

# Simplifying the Noninterview Adjustment Used in Weighting the American Community Survey Housing Unit Sample

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# Presentation Outline

- Introduction
- Background
- Methodology
- Results
- Conclusions

# Introduction

# Motivation

- American Community Survey (ACS) has low housing unit nonresponse rate (e.g., 4.2% in 2015, 5.3% in 2016) (U.S. Census Bureau, 2017)
- ACS housing unit weighting noninterview (NI) adjustment uses three factors
- Low nonresponse rate suggests we could simplify NI adjustment

# Research Questions

- How would simplifying the NI adjustment affect the mean square error (MSE) of estimates?
- How much of the MSE of estimates is composed of bias versus variance?

# Background

# Essential Information

- Data collection:
  - Month 1: mail and internet
  - Month 2: telephone
  - Month 3: in-person (CAPI)
- Weighting:
  - Probability of selection
  - NI adjustment
  - Coverage adjustment

# Current NI Adjustment

- Two parts
- Part 1 reduces nonresponse bias
  - First noninterview adjustment factor (NIF1)
  - Second noninterview adjustment factor (NIF2)
- Part 2 reduces “mode bias” from Part 1
  - Mode noninterview adjustment factor (NIFM)
  - Mode bias factor (MBF)
- Computed within single counties/groups of counties



# Part 1 (NIF1 and NIF2)

- NIF1: building type x census tract
- NIF2: building type x data collection month
- Shift weight of NIs to interviews
- Two factors are used instead of one to reduce variance
- Interviews from all modes are used, which may introduce mode bias

# Part 2 (NIFM)

- NIFM weights:
  - Independent of NIF1, NIF2
  - Only used to compute MBF, reduce mode bias
- Building type x data collection month
- Shifts weight of NIs to CAPI interviews
- NIFM may reduce bias more than current NI adjustment, but it increases variance and MSE (Adeshiyan, 1998)

# Part 2 (MBF)

- Household tenure x data collection month x marital status of householder
- Computed using interviews only
- Applied to the weights after NIF2
- Within each cell, weighted total same as if NIFM was used, but shifts weight of NIs to all interviews, reducing mode bias without causing large variance increases

# Methodology

# Data

- 2011-2015 ACS 5-year data
- Group quarters data excluded
- Tract-level estimates examined
- 40 housing unit characteristics (e.g., proportion housing units rented)
- 13 person characteristics (e.g., proportion persons unemployed)

# Weights

- Two sets of NI-adjusted weights compared
  - Current weights (CUR): NIF1 x NIF2 x MBF
  - Experimental weights (EXP): NIF1 only
- No coverage adjustment applied to these weights

# Analysis Measures

- NIFM estimate was benchmark for bias estimation
- Measures:
  - Relative MSE ( $MSE = \text{Variance} + \text{Bias}^2$ )
  - Change in relative MSE:  $(EXP - CUR)/(CUR)$
  - Relative variance and relative square bias
- Measures relative to square estimate to account for estimate size

