Impact of Dependent Interviewing on Consistency of Answers in the American Housing Survey

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Any views expressed are those of the authors and not necessarily those of the U.S. Census Bureau.

The American Housing Survey

- **Key source of national data on housing markets, conditions, and dynamics**
  - Assess and monitor housing adequacy
  - Meet a need for up-to-date information on the US housing stock
  - Estimates can be made at the national, regional levels, and metro level for a selection of metro areas
- **Fully funded by HUD**
  - AHS estimates are primarily used by HUD to assess the effectiveness of their housing programs
- **Conducted every two years**
- **Longitudinal survey**
  - First conducted in 1973
  - Previous sample: 1985-2013
  - Current sample: 2015-

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The American Housing Survey – Core Topics

- **Housing characteristics**
  - Type of unit, year built, unit size, lot size
  - Housing costs
  - Home improvement activities
- **Housing quality**
  - Exterior condition: sagging roof, missing siding, broken windows
  - Interior condition: holes in floors, exposed wiring, peeling paint
  - Neighborhood quality: vandalism, street conditions
- **Equipment**
  - Kitchen appliances, heating and cooling systems
  - Sewage disposal method, water source
  - Breakdowns in equipment
- **Occupant characteristics**
  - Demographics
  - Education, income
  - Disability status, veteran status

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Dependent Interviewing: **The use of prior information about a respondent to modify question phrasing or routing in a longitudinal survey.**

Topic	Independent (INDI) Question	Dependent Interviewing (DI) Question
Cooking Fuel	What fuel is used MOST for cooking--electricity, gas or something else?	Last time we recorded that your home used kerosene most for cooking. Is this information still correct?
Appliances	1. Does your home have a garbage disposal? 2. Does your home have a built-in trash compactor? 3. Does your home have a dishwasher? 4. Does your home have a washing machine? 5. Does your home have a clothes dryer?	Last time we recorded that your home had the following in working order: garbage disposal, dishwasher, washing machine, clothes dryer. And that you do not have the following appliances in working order: built-in trash compactor. Is this information still correct?
Home Purchase	When did this household buy the house?	(Household is not re-asked this question)

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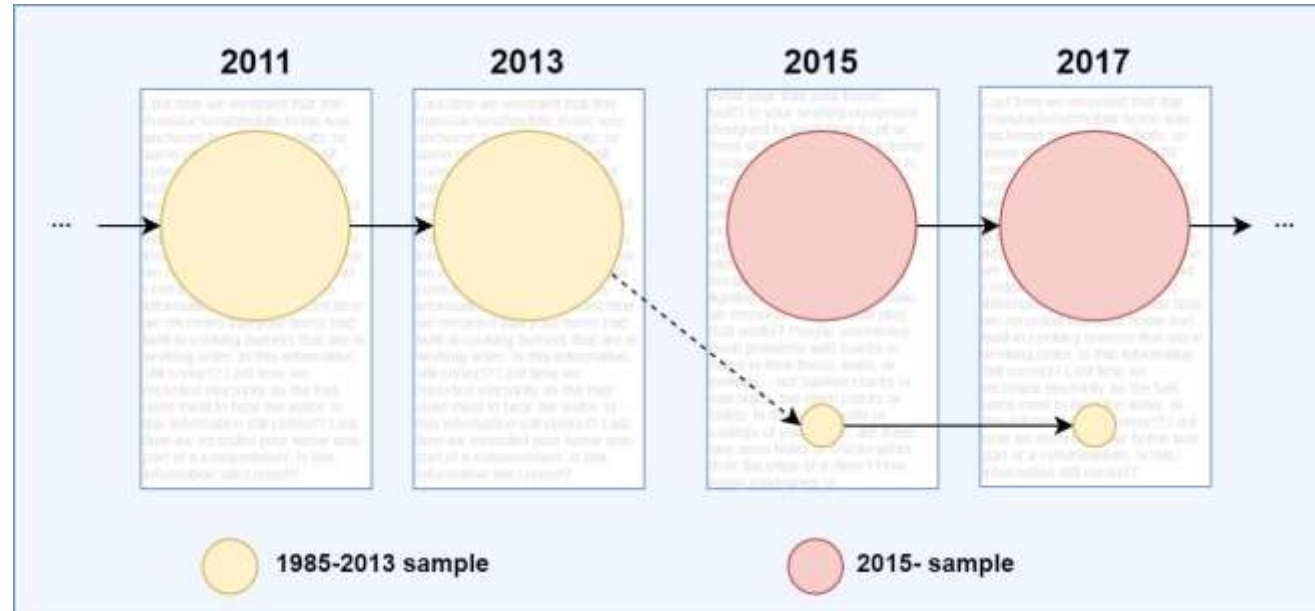# Effects of dependent interviewing observed in other surveys

