Survey Research and Design

Bird's-Eye View of Survey Research

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September 7, 2022

Housekeeping

- Paper presentation sign-up — look for Canvas announcement this week
- Slides on Canvas
- R setup and installation — finish by next class

Roadmap

1. What is a survey?
2. A bottom-up view of survey research
3. A top-down view of survey research
4. Discussion of survey error in Lee and Zhang (2017)

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Our Goals in this Course

- Ultimately, surveys are useful because there is a concept in the world that we would like to learn
- The field of survey methodology is aimed at developing tools to obtain an accurate **estimate**
- **Error** is unavoidable — we'll develop tools to categorize, understand, minimize, and quantify it
- By the end of the semester we'll have many tools

Survey Methodology is Interdisciplinary

We'll be wearing a lot of hats:

- statistician
- data scientist
- writer
- subject-matter expert
- cognitive scientist

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Survey methodology is changing quickly right now

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Our approach:

- First cover classic methods: baseline, "idealized" process of survey research
- Then cover departures from the ideal and (potential) solutions

Survey Design from the Bottom Up

Survey Lifecycle in Practice

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8. Write up results (**reporting**)

Survey Design in Practice

- There are lots of design decision to make:
  - how to word questions? what response options to give?
  - which sample frame?
  - how to recruit sample?
  - whether and how to compute weights?
  - etc.
- We need a framework to help guide these decisions

Survey Design from the Top Down

Survey Design from the Top Down

- Instead of thinking about the bottom-up *process*, a top-down scheme emphasizes **total survey error**
- We have our idealized, *unobservable* target of inference and our observable operationalization
- Each step of the survey process may introduce error: differences between the target of inference and our measurement

A Running Example

Suppose we want to measure the political ideology of registered voters in Philadelphia.

