sources using personally identifiable information (PII)





1. Background

- Value added by linkage
  - Additional variables
  - Longitudinal outcome information
  - Reduced participant burden
  - Improved ascertainment of difficult-to-remember information

- Additional considerations when analyzing linked data
  - Potential reduction in sample size
  - Potential for bias in estimates

1. Background

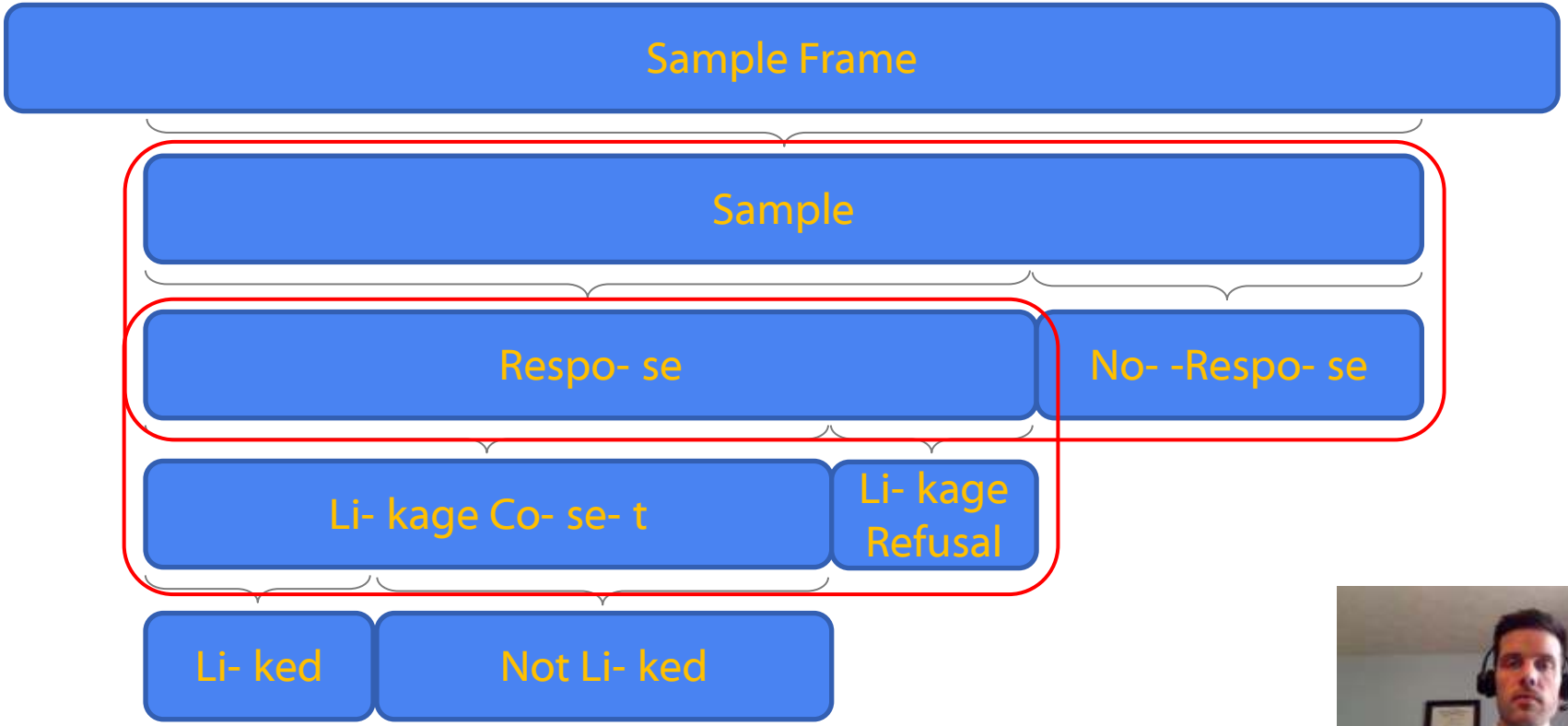
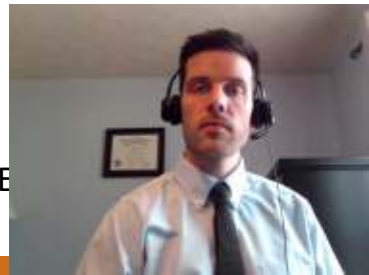


