Data collection and surveys

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Survey administration methods

- Online
  - Easy, minimal data entry, survey logic minimizes respondent burden
  - Excludes people who don’t have internet access, are not tech savvy, or do not trust technology
- Paper
  - Can be scantron type, or manual data entry
  - Expensive: printing, data entry
- Telephone
  - Not used much anymore

Recruitment methods: intercept surveys

- Approach people where they are
  - Often used for transit—approach people at stations or on vehicles

Recruitment methods: mailing

- Mail survey materials to selected addresses
  - Often from mailing list purchased from marketing companies
- Printing is expensive, turnaround times are slow
- Many newer mail surveys just send a link to a site where the survey can be filled out online

Recruitment methods: email

- Invite respondents via email
  - Often with purchased email lists
- Can work well with a list of people you already have
- *Very* difficult to avoid going to spam
- Low response rates (COVID Future Survey: 0.4% *Chauhan et al. (2021)*)

Recruitment methods: social media

- Social media ads can be effective
- Not very expensive
- Representativeness is a challenge
  - Social media ad algorithms can directly undermine representativeness by advertising your survey to people similar to those who have already taken it

Recruitment methods: text message

- I haven’t seen much literature on this, but the Census Bureau is doing it

Sampling methods

- Your survey will almost always reach a sample of the population
- How the sample is designed is important when it comes time to analyze the data

The *sampling frame*

- Your sampling frame is the population from which you are drawing your sample
- e.g. all households in the US, all students at UNC, etc.
- Your sampling frame is generally not perfect - e.g. a list of residential address is likely incomplete and will miss unhoused people

Random sampling

- You randomly select from your sampling frame
- Almost always *without replacement*—the same unit cannot be sampled twice

Stratified sampling

- You randomly select from your sampling frame, but some units are more likely to be selected than others

Cluster sampling

- You sample a cluster of individuals (e.g. in a neighborhood or at a bus stop)

Convenience sampling

- You sample convenient respondents
- Many planning studies use convenience samples, though they strive for representativeness

Snowball sampling

- You ask earlier participants to invite other participants they may know
- Can create problems for statistics if the people share some unobserved characteristics

Survey panels

- A newer approach is to use a “survey panel”—a group of respondents curated by a company
- The company will charge per completed response
- Useful especially for national samples of common groups, less useful for specific groups

Quota sampling

- To help ensure a representative sample, set maximum quotas for groups
- You can’t specifically set a minimum quota, but you can set a maximum for anyone *not* in that group
- Often combined with other sampling techniques

Household, person, etc. level surveys

- Most surveys are at the person level
- Other surveys are at the household level - all members of a household are surveyed
  - Typical of travel surveys - significant inter-household dynamics