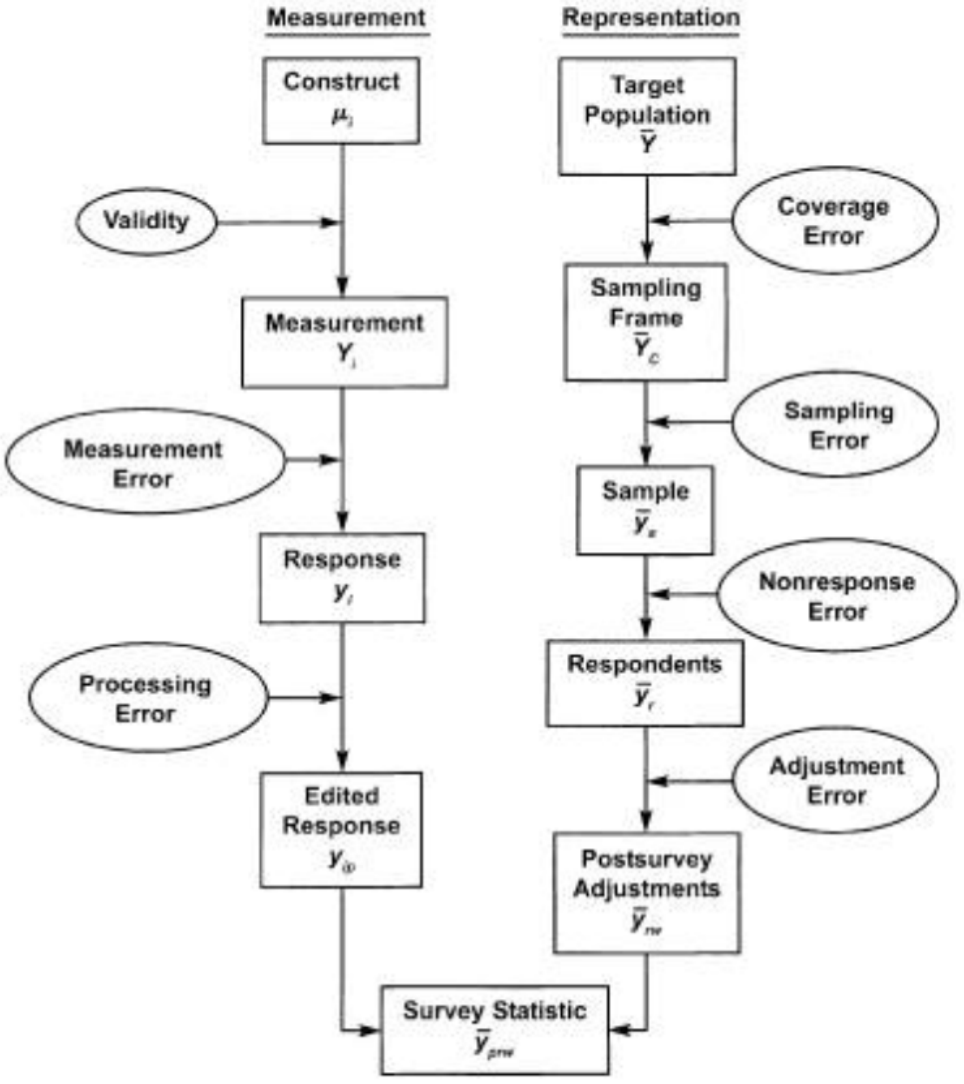

Figure 2.5 Survey life cycle from a quality perspective.

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Partisanship

- registration?
- as social identity?
- typical vote choice?

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We'll define ideology as a worldview that organizes one's political beliefs.

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Validity

- The extent to which the measure Y_i is the same as the construct itself is called **validity**
- In our notation, we can think of validity as $\varepsilon_i = \mu_i - Y_i$
- When ε_i is low, we have high validity, and vice versa

Ideology in Philly: Validity

If ideology μ_i is an organizing worldview, the measure Y_i could be whether the respondent thinks of themselves as liberal or conservative:

> *In general, how would you describe your own political viewpoint? Very liberal, Liberal, Moderate, Conservative, or Very Conservative?*

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> *In general, how would you describe your own political viewpoint? Very liberal, Liberal, Moderate, Conservative, or Very Conservative?*

Under what assumptions is this a valid measure ideology? Why might it not be?

From Measure to Measurement

- After we've decided on an observable **measure**, we have to collect data
- For surveys, we ask people a question and record their response
- Groves denotes an observed survey response y_{it}
- Note t subscript because we imagine the same person repeatedly answering the question (even if in reality they only answer once)
- Differences between Y_i and y_{it} is **measurement error**