Figure based on AAPOR Proceedings, “Non-Consent Error, Non-Response Error, and Measurement E
Overall Quality of Linked Survey and Administrative Data” by Joseph Sakshaug



2. Linkage eligibility bias as defined in the NHIS

Prior to 2007

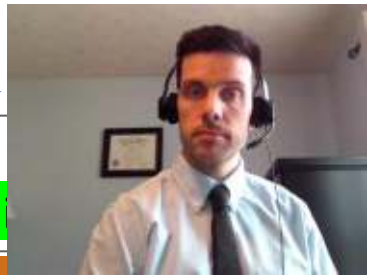
Asked for SSN9

- Refused: Not Linkage Eligible
- Don't know/missing: Linkage Eligible
- Provided: Linkage Eligible

2007 forward

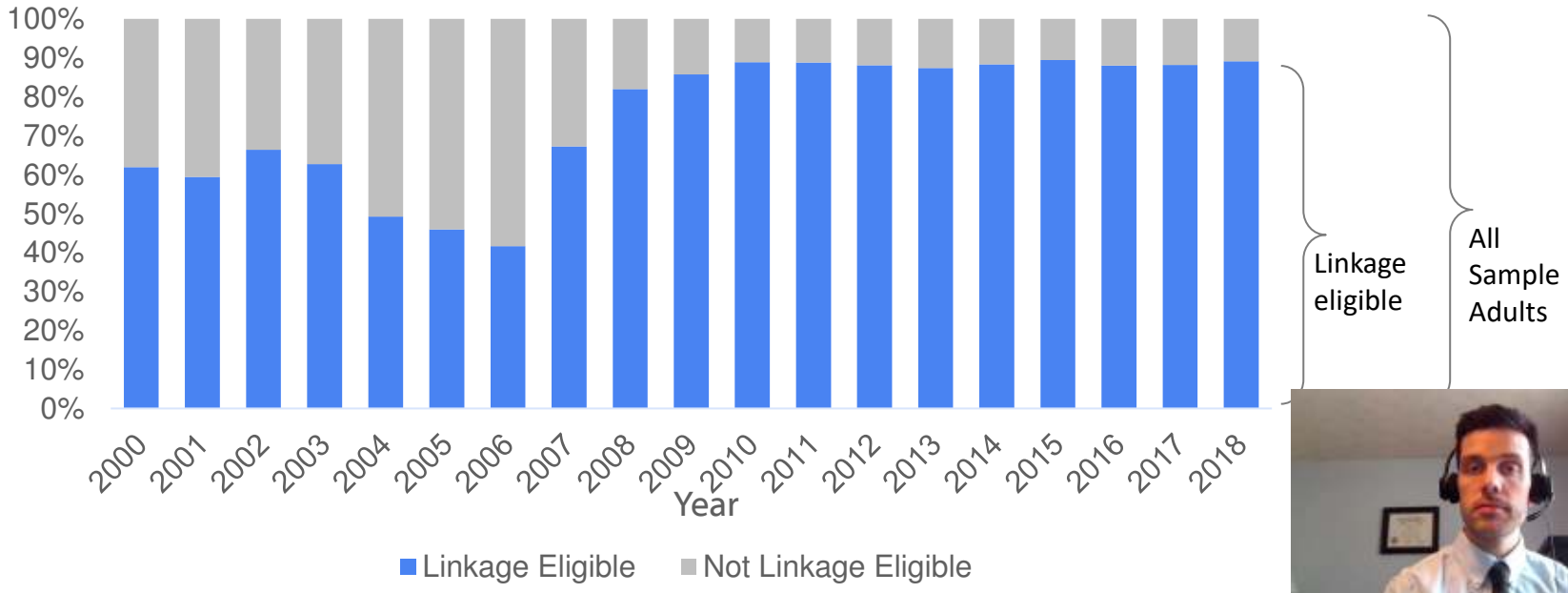
Asked for SSN4

- Refused/don't know/missing
  - Asked for consent to link without SSN4
    - Refused: Not Linkage Eligible
    - Agreed: Linkage Eli
- Provided: Linkage Eligible



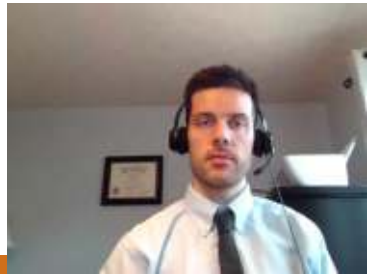
