36-303: Sampling, Surveys and Society

More Survey Questions & Upcoming Midterm

Brian Junker
132E Baker Hall
brian@stat.cmu.edu

Handouts and Reading…

- These Lecture Notes
- Read Groves Ch's 7 and 8 on Question Design and Pretesting

Outline

- Survey Questions
  - Standards for Survey Questions
  - Evaluating and Revising Survey Questions
  - Question and Questionnaire Design Pointers
- Quantitative Review
  - Sample Size Calculations
- About that Midterm (Thu Feb 17)…
  - What it will cover
  - What you can bring to class

Standards for Survey Questions

- Content Standards
  - Are the questions asking about the right things?
- Cognitive Standards
  - Do respondents consistently understand the questions?
  - Do they have the information needed to answer?
  - Are they willing and able to answer?
- Usability Standards
  - Can respondents—and interviewers, if they are used—complete questionnaire easily & as intended?

Evaluating and Revising Survey Questions

- Expert Reviews
  - Subject matter experts can review for content
  - Questionnaire design experts can review for cognitive and usability issues
- Cognitive Interviews (n=1 at a time) or Focus Groups (n>1 at a time)
  - Administer questionnaire to small group of target pop, interview about how they think and talk about the issues (content), how they think about the survey questions (cognitive) and how they formulate their answers (usability).
- Field Pre-tests (n from about 20 to about 100)
  - Administer questionnaire to a larger sample, debrief respondents (and interviewers, if used) to learn about content, cognitive and usability issues.
- Randomized Experiments for comparing different wordings, etc.

Evaluating and Revising – What you can easily do

- Expert Reviews
  - You may be able to find a subject matter or questionnaire design expert – use him or her!
  - I will be looking at your questions as well.
- Cognitive Interviews, Focus Groups, Field Pretests
  - *You will learn incredibly much*, just giving the survey to 5-10 friends outside your team, and finding out what "worked" and "didn't work" for them.
  - You should do this for every major revision of your survey.
- Randomized Experiments on Wording
  - Not really feasible within our time limits.

Questionnaire Design

- Step 1: Define what you want to measure
  - Refine your research question
  - Refine the set of variables you want to measure, for that research question
- Step 2: Design questions
  - What do you need to ask respondents, to measure those variables?
  - How can you set consistent, easy to understand expectations about what respondent should say?
- Step 3: Pretest questions on every revision round
  - First, pretest and discuss within your team
  - Second, try to pretest with 5-10 people outside your team

Good Survey Questions: Criteria

- Two characteristics of good survey questions that we strive for:
  - *reliability* (two different people with the same opinion should give the same answer)
  - *validity* (the answers should correspond to what we want to measure)
- Analogous to *variance* and *bias.*

(many of the following design pointers are from Converse & Presser, 1986)

Simple Language

- Avoid *$25 words*
  - "Principal" vs "main"
  - "Intelligible" vs "clear"
  - "Intuition" vs "feeling"
- Use *Standard English* (spoken or written?)
- Use *fewer, shorter, less complicated sentences* (usually!)
- Avoid *double-barreled questions*
  - Agree or disagree: Teachers should not be required to supervise students in the halls, the lunchroom, and school parking lots.
- Avoid *implicit or confusing negatives*
  - Do you favor or oppose a law *outlawing* guns in the state of Maryland?
  - Do you favor or oppose a law *allowing* guns in the state of Maryland?
- Put *choices last rather than first* (see previous example!), especially if there are more than two

Common Concepts

- Ask about things people generally can think about
- Example: Rates, proportions and percents
  - Many people do not remember what percents or rates actually are
  - Many people who do remember try to avoid the effort of working them out
    - What proportion of your evening TV viewing do you spend watching news programs? *[Belson (1981): only 14% of sample could define "proportion" correctly!]*
    - In the past week [SINCE DAY/DATE], how many hours did you spend watching TV in the evening?

      Did you spend any of that time watching news programs?

      [IF YES] How many hours did you spend watching news programs?

Manageable Tasks

- Facts vs opinions/attitudes
  - Are you married?
  - Did you have the flu this winter?
  - What is your ethnicity/nationality?
  - Are you unemployed/looking for work?
  - Were you or someone you know the victim of a crime?
    - “Someone took the computer from my office.”
    - “My father slapped my mother so hard it chipped her tooth.”
- Shared definitions / shared assumptions
  - Very much like “common concepts”

Manageable Tasks (cont'd)

- **Recall of the past**
  - *Events* or actions that were viewed as *important* or *salient* **to the respondent** at the time are *easier to recall*
  - Time dilation/telescoping
- **Some fixes**
  - *Bounded recall* (How many times last month? How many times this month? – reduces over-reporting of this month)
  - *Narrowing the reference period* (last year, last 6 mo, last month, last week, yesterday)
  - *Averaging*
    - How much time did you study yesterday?