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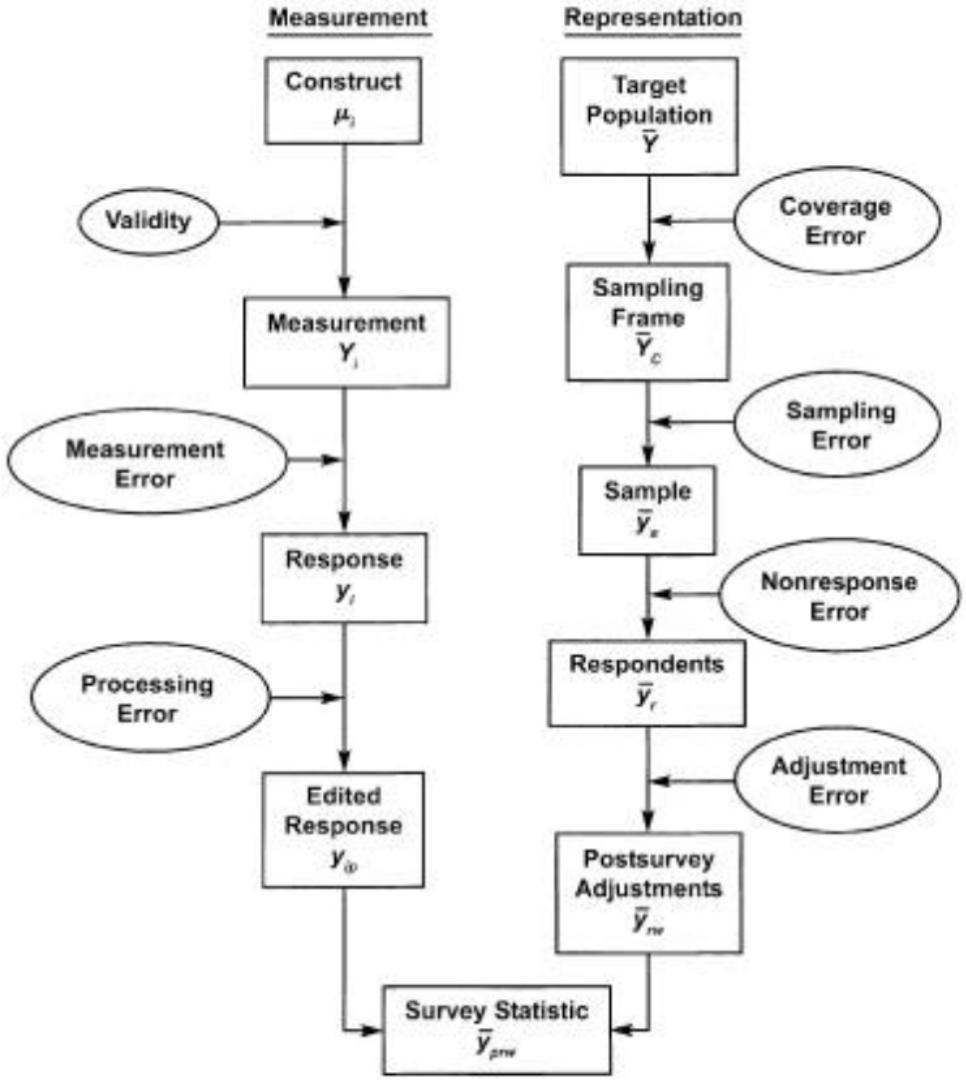
- what do we mean by "average"?
- thought experiment: imagine we ask the question infinitely many times (to different people)



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- Typical default choices for public opinion research:
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  - Adult citizen population
  - Registered voters
- Can get more vague too
  - Election forecasting: People who will vote in November
  - Market research: people in the market for a used car

From Population to Sampling Frame

- The **sampling frame** is the set of people who *could* be included in our survey
- Think of this as a list of actual people/units (we may not know anything about the people, but the list exists)
- We'd like this to perfectly reflect the population, but we might have **undercoverage** or **overcoverage** error
- Sampling frame will be highly affected by **survey mode** (phone, internet, in-person, etc.)

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- Phone survey: phone numbers in 215, 610, and 267 area codes
- **Door-to-door survey: All people listed in voter file with adddress**

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Non-probability sample: units have an *unknown* probability of being sampled

From Sampling Frame to Sample

For **probability samples**:

- We **randomly sample** members of the sampling frame to invite to participate in the survey
- Random sampling allows us to use probability theory to quantify the difference between a statistic in the sample and the population
- $\rightsquigarrow$ more on that next week

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Sampling Error

Because we select a **sample**, the average value of the construct in our sample may differ from that of the population as a whole

- if you ask 1,000 people how tall they are, unlikely the average will be *exactly* the same as the average in the population

This is called **sampling error**

- relatively innocuous because we can quantify it
- as our sample size increases, this type of error goes to 0 very quickly

Ideology in Philly: Selecting a Sample

Suppose we select a random sample of individuals from the voter file, knock on their door and interview everyone who lives in their household.

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Not everyone has an equal probability of selection!