3. Motivation and methods for “linkage eligibility bias” assessment

Linkage Eligibility, NHIS Sample Adults



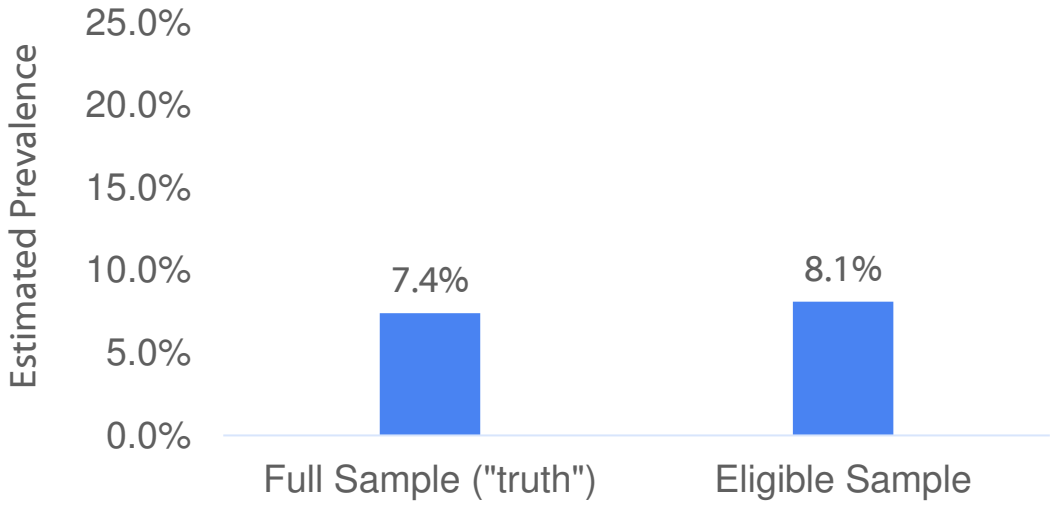
3. Motivation and methods for “linkage eligibility bias” assessment

- The fact that not everyone is linkage eligible could have implications for inference when using the linked data
- Survey years were grouped to reflect changes in sample design and in linkage eligibility criteria
- Bias was measured by comparing estimates from the full sample and the linkage-eligible sample
  - Demographic variables
  - Selected health conditions
- Survey weights were adjusted for linkage eligibility
- Bias was reassessed using adjusted weights