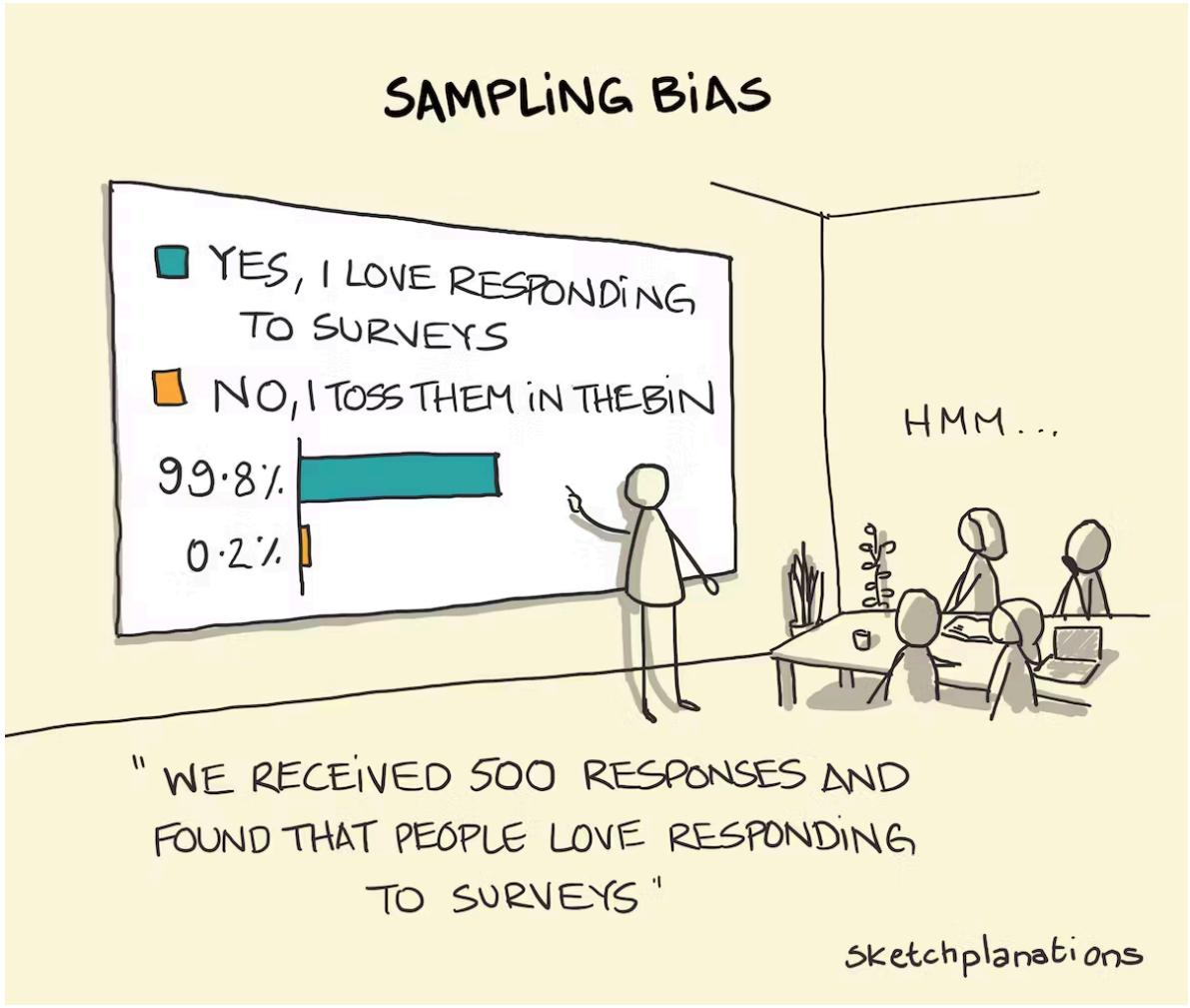
Panel/longitudinal studies

- Panel or longitudinal studies sample the same people over time
- Very useful, especially to understand cause
- But rare - expensive, not aligned with funding cycles
- Significant attrition is common
  - In the COVID Future survey, we lost about 2/3 of respondents from Wave 1 to 2

Sampling and statistics

- Anything other than a simple random sample theoretically requires adjusting standard errors (and possibly means)
- We'll talk a little about this when we talk about weighting

Does any of this matter?



- this is actually nonresponse bias, not sampling bias

Does any of this matter?

- High rates of non-response undermine even the best sampling designs
- We still need to correct for non-response
- But a good sampling design gives your survey the best chance

Nonresponse

Weighting your survey

- Most large surveys are *weighted*
- A weight is a number assigned to each response, representing how influential it should be

Weighting your survey

- The ideal weight is the *inverse sampling probability*
  - if someone has a probability of 0.01 of being sampled and responding, their weight would be 100.
  - if someone else has a probability of 0.02, their weight would be 50
- The idea is that there first person was half as likely to respond, therefore there are twice as many people *like them* in the population

The weighted mean

$$\bar{x} = \frac{\sum_{i=1}^{n} w_i x_i}{\sum_{i=1}^{n} w_i}$$

- A normal mean is a weighted mean where all the weights are 1

The weighted standard error

- Non-random samples can inflate *or* deflate standard errors/standard deviations
  - Generally speaking,
  - *Clustering* inflates standard errors
  - *Stratification* decreases them
- Corrections to the standard error/standard deviation formula are complex and survey-specific
- Look at the documentation of the survey you're using