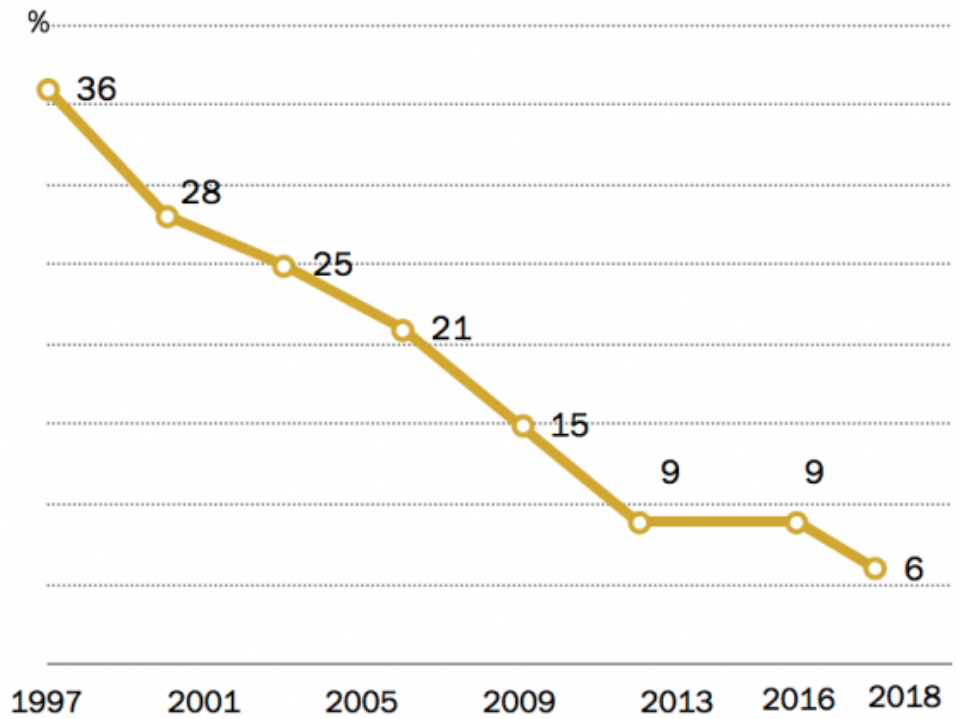
Instead, the probability an individual is sampled is proportional to the number of people in their household

- people in large households will be overrepresented

Intentions and Outcomes

After brief plateau, telephone survey response rates have fallen again

Response rate by year (%)



Note: Response rate is AAPOR RR3. Only landlines sampled 1997-2006. Rates are typical for surveys conducted in each year.
Source: Pew Research Center telephone surveys conducted 1997-2018.

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From Intended Sample to Realized Sample