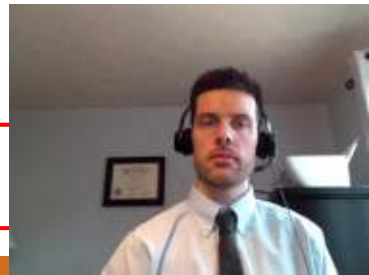


3. Motivation and methods for “linkage eligibility bias” assessment

Example: Percent Relative Bias, Prevalence of Diabetes, 2004-2006

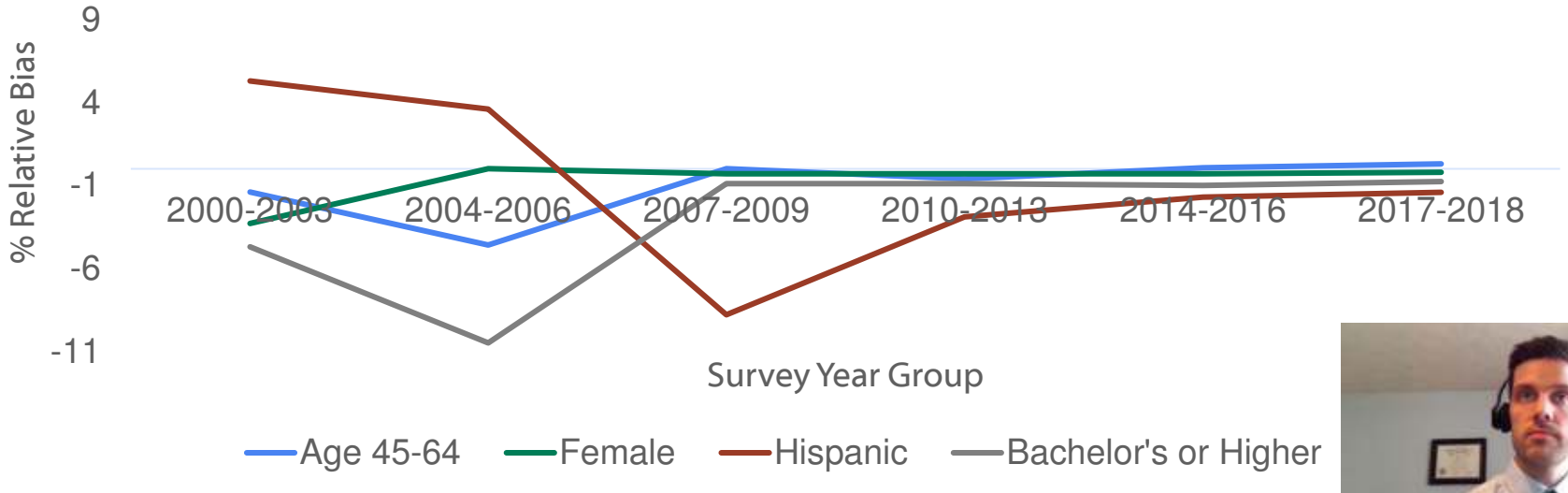


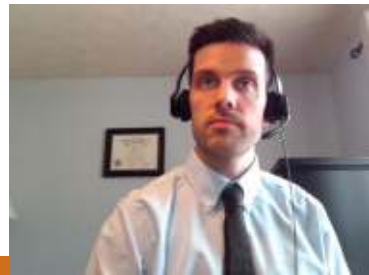
$$\frac{(Estimate_{linkage\ eligible\ sample} - Estimate_{full\ sample})}{Estimate_{full\ sample}} = \frac{(8.1 - 7.4)}{7.4} * 100 \approx 9\%$$