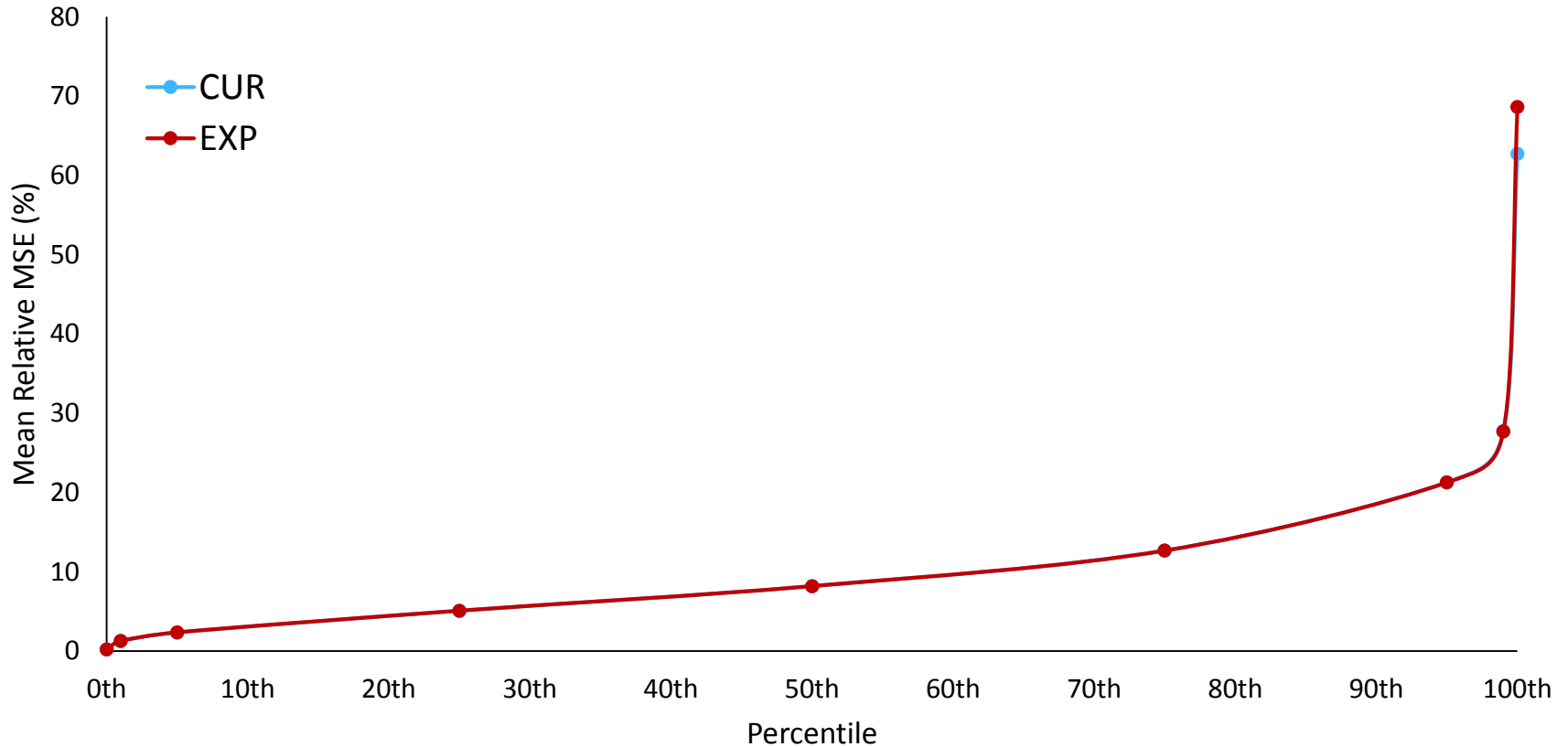
# Examining Results

- Tract-level distributions of each measure obtained for each characteristic
- Mean values at select percentiles shown
- Estimates not significantly different from zero at  $\alpha = 0.1$  when formed using current and experimental weights were excluded in order to remove low-quality estimates



# Results

# Mean Relative MSE



Source: 2011-2015 American Community Survey (ACS) 5-Year Data

Note: For more information on sampling error, non-sampling error, and confidentiality protection in the ACS, see <https://www.census.gov/programs-surveys/acs/technical-documentation/code-lists.html>.