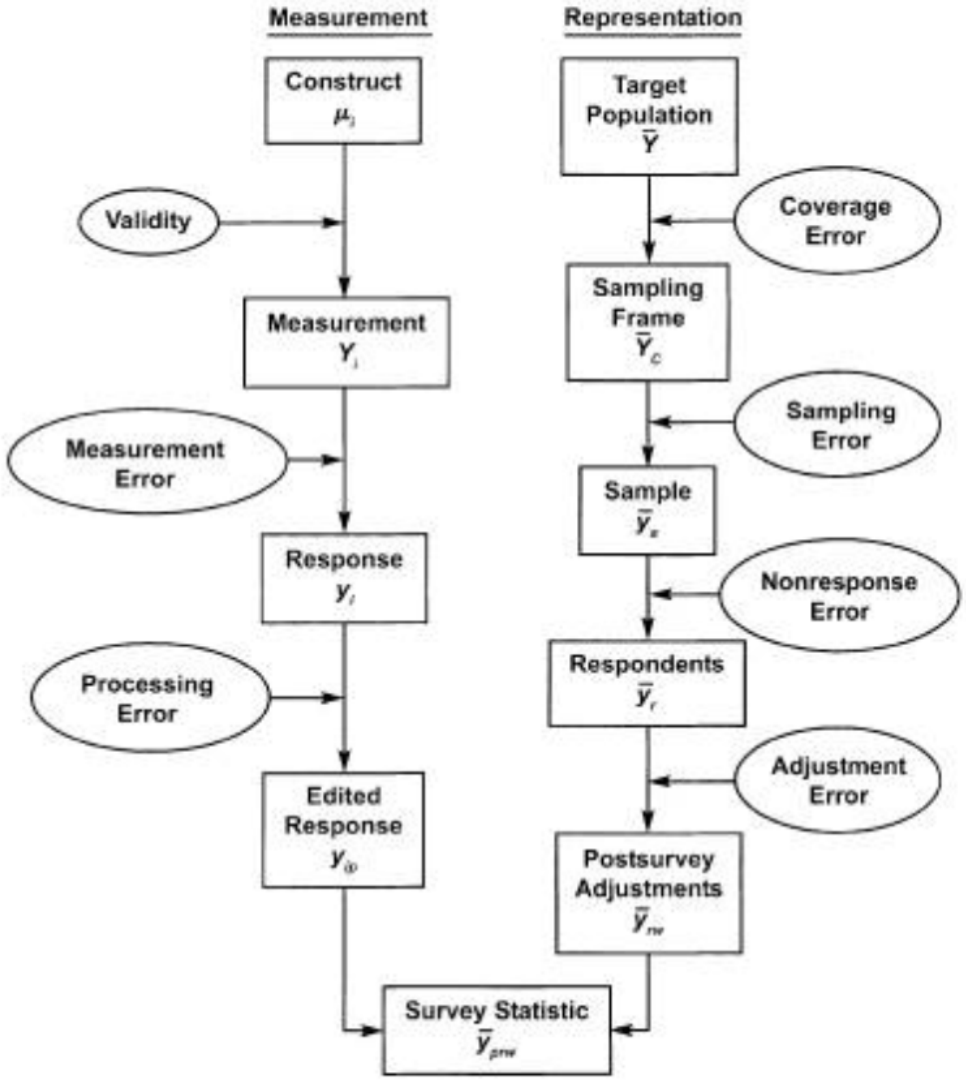
- We may invite a random sample to participate, but those who actually are not random
- Two types of **nonresponse** error:
  - **unit nonresponse**: entire sampled units do not complete the survey
  - **item nonresponse**: individuals may not respond to individual survey questions
- Nonresponse is a problem if those who respond are systematically different from those who do not. Can lead to **nonresponse bias**

Ideology in Philly: Nonresponse Bias

In our door-to-door survey of Philly registered voters, what might be some potential concerns with nonresponse?

Opt-In Surveys: No Well-Defined Sampling Frame

- Opt-in surveys (incl. most internet surveys) are **non-probability samples**
- No defined sampling frame and unknown inclusion probabilities
- Makes the statistical theory much more difficult — a big cause of concern 10-15 years ago
- Now there's recognition that no sample is really random due to nonresponse anyway



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- Theory: states need *systematic*, *standardized* measures about citizens
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- But how do we know if Census records are accurate?
- When Census records are inaccurate it tends to manifest in "clumping"

Example from 1971 Moroccan Census

Enumerator: What is your age?

Respondent: Who me? Our generation was unrecorded. We didn't have any. No date of birth. Nothing.

Enumerator: How many (years), how many? Estimate.

Respondent: How am I going to estimate? I have nothing to estimate with. I can tell you that I am 60 years; 70 I haven't reached.

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What type of survey error is this?