4. The extent of linkage eligibility bias in NHIS

Percent Relative Bias, Select Sociodemographic Variables, 2000-2018





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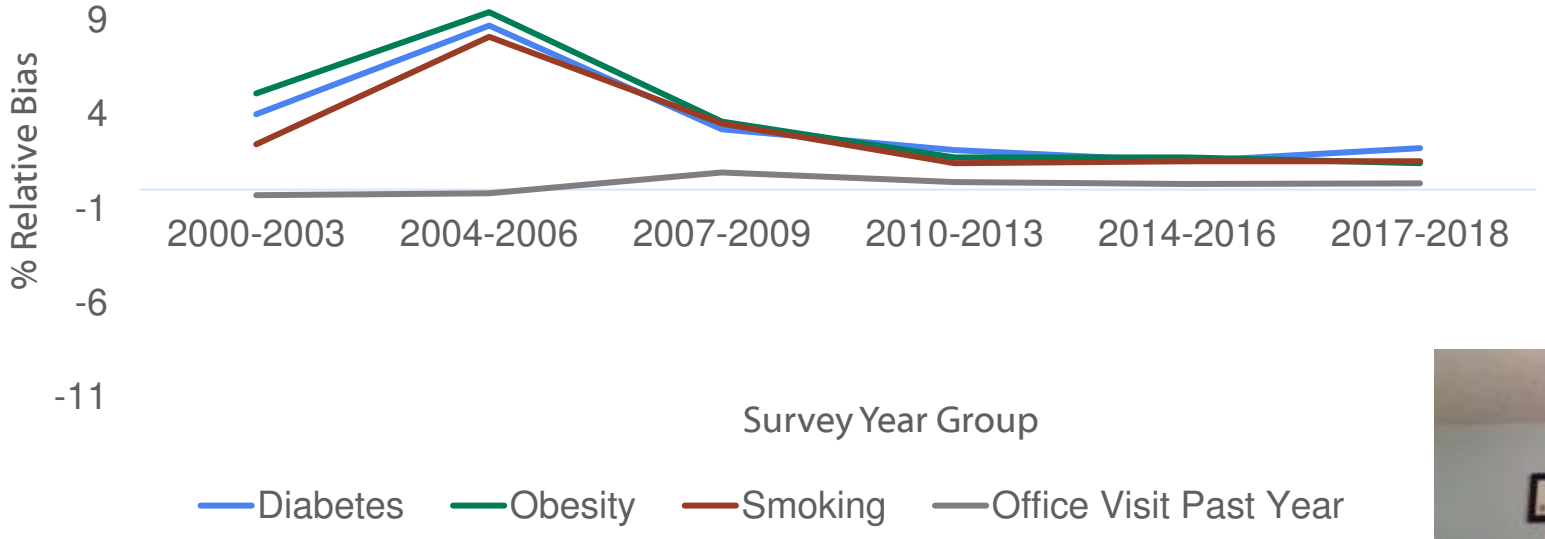