- Reduces item nonresponse
  - Income questions, SIPP (Moore 2006, *U.S. Census Bureau Research Report Series*)
- Reduces variability in a sampling unit's responses across waves
  - Spurious change reduced in occupation and industry of employment questions, SIPP (Hill 1994, *Journal of Official Statistics*)
- Reduces burden
  - Interviewer burden reduced, British Household Panel Survey (Sala et al. 2011, *Field Methods*)
  - Labor market activity reporting time shortened, European Community Household Panel Survey (Jackle 2008, *Journal of Official Statistics*)

Effects of dependent interviewing in the AHS

- Reduces item nonresponse
  - Decreased item uninformative ("I don't know" or refusal) response percentages
- Reduces variability in a sampling unit's responses across waves

- Reduces burden

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Dependent interviewing and item nonresponse in the AHS

The AHS Bridge Sample
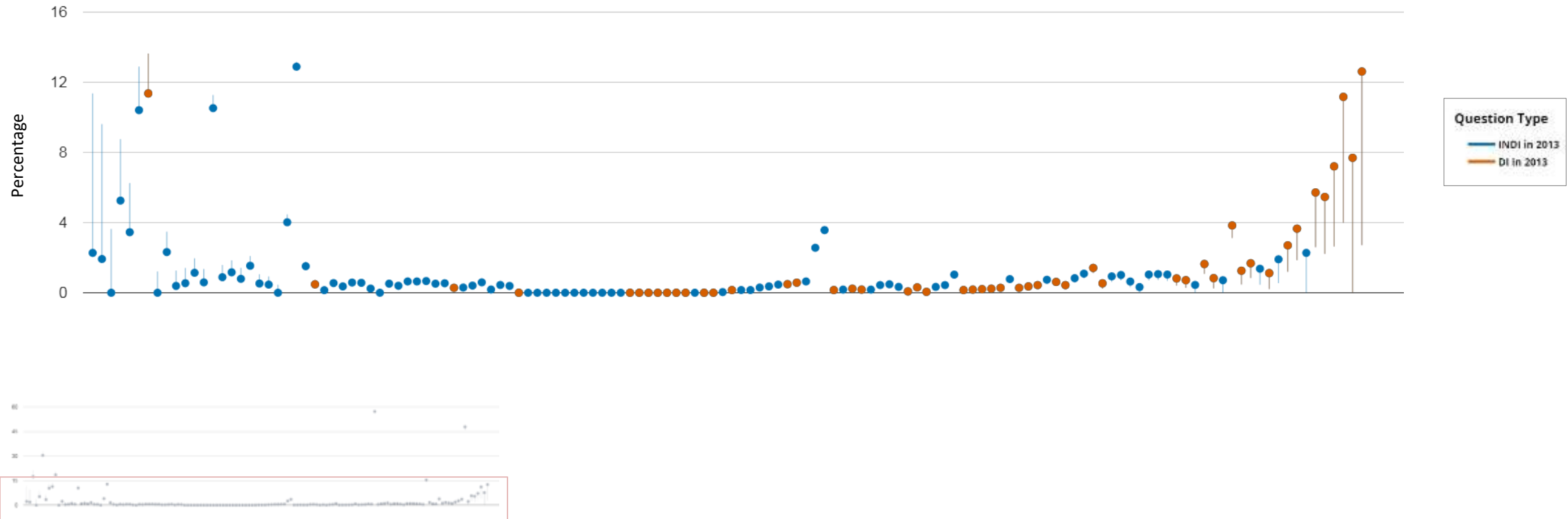
Dependent interviewing and item nonresponse in the AHS