Weights in regression

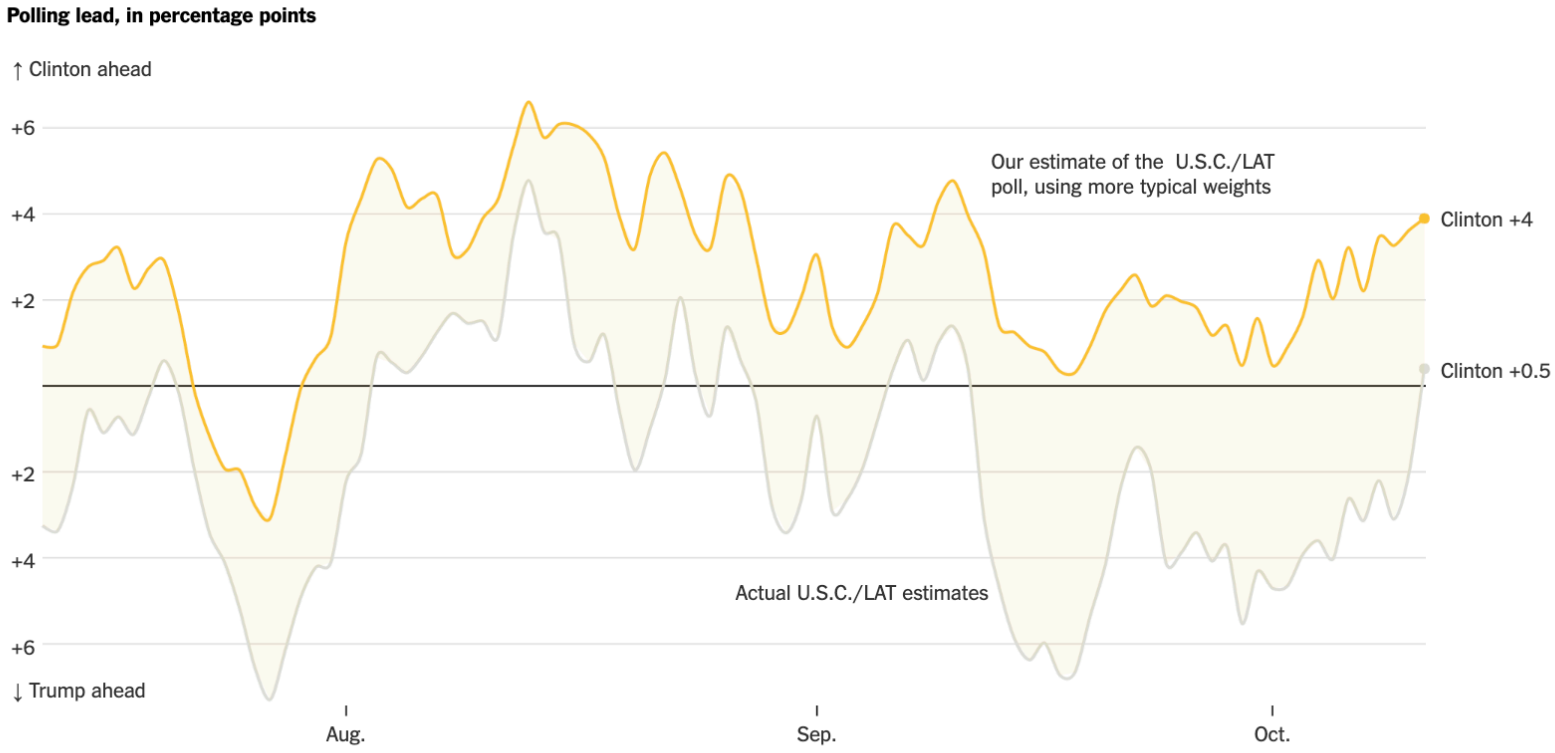
- It's often not necessary to use weights in regression
- You just need to control for the variables used to make the weights
- The regression measures the relationships of interest holding other things constant - e.g. the relationship between free transit passes and transit use, holding income constant
- Basically, if (we assume) everyone has the same response to free transit passes, we are okay
  - They probably don't, and we would use an interaction term for this
- Where this gets tricky is if you have heterogeneity in coefficient values for different groups

See further: *Solon, Haider, and Wooldridge (2015)*

Dangers in weighting

The New York Times

How One 19-Year-Old Illinois Man Is Distorting National Polling Averages



Creating weights

Creating weights

- Any survey you conduct is more than likely nonrepresentative
- We use Census data to determine population proportions in different groups, and then adjust the proportions in our sample to match

Creating weights

- If all the population proportions we want are in a single Census/ACS table, weighting is easy
- The weight for each individual is the ratio of their population and sample proportions
  - So if 15% of the sample is Hispanic, and 30% of the population in the are surveyed is, we give all Hispanics a weight of 2

Creating weights

- Often, you want to create weights from a set of variables that does not have a specific Census crosstab
- For this, you can use iterative proportional fitting