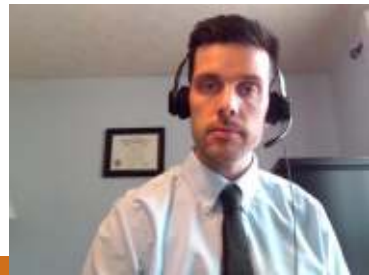
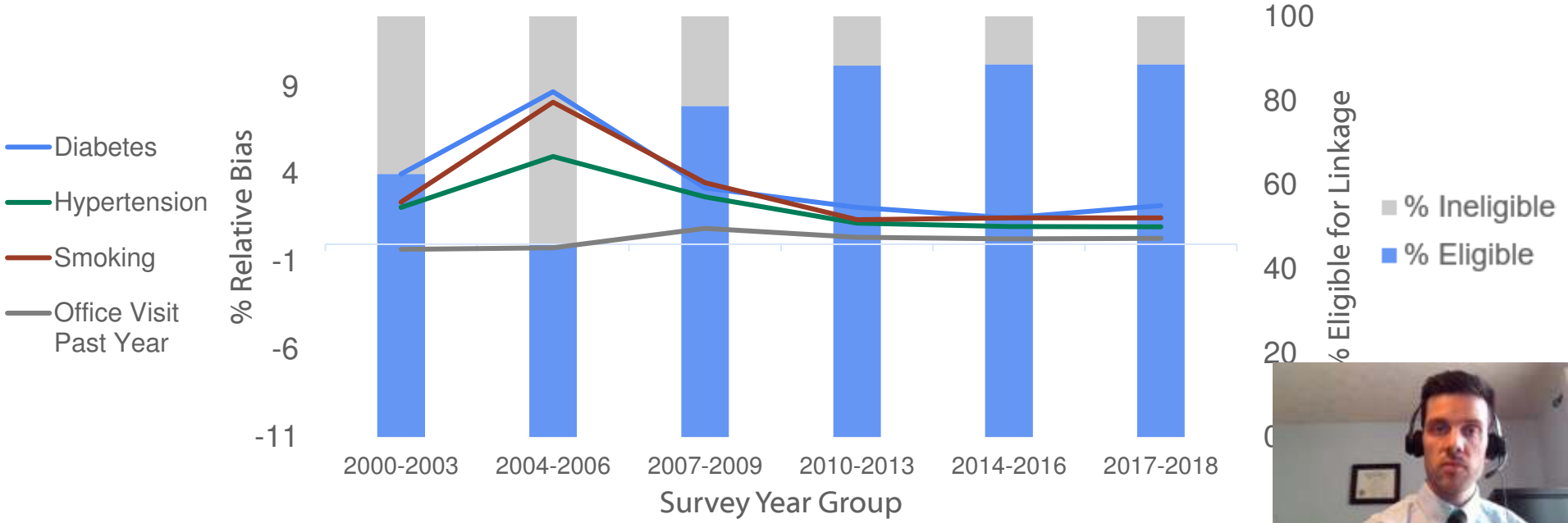
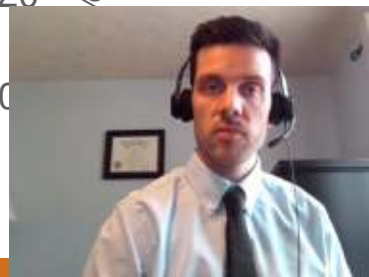
Percent Relative Bias, Prevalence of Select Health Outcomes, 2000-2018