Question on water source (2013-2015)

Wave	DI/INDI	Question	Percentage Uninformative, Bridge Sample
2013	DI	*Last time we recorded that most of your water came from a public or private water system. Is this information still correct?*	0.02
	INDI	*Does most of the water for your home come from a water system, either public or private, from an individual well, or from some other source?*	
2015	INDI	*Does most of the water for your home come from a water system, either public or private, from an individual well, or from some other source?*	0.04

		2015		
		Informative	*Uninformative*	**Total**
2013	*Informative*	3881	17	3898
	Uninformative	8	0	8
Total		3889	17	3906

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Source: U.S. Census Bureau, American Housing Survey, 2013-2015.

Dependent interviewing and item nonresponse in the AHS

Change in Percentage Uninformative for Questions in 2013 and 2015 Having ≥25 Respondents in Bridge Sample

Source: U.S. Census Bureau, American Housing Survey, 2013-2015.

Dependent interviewing and item nonresponse in the AHS

95% CI of Difference in Percentage Uninformative for Questions in 2013 and 2015 Having ≥25 Respondents in Bridge Sample
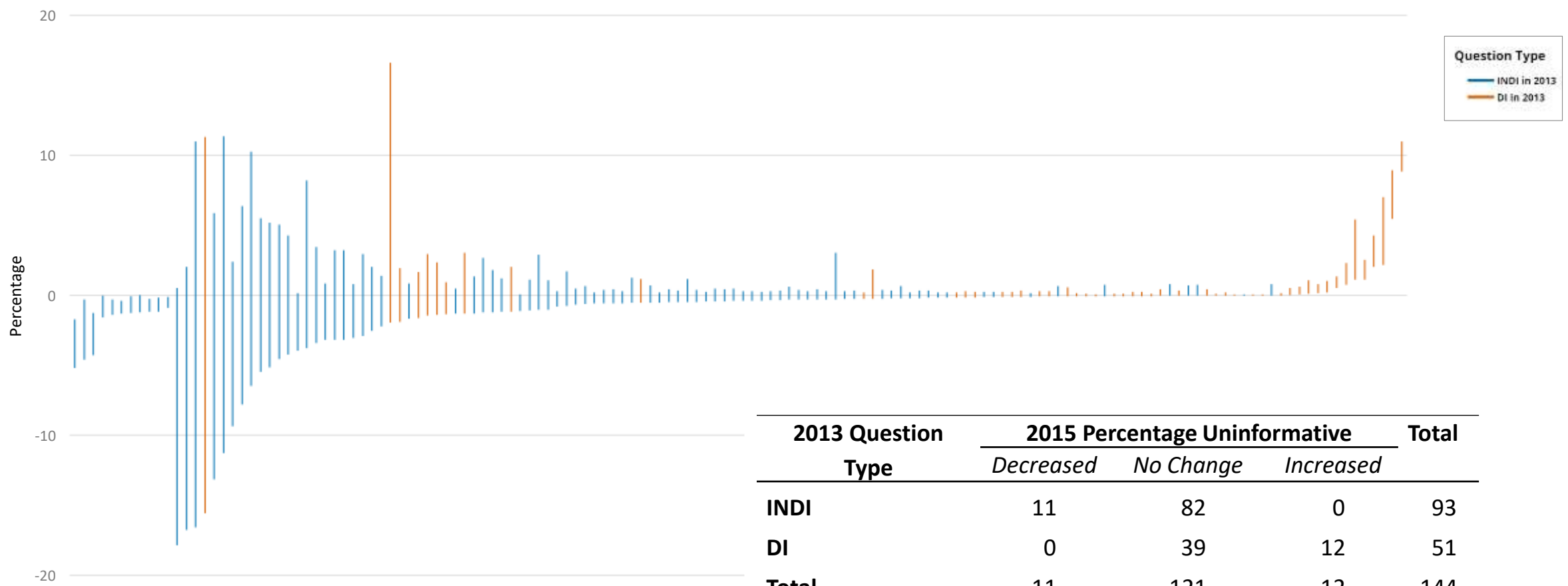
2013 Question Type	2015 Percentage Uninformative			Total
	Decreased	*No Change*	*Increased*	
INDI	11	82	0	93
DI	0	39	12	51
Total	11	121	12	144

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Source: U.S. Census Bureau, American Housing Survey, 2013-2015.