“Lumping” in the Age Distribution

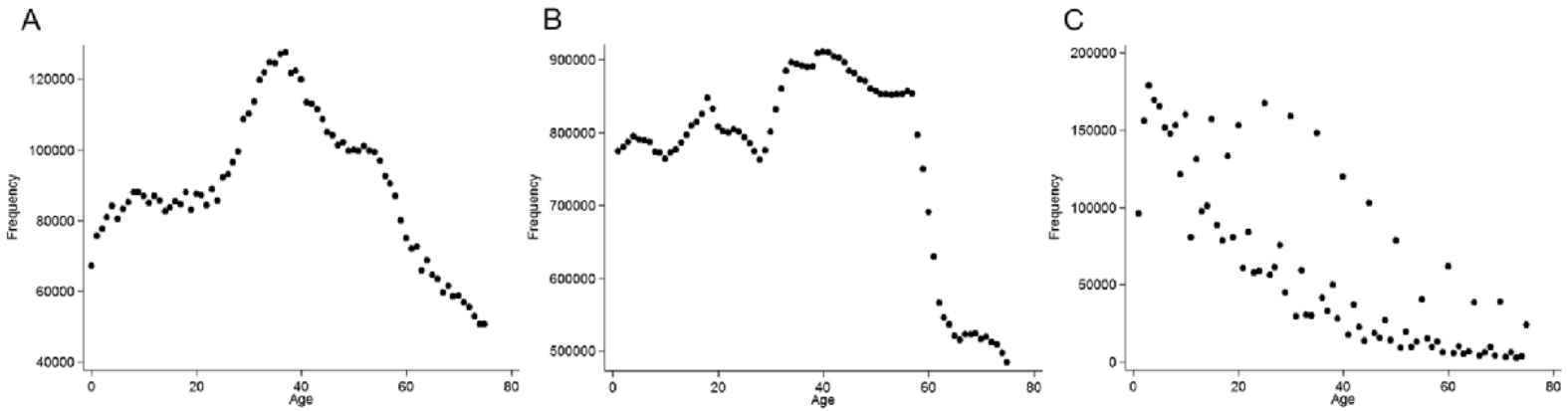

Figure 1. The effect of demographic shocks on the smoothness of age curves: *A*, Switzerland, 2000; *B*, France, 2006; *C*, Sierra Leone, 2004

Lee and Zhang (2017) Statistic

- To quantify the extent of lumping, first note that we might expect all terminal digits to be equally likely (e.g., 2$\underline{2}$, 2$\underline{3}$, 2$\underline{4}$, 2$\underline{5}$)* or **uniformly distributed**

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- Calculate deviation from this "equally likely" baseline
- Lower deviation = more legibility (so the argument goes)

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- To quantify the extent of lumping, first note that we might expect all terminal digits to be equally likely (e.g., 22, 23, 24, 25)* or **uniformly distributed**
- Calculate deviation from this "equally likely" baseline
- Lower deviation = more legibility (so the argument goes)
- Consider: Is this a valid measure of the construct they're interested in?