5. The relationship between eligibility rates and linkage eligibility bias



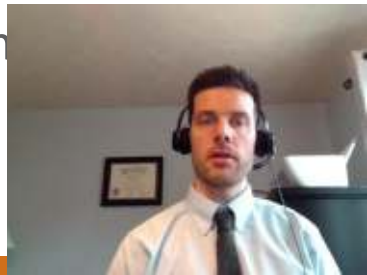


6. Mitigating linkage eligibility bias through weight adjustments

Adjusting Weights for Linkage Eligibility

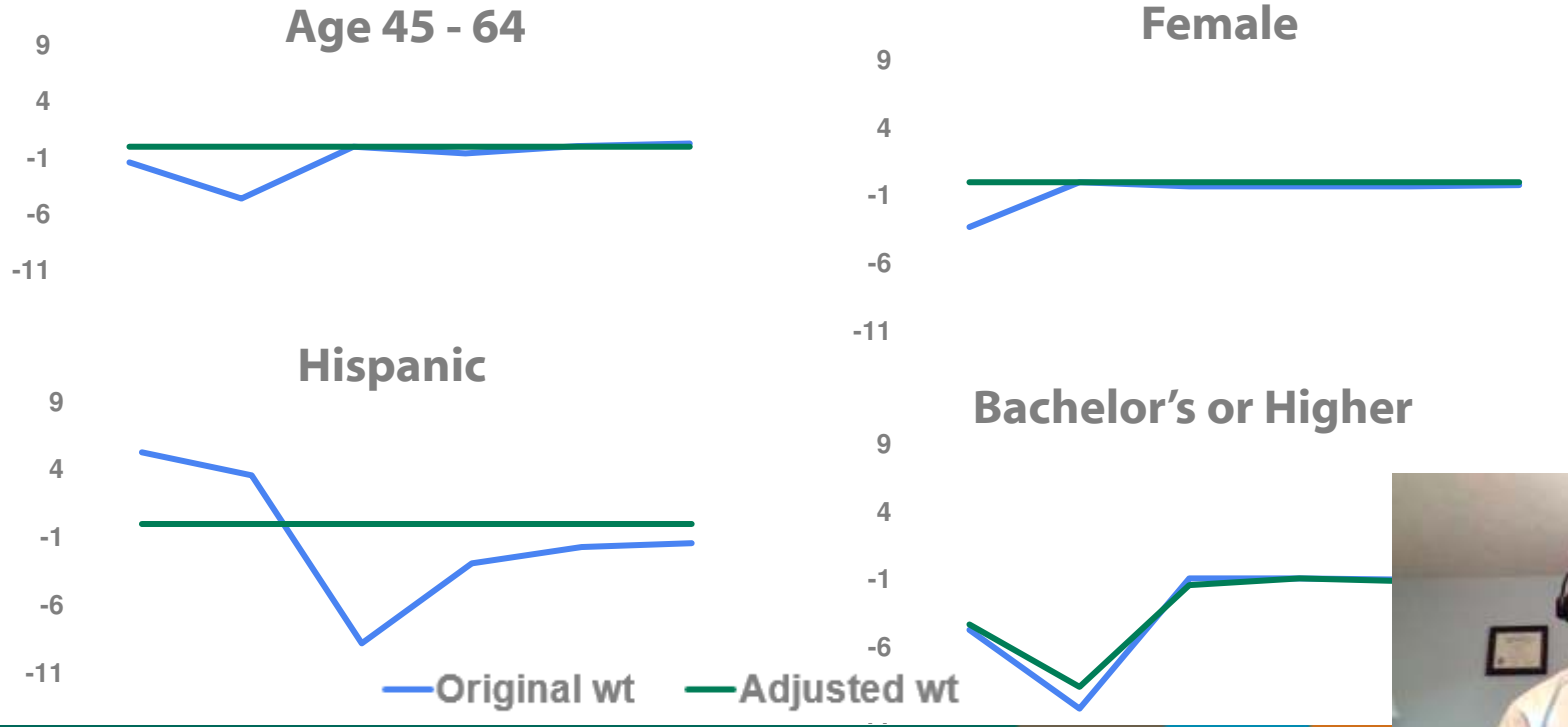
$$Model\colon\ Linkage\ Eligible = Sex * Age\ Group * Race/Ethnicity$$

- By including demographic variables, the relative bias for those variables was reduced to zero
- There was residual bias for variables not included in the adjustm