Iterative proportional fitting

- We start by cross-classifying the survey variable by all of the dimensions we're interested in, expressed as proportions of the total sample
  - Sometimes people do this with numbers rather than proportions - the result is similar
  - This is the *seed matrix*
- Then, you get the total proportions for each row and column from the Census
  - Again, sometimes population totals
  - These are the *marginals*

Iterative proportional fitting

- Adjust each row so that the total in the row equals the marginal value for that row (by multiplying by the marginal value divided by the sum of the row)
- Do the same with the columns
- Repeat until the results are stable
- IPF uses the control totals, but also accounts for correlations using the sample itself

Note: I want you to know what this is, and have a basic understanding of how it works - I don't need to know how to do it from memory

Respondent compensation

- In many research surveys (especially long ones!) compensation is offered
- This might be money, but is often a gift card
- Sometimes it's a lottery
  - UNC generally doesn't like this
  - Some states consider this gambling

Survey instrument design

- The *survey instrument* is the actual survey the respondents experience
- Good design of survey instruments increases data reliability and response rate

Survey response burden

- Burden of the survey is how long it takes to complete
- And how difficult/intrusive aspects of it are
- One of the biggest challenges in survey design is balancing burden and information collected

Use survey logic

- Many surveys are constructed electronically nowadays
- Every online survey platform lets you skip questions based on previous questions
- This lowers respondent burden and prevents confusion

Response types: multiple choice

- Can be a single question or a matrix
- Can allow single or multiple responses
  - Implications for how data is recorded

Response types: open-ended

- Free text entry (possibly length-limited, constrained to numbers, etc.)
- Harder to analyze, but often yields richer results

Response types: Likert scale

- Very common for attitudes and perceptions
- Strongly disagree, disagree, neutral, agree, strongly agree
- Or some variation—somewhat agree, etc.
- Sometimes neutral option is left out
- Generally, the “question” is actually a statement
  - e.g. “I think we should do more to save the environment”
- Also used for behaviors
  - I recycle whenever I can

Writing good survey questions

- Advice largely from *Stopher (2012)*

Threatening questions

- Some questions may be perceived as “threatening”
- e.g. income, illegal behaviors
- Explaining why you are asking the question may help
- Open ended responses may help
- Asking later in the survey may help

Age

- Often, people are more comfortable sharing the year they were born than their age :thinking_face:

Location

- Often, people are uncomfortable sharing their home address, and it's often not necessary
- Alternatives
  - ZIP codes (same problems as Census ZCTAs)
  - Cross streets (difficult to geocode, may need manual coding)

Other people

- Questions about others are often seen as threatening (am I allowed to share this?)

Clear and concise questions

- Questions should be clear and concise
- They should not use complex words
- It’s better to use multiple sentences than one long one
- Tools like Hemingway App are useful to reduce the grade level of your writing

Double-barreled questions

Tradeoffs and false dichotomy

- When you ask questions about tradeoffs, make sure you don’t present false dichotomies
- Do you drive to campus or bike?

Include “other, specify” options

- When you have a multiple choice question where they may be other responses, it’s a good idea to include “other, specify” options
- This can capture response options you might have missed

Think about who will be left out by questions

- I once took a survey that started by asking how I got to work, then followed up with a bunch of questions about my satisfaction with parking
- In cases like these, you should use survey logic to skip questions that don't apply

Priming

- Priming is when earlier questions (or answers) affect later responses
- Especially an issue with attitudinal surveys—people make their reported attitudes and behaviors consistent, even when they are not

Usual/normal activities

- These can be subjective
- A lot of interesting planning questions are driven by the non-normal activities
  - e.g. vehicle trips over 100 miles are ~1% of all trips, but 21% of overall vehicle miles traveled (2017 NHTS)
  - The tail wags the dog

Recall

- Many surveys are retrospective
- People are not always good at remembering what they did in the past, how often they did it, or when they did it
  - Most people are confident they remember where they were/what they were doing when they heard of the 9/11 attacks, but many of them are misremembering *(Hirst et al. 2015)*

Straightlining

- Sometimes, when respondents are tired or uninterested, they may “straight-line” responses
- Especially for matrix response questions
- Where they select the same answer for every question
- It’s useful to have some similar questions worded in opposite directions, to help differentiate straightliners from true responses
- e.g. “we should do more to protect the environment” and “air pollution is a relatively minor issue”
- Sometimes, people include “trap questions” - e.g. “Please select ‘strongly disagree’ for this question”

Other question ordering philosophies

- Ask screening questions early
- Some say demographics at end, when you have established more trust
  - These questions are also easy to answer
- Opinions (if asked) can be helpful early on

Social desirability bias

- Sometimes, respondents may answer what they think you want to hear, rather than what is actually true
- This is often true with questions about things that socially desirable or undesirable
  - e.g. underreporting smoking, distracted driving
  - overreporting seat belt use, recycling, etc.