Dependent interviewing and discrepant responses in the AHS

"What year was your home built?"

Ideally we ask only once, when the housing unit is new to the sample.

But we also ask under these circumstances:

- No year value is recorded for the housing unit that has been surveyed previously
- Tenure of the housing unit changes from renter to owner
- An interview was not completed for the housing unit in the previous wave

Year Built Values Reported in 2007 and 2009	Percentage
2007 and 2009 decade values match	55.1
2007 and 2009 decade values do not match	**45.0**
Different value provided in 2009	33.5
"Don't know" in 2009	10.7
Missing in 2009	0.8

n = 32,141. Percentages are unweighted. Source: U.S. Census Bureau, American Housing Survey, 2007-2009.

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Dependent interviewing and discrepant responses in the AHS

Percentage Decade Built Values Reported in 2007 or Earlier Discrepant With 2009 Value

2007 Decade Built (y-axis)

- 1919 or Earlier
- 1920-1929
- 1930-1939
- 1940-1949
- 1950-1959
- 1960-1969
- 1970-1979
- 1980-1989
- 1990-1999
- 2000-2009
- All Years

Legend:
- Discrepant
- Discrepant and Uninformative

x-axis: 0, 10, 20, 30, 40, 50, 60, 70, 80

Percentage Discrepant with 2009 Decade Built

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Dependent interviewing and discrepant responses in the AHS