6. Mitigating linkage eligibility bias through weight adjustments

Percent Relative Bias, Select Sociodemographic Variables, 2000-2018



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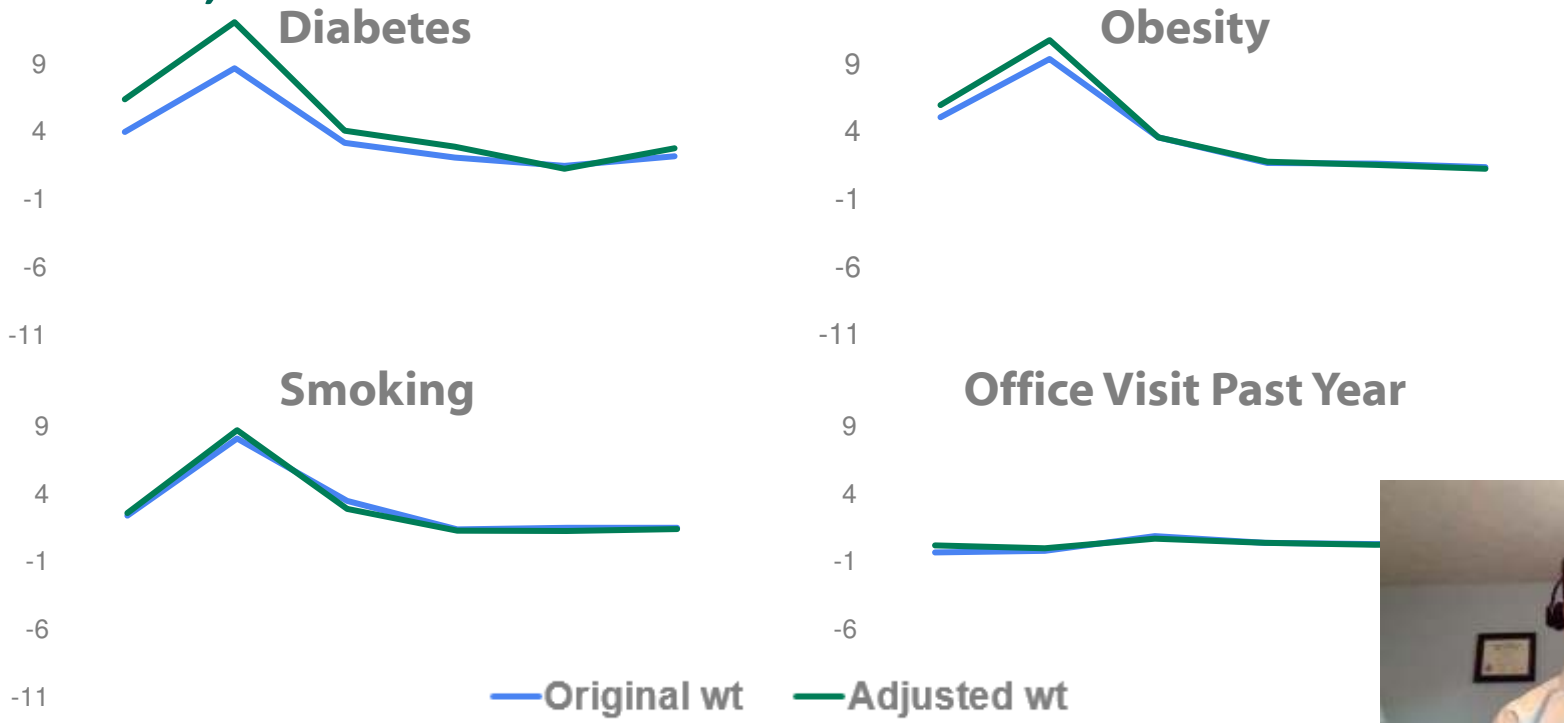
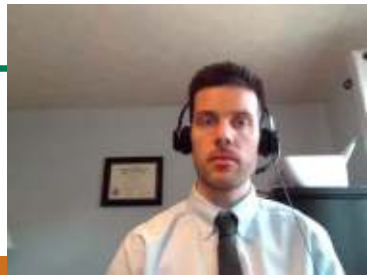
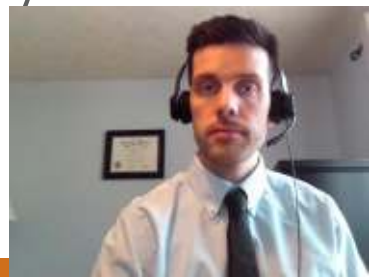




Conclusions

- The fact that not everyone is linkage eligible could have implications for inference when using the linked data
- Changes in data collection and consent procedures resulted in higher linkage eligibility over time
- For many variables, the largest magnitude of bias coincided with low linkage eligibility rates
- For the variables used to adjust survey weights, bias was reduced to zero
- Analysts should consider estimating bias when selecting survey years for analysis and adjusting weights when bias is detected



References

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Sakshaug, J. W. and M. Huber (2015). "An Evaluation of Panel Nonresponse and Linkage Consent Bias in a Survey of Employees in Germany." Journal of Survey Statistics and Methodology **4**(1): 71-93.

More Information

NCHS Data Linkage Program:

datalinkage@cdc.gov

www.cdc.gov/nchs/data-linkage

Jonathan Aram: JAram@cdc.gov

Subscribe to our ListServ (updates on program including release dates): Send an email message to **list@cdc.gov.** Leave the subject line blank. In the body of the message, type or paste: SUBSCRIBE NCHS-DATA-LINKAGE-PROGRAM lastname, firstname where 'lastname, firstname' is your last and first name.

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