      Was that typical of how much time you spent studying on weekdays during the past week?

      [IF NO] What was the typical amount of time you spent studying on weekdays in the past week?
  - *Landmarks* ("Since Christmas [or 9/11, or…], how many times…")
  - *Cueing*
    - In the past 6 mo, has anyone assaulted you?
    - In the past 6 mo, has anyone used force on you by grabbing, punching, choking, scratching or biting you?

Manageable Tasks (cont'd)

- Hypotheticals
  - Suppose you had an opportunity to cheat on a midterm exam. Under what circumstances would you cheat? Why?
  - Suppose the free bus pass for CMU students and employees was discontinued. What would you do? Why?
- We generally don't know what tools (information, experiences, etc.) people use to answer them.
- Ask about real experiences if at all possible (sometimes it's not possible though!)
  - Think of a time that you cheated (on a test, homework, in a game, etc.). Describe the circumstances. Why did you?
  - Describe a situation or place where free bus passes were not available to you. How did you get around? Why?

(these are not yet great questions but they refer to real events!)

Widespread Information

- Assume little about what respondents know about your topic
  - Locate these 10 (well-known) states on a US map
    - Gallup (1947; today?): 4% of citizens with only grade school ed could; 8% of citizens with some college could!
  - John Boehner currently holds an elected office.
    - What is that office?
    - In what state was he elected?
    - Why is he currently in the news?
  - "As you probably know, a part of your student fee supports free bus pass stickers for your ID…"

Specific vs General; Question Order

- Like hypotheticals, we don't know what tools people use to answer general questions!
  - Taken altogether, how would you say things are these days: would you say you are very happy, pretty happy, or not too happy?
- The order of specific vs general can affect answers to general questions (e.g. priming)
  - Taking all things together, how would you describe your marriage: would you say your marriage is very happy, pretty happy, or not too happy?

    Taken altogether, how would you say things are these days: would you say you are very happy, pretty happy, or not too happy?
- More broadly, try different orders of questions; they often reveal different facets of the research issue.

Open vs Closed

- **To what organizations do you belong? Vs.**
- **Here's a list of organizations; pick all that apply:**

A. Fraternal groups
B. Service clubs
C. Veterans groups
D. Political clubs
E. Labor unions
F. Sports groups
G. Youth groups
H. School service groups
I. School fraternities or sororities
J. Nationality groups
K. Farm organizations
L. Literary, art, or discussion groups
M. Professional/academic societies
N. Church-affiliated groups
O. Hobby or garden clubs

- Open can catch unanticipated responses
- Closed communicates expectations clearly; they are more specific
- For closed, adding an "Other? List them here:" category can be useful

Likert Items: Middle Categories and "No Opinion"

- I like drinking Milk in the morning
  - Pick one:

    Agree, Disagree
  - Pick one:

    Agree, Disagree, Don't know, N/A
  - Pick one:

    (strongly agree) 1 2 3 4 (strongly disagree)
  - Pick one:

    (strongly agree) 1 2 3 4 5 (strongly disagree)
- Their advantages and disadvantages are the same: people will choose them

Likert Items: Avoiding Pitfalls

- **"Have you thought about…" filters**
  - Have you thought about the state of health insurance in the US?

    [IF YES] How important is universal health coverage to you? (very important) 5 4 3 2 1 (not important)
- **Agree/Disagree vs Forced Choice**

  (Schuman & Presser, 1981)
  - Do you agree or disagree: Most men are better suited emotionally for politics than most women.

	Years of schooling		
	0-11	12	13+
Percent for "agree"	57	44	39

  - Would you say that most men are better suited emotionally for politics than most women, that men & women are equally suited, or that women are better suited than men in this area?

Percent for "men"	33	38	28

Question Wording

- **Loading – question setup**
  - Some people think that terrorism can sometimes be justified. Should such people be allowed to speak on campus?
  - There are always some people whose ideas are considered bad or dangerous by others. For example, people who think terrorism can sometimes be justified. Should such people be allowed to speak on campus?
- **Loading – word choice**
  - Pro-life vs. Anti-abortion … Taxes vs. Revenues … etc.
- **Apparently trivial wording differences…**

  …or pleasing the interviewer?
  - Do you think the US will get into WW II before it is over?

    Yes 41% No 33% Don't Know 26%
  - Do you think the US will succeed in staying out of WW II?