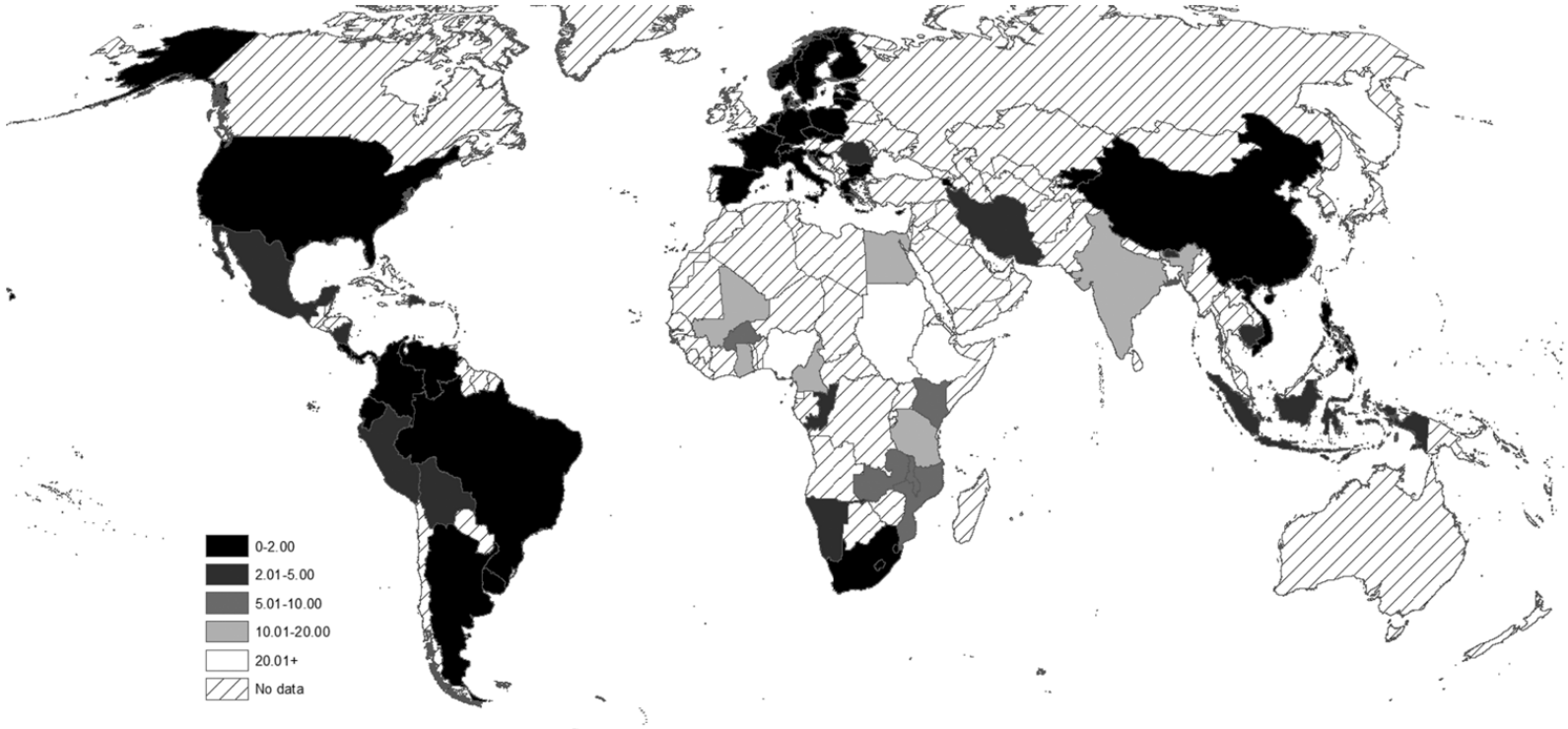

Figure 3. Myers scores by country, 2005–12

Results

Table 6. Legibility and Public Goods: National-Level Results

	Mortality (1)	Mortality (2)	Literacy (3)	Literacy (4)	Enrollment (5)	Enrollment (6)
Legibility	−.663**	−.283**	.797**	.507**	.586**	.229*
	(.0398)	(.0481)	(.0649)	(.0839)	(.0867)	(.0942)
GDP per capita		−.531**		.355**		.367**
		(.0572)		(.0738)		(.0955)
Democracy		−.0835*		.104		.0736
		(.0364)		(.0726)		(.0636)
Population density		−.146**		.0374		.131+
		(.0322)		(.0456)		(.0678)
Terrain ruggedness		.0551+		.113+		.184**
		(.0281)		(.0581)		(.0655)
Constant	.333**	.221**	−.597**	−.514**	−.426*	−.413**
	(.0687)	(.0531)	(.212)	(.193)	(.163)	(.147)
Number of observations	326	326	188	188	244	244
Number of countries	111	111	84	84	105	105
R^2	.744	.888	.673	.758	.445	.576

Note. Decade-specific intercepts are suppressed. Standard errors are in parentheses and are clustered by country.

+ $p < .10$.

* $p < .05$.

** $p < .01$.

Examining Design Features of the American National Election Studies

ANES Design Features

Get some practice identifying key design features. Download the guide for the 2020 version of the American National Election Study from Canvas ("Misc" folder). Read the section "Sample Design and Respondent Recruitment."

- What is the target population?
- What is the sampling frame(s)?
- How were respondents recruited?
- What are the interview modes (i.e. how were respondents interviewed)?
- What is the sample size?
- Other design features?

ANES Design Features

Population:

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Population: "The target population for the fresh cross-section was the 231 million non-institutional U.S. citizens aged 18 or older living in the 50 US states or the District of Columbia."

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Mode:(1) web only; (2) mixed web-phone; (3) mixed video-web-phone

Sample size: total 5,441 in fresh cross-section

Other design features: incentives, re-contact, links to other data sets