n = 28,686. Percentages are unweighted. Source: U.S. Census Bureau, American Housing Survey, 2007-2009.
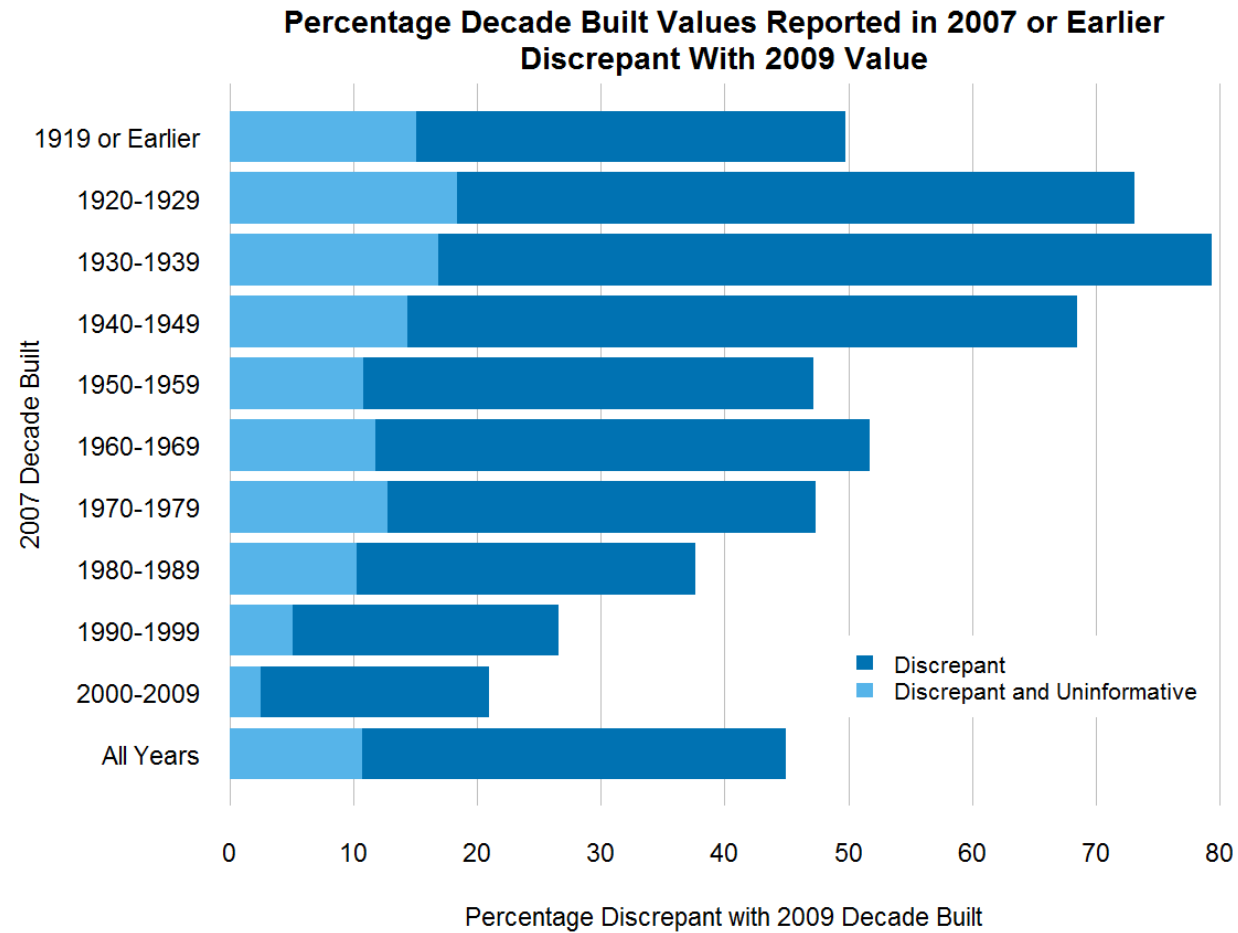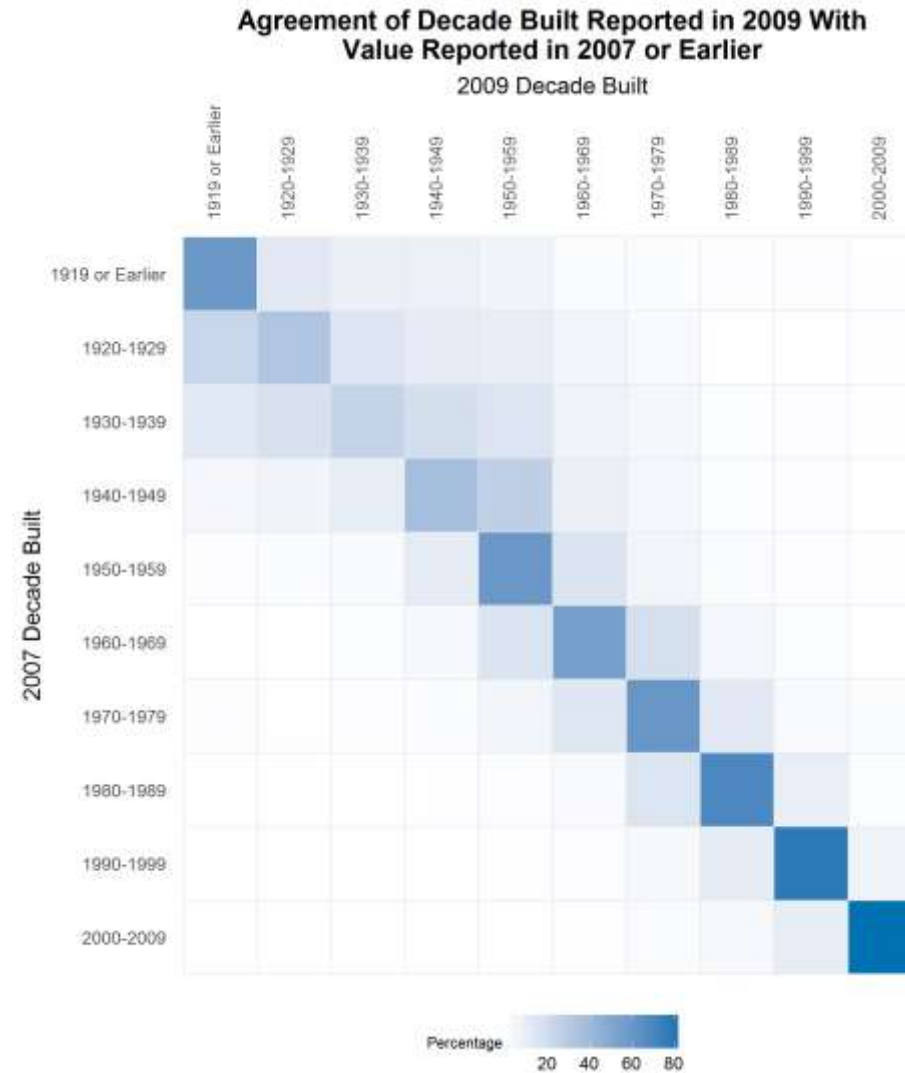
Dependent interviewing and discrepant responses in the AHS