    Yes 44% No 30% Don't Know 26%

    (Rugg & Cantrill, 1944)

Question Wording: Avoiding Pitfalls

- Pretest, pretest, pretest!
- Use open followups to closed questions (e.g. the club/organizations question above)
- Ask multiple questions on a topic
  - Useful if most ways of asking the question are subject to interpretation, or can't get at the whole topic
    - Use multiple questions to get at different facets/interpretations
  - This is why most mid-terms and finals are not one-question tests!
  - Choose wisely when to do this; otherwise questionnaire long and respondent will quit early

Survey Sample Size Estimation

- *Review*: CLT-based conf. interval and sample size calculation for ***SRS with replacement:***
  - 100%(1-α) CI for μ:

$$\left(\overline{X} - z_{\alpha/2} \frac{SD}{\sqrt{n}} \ , \ \ \overline{X} + z_{\alpha/2} \frac{SD}{\sqrt{n}} \right)$$

  - Margin of error (ME) is ½ width of CI, so

$$ME \ = \ z_{\alpha/2} \frac{SD}{\sqrt{n}}$$

  - For a given ME, get sample size by solving for n:

$$n \geq n_0 \ , \quad \text{where } n_0 = \frac{z_{\alpha/2}^2 (SD)^2}{(ME)^2}$$

Survey Sample Size Estimation

- *New*: CLT-based conf. interval and sample size calculation for ***SRS w/o replacement:***
  - 100%(1-α) CI for μ requires FPC:

$$\left(\overline{X} - z_{\alpha/2} \sqrt{1 - \frac{n}{N}} \frac{SD}{\sqrt{n}} \ , \ \ \overline{X} + z_{\alpha/2} \sqrt{1 - \frac{n}{N}} \frac{SD}{\sqrt{n}} \right)$$

  - For a given ME, get sample size by solving

$$z_{\alpha/2} \sqrt{1 - \frac{n}{N}} \frac{SD}{\sqrt{n}} \ < \ ME$$

  - After some algebra, get

$$n \geq \frac{N n_0}{N + n_0} \ , \quad \text{where } n_0 = \frac{z_{\alpha/2}^2 (SD)^2}{(ME)^2}$$

Example: Sample Size Estimation

- *Estimate proportion of CMU undergrads who would prefer one week for carnival, to within +/-0.05, with 95% confidence.* *How large n?*
- For SRS with replacement

$$n \geq n_0 \ , \quad \text{where } n_0 = \frac{z^2_{\alpha/2}(SD)^2}{(ME)^2}$$

  - ME = 0.05; z = 1.96 (or 2); SD = $\sqrt{p(1-p)}$, but p is what we want to estimate!
    - Initial guess for p? Maybe p=0.9?
    - Worst-case guess for p? p=0.5.

Example: Sample Size Estimation (2)

- Go with ME = 0.05, z = 1.96, and
  SD = $(0.5*(1-0.5))^{1/2} = 0.5$

- For ***SRS with replacement***, we get

$$n_0 = \frac{z^2_{\alpha/2}(SD)^2}{(ME)^2} = \frac{(1.96)^2(0.5)^2}{(0.05)^2} = 384.16$$

  so, sample n $\geq$ 385 students.

Example: Sample Size Estimation (3)

- For SRS with replacement, we take n at least

$$n_0 = \frac{z^2_{\alpha/2}(SD)^2}{(ME)^2} = \frac{(1.96)^2(0.5)^2}{(0.05)^2} = 384.16$$

- For ***SRS w/o replacement*** (www.cmu.edu claims 5705 undergraduates at CMU), we take

$$n \geq \frac{N \cdot n_0}{N + n_0} = \frac{(5705)(384.16)}{5705 + 384.16} = 359.9$$

a savings of about 24 students.

About that Midterm…

- Covers:
  - Groves, Ch 1, 2, 4 (first part), 5, 7, 8, 11 (first part); and Lohr, Appx B.
  - Lecture notes and handouts from class.
  - Material from homework or team assignments.
- You may bring:
  - Calculator.
  - No paper (or electronic) notes or formula sheets. Otherwise I have to make the test harder.
- Likely to be mixture of
  - open-ended (esp calculations), and
  - multiple choice/short answer (esp concepts).
- Full review for midterm next Tues in class.
  - I will show you the formula sheet for the exam on Tues!

Review

- Survey Questions
  - Standards for Survey Questions
  - Evaluating and Revising Survey Questions
  - Some Examples
- Quantitative Review
  - Sample Size Calculations
- About that Midterm…
  - Thursday Feb 17, in class.
  - Review Tues Feb 15