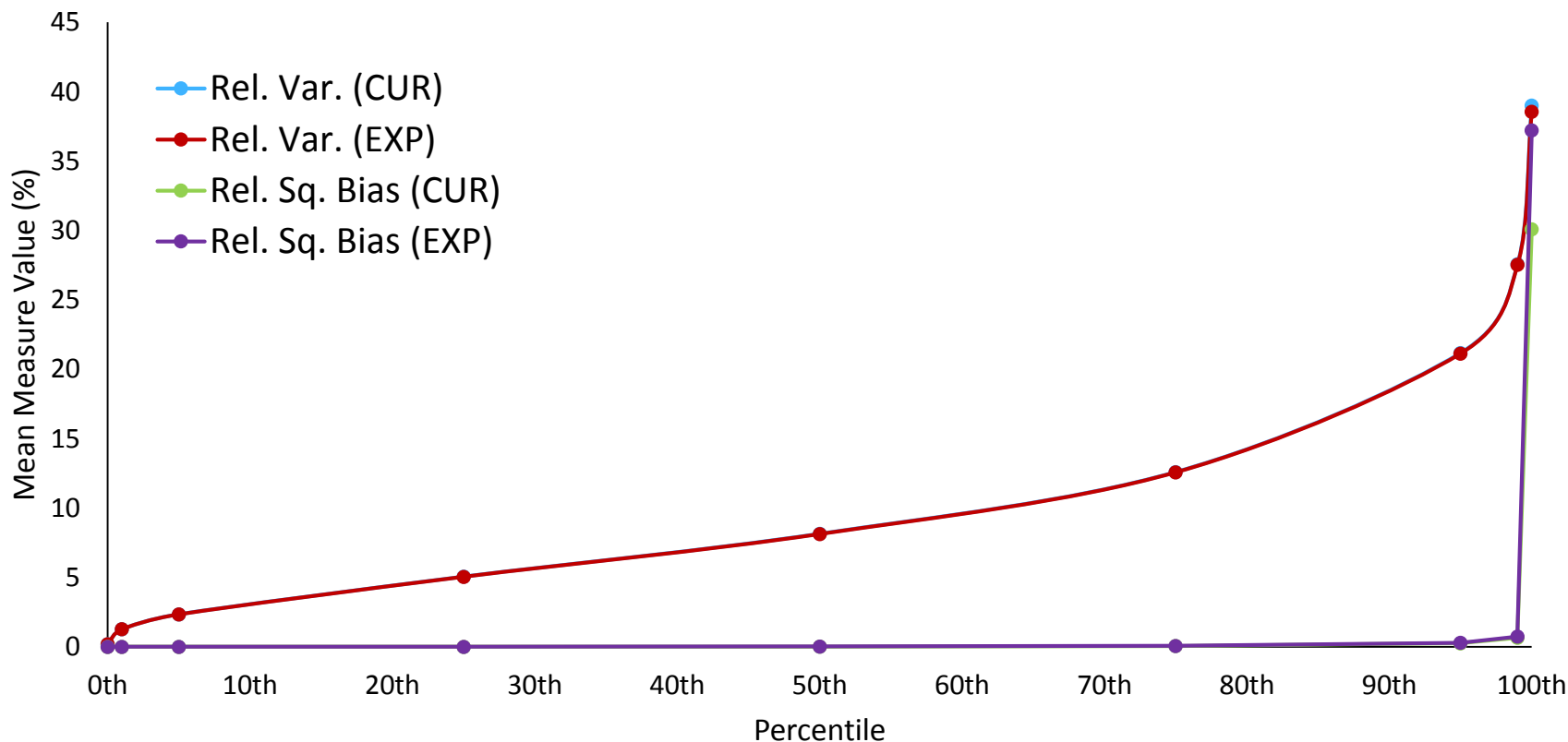
# Mean Change in Relative MSE (%)

Percentile								
0 <sup>th</sup>	1 <sup>st</sup>	5 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th</sup>	75 <sup>th</sup>	95 <sup>th</sup>	99 <sup>th</sup>	100 <sup>th</sup>
-22.71	-4.45	-2.22	-0.66	-0.10	0.40	1.77	3.90	33.72

Source: 2011-2015 American Community Survey (ACS) 5-Year Data

Note: For more information on sampling error, non-sampling error, and confidentiality protection in the ACS, see <https://www.census.gov/programs-surveys/acs/technical-documentation/code-lists.html>.

# Mean Relative Variance and Relative Square Bias



Source: 2011-2015 American Community Survey (ACS) 5-Year Data

Note: For more information on sampling error, non-sampling error, and confidentiality protection in the ACS, see <https://www.census.gov/programs-surveys/acs/technical-documentation/code-lists.html>.

# Conclusions

- Simplifying NI adjustment did not notably affect estimate quality
- NI cells defined by small, local geography and building type sufficiently account for nonresponse bias
- Simplified NI adjustment will be used in ACS housing unit weighting starting in data year 2017

# Acknowledgements

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# References

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