"How many bedrooms are there in your home?"

Room Type Counts: Number of Bedrooms

Wave	2009	2011	2013
Question for returning respondents	How many bedrooms are there in your home?	How many bedrooms are there in your home?	Last time we recorded there were 2 bedrooms in your home. Is that still correct?
Example responses			
Respondent A	"2"	"2"	"Yes"
Respondent B	"3"	"2"	"No, it's 3"
Respondent C	"3"	"2"	"Yes"
Percentage responses discrepant with previous wave		14.6	5.3

n = 27,988. Percentages are unweighted. Source: U.S. Census Bureau, American Housing Survey, 2009-2013.

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Dependent interviewing and discrepant responses in the AHS

Room Type Count Responses Discrepant Between Adjacent Waves, 2009-2013
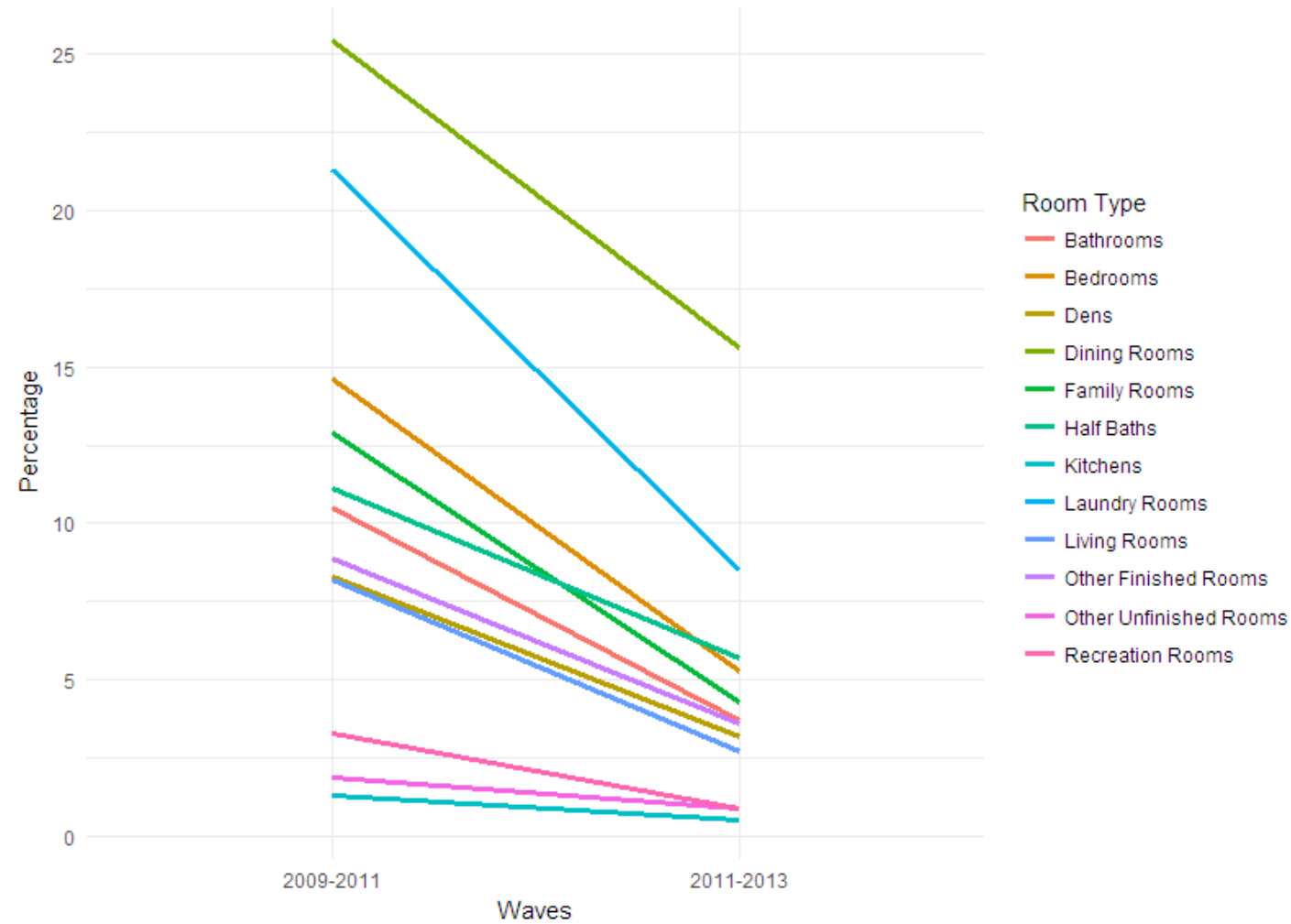
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Count of cases per room type ranged from 10,418 to 28,047. Percentages are unweighted. Source: U.S. Census Bureau, American Housing Survey, 2009-2013.