Ask for permission to follow up

- It is really hard to recruit participants to a survey!
- It’s a good idea to ask respondents if you can re-contact them for a follow-up or additional surveys
- People who agree will have much higher response rates in the future

Add a “anything else you want to tell us” question

- Most people will skip it
- But for some people it gives them a chance to express something they feel was absent
- Or report issues with the survey

Survey pre-testing

- Pre-testing is an important part of survey deployment
- Test the survey yourself and among co-workers
- Try many different combinations of responses (especially if you have survey logic)

Pre-test on cell phones!

- An astonishing number of people take surveys on cell phones nowadays

Survey platforms

- Google Forms (very common, free)
- Qualtrics (powerful, ubiquitous in academia, approved by UNC for identifiable information)

Creating a survey in Google Forms

- Browse to forms.google.com
- Choose “+Blank”

Question types in Google Forms

- Multiple choice or checkboxes (one selection/multiple selections)
- Matrix
- Short/long answer
- Dropdown (use sparingly, e.g. for state)

Question validation

- You can add response validation to a text field, to only allow numbers, email addresses, or a regular expression (advanced text matching tool)

Survey logic in Google Forms

- Logic is pretty limited in Google Forms
- You can split your form into sections
- With multiple-choice questions, you can select “go to section based on answer” to skip to another section

Creating a survey in Qualtrics

- Log in to Qualtrics (unc.qualtrics.com)
  - May need to request an account first
- Click “Create a new project”
  - Choose “From Scratch > Survey”

Question types in Qualtrics

- Text/graphic (survey instruction blocks)
- Multiple choice (can be single or multiple response)
- Matrix table
- Text entry (can be short or long)
  - More powerful validation than in Google Forms

Survey logic in Qualtrics

- There are three types of survey logic in Qualtrics
  - Display logic
  - Skip logic
  - Survey flow

Display logic

- Display logic is conditions applied to a single question (or even a single response to a multiple choice question) that controls whether it is displayed
- Conditions can be complex, refer to multiple previous questions, etc.

Skip logic

- Skip logic is applied after the question it is associated with
- If the conditions specified are true, the survey will skip to a specified question

Survey flow/branch logic

- Like Google Forms, Qualtrics surveys can be divided into sections or “blocks”
- The “Survey Flow” editor lets you edit the ordering of these, and use “branching” to set conditions for when blocks will be displayed

Chauhan, Rishabh Singh, Matthew Wigginton Bhagat-Conway, Denise Capasso da Silva, Deborah Salon, Ali Shamshiripour, Ehsan Rahimi, Sara Khoeini, Abolfazl (Kouros) Mohammadian, Sybil Derrible, and Ram Pendyala. 2021. “A Database of Travel-Related Behaviors and Attitudes Before, During, and After COVID-19 in the United States.” *Scientific Data* 8 (1, 1): 245. https://doi.org/10.1038/s41597-021-01020-8.

Hirst, William, Elizabeth A. Phelps, Robert Meksin, Chandan J. Vaidya, Marcia K. Johnson, Karen J. Mitchell, Randy L. Buckner, et al. 2015. “A Ten-Year Follow-up of a Study of Memory for the Attack of September 11, 2001: Flashbulb Memories and Memories for Flashbulb Events.” *Journal of Experimental Psychology: General* 144 (3): 604–23. https://doi.org/10.1037/xge0000055.

Solon, Gary, Steven J Haider, and Jeffrey M Wooldridge. 2015. “What Are We Weighting For?” *Journal of Human Resources* 50 (2): 301–16. https://doi.org/10.3368/jhr.50.2.301.

Stopher, Peter. 2012. *Collecting, Managing, and Assessing Data Using Sample Surveys*. 1st ed. Cambridge University Press. https://doi.org/10.1017/CBO9780511977893.