Dependent interviewing and discrepant responses in the AHS

Longitudinal model of probability of a discrepant answer
Data: 2011-2015 fuel type responses from bridge sample (n=3,151)

Response Variable	Explanatory Variables

Answer was discrepant with answer from previous wave	Tenure
	  Renter
	  Owner

	Structure type
	  Single unit detached
	  Single unit attached
	  Multiunit building
	  Manufactured/mobile home

	Fuel question asked
	  Main cooking fuel
	  Clothes dryer fuel
	  Main heating fuel
	  Water heater fuel

	Respondent was asked the independent question

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Dependent interviewing and discrepant responses in the AHS

Longitudinal model of probability of a discrepant answer
Data: 2011-2015 fuel type responses from bridge sample (n=3,151)

Response Variable	Explanatory Variables	Odds Ratio Estimate (95% CI)	Fixed Effect Significance Test P-Value
Answer was discrepant with answer from previous wave	Tenure		<0.0001
	Renter	.	
	Owner	0.6 (0.49,0.75)	
	Structure type		0.0167
	Single unit detached	.	
	Single unit attached	1.05 (0.76, 1.46)	
	Multiunit building	1.23 (0.98, 1.54)	
	Manufactured/mobile home	0.59 (0.38, 0.91)	
	Fuel question asked		<0.0001
	Main cooking fuel	.	
	Clothes dryer fuel	1.46 (1.16, 1.85)	
	Main heating fuel	3.05 (2.52, 3.69)	
	Water heater fuel	2.72 (2.42, 3.30)	
	Respondent was asked the independent question	41.3 (25.5, 66.8)	<0.0001

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Source: U.S. Census Bureau, American Housing Survey, 2011-2015.

Dependent interviewing in the AHS

Reduces item nonresponse

Making dependent interviewing questions independent increased their uninformative response percentages.

Reduces variability in a unit's responses across waves

Re-asking the year built question yielded 45% responses discrepant …

… and responses were on average unbiased.

Adding dependency to the room type count questions decreased discrepant responses.

The probability of a discrepant answer was predicted to decrease with dependent interviewing, for four fuel type questions.

Open questions
- Does dependent interviewing lead to biased responses for some questions in the AHS?
- Is the effect of dependent interviewing modulated by whether a different household is responding in the subsequent wave? A different respondent in the same household?
- Might other factors contribute to the apparent extreme influence of dependent interviewing on probability of a discrepant answer?

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