Online Panels for Data Collection

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RCMAR/EXPORT
Methodological Seminar Series

https://uclahs.webex.com (meeting # 806 592 178)

December 15, 2014 (3-4pm)

CTSI Competencies

1) Assess the strengths and weaknesses of possible study designs for a given clinical or translational research question.

2) Design a research data analysis plan.

3) Assess threats to internal validity in any planned or completed clinical or translational study, including selection bias, misclassification, and confounding.

Gmail by Google

Ron Hays <dr.ronhays@gmail.com>

Exciting new survey opportunity!
1 message

Opinion Miles Club <info@opinionmilesclub.com>
To: Ron Hays <drhays@ucla.edu>

Tue, Nov 18, 2014 at 6:32 PM

OpinionMilesClub

MileagePlus UNITED

Reward: 60 Award Miles

Survey Length: 30 Minutes

Participate now by **clicking here »**

You're Invited!

Dear Ron,

Share your opinions today!

Thanks for participating!
-The Opinion Miles Club Team

http://www.surveypolice.com/opinion-miles-club

https://www.opinionmilesclub.com/

Bait and switch repeatedly. Plus, they collect information for 20 or more minutes, then say "not a match" or conveniently develop a technical glitch so that you can't complete the survey.

The help desk is beyond frustrating, work off of a script and seem incapable of addressing any problem. The only thing they "help" with is to issue the same stock response and refuse to put one in touch with a supervisor.

This is, by far, one of the absolute worst survey sites ever!

Non-Probability (Convenience) Internet Panels

- NIH Toolbox
  - Multidimensional set of brief measures assessing cognitive, emotional, motor and sensory function from ages 3 to 85.

- Delve, Inc databases assembled using online self-enrollment, enrollment through events hosted by the company, and telephone calls from market research representatives

Convenience Internet Panels

- PROs
  - Relatively inexpensive and faster
  - Able to get to low incidence subgroups
- CONs
  - Data integrity
    - False answers
    - Answering too fast
    - Same answer repeatedly
    - Duplicate surveys from same person
  - Respondents may differ from intended target on measured (more educated) and on unmeasured characteristics

Convenience Internet Panels differ from Underlying Population

- 2002 Health and Retirement Study (HRS) sample of 11,279 of 55 and older population
- 30% reported internet access
- Predicted internet access from
  - Race/ethnicity, gender, education, age, marital status, income, owns house, and self-rated health

Schonlau, M. A. et al. (2009). Selection bias in web surveys and the use of propensity scores. Sociological Methods and Research, 37, 291-318.

Internet Sample vs. Full Sample

Variable	Internet sample	Weighted internet sample	Full sample
High blood pressure	44%	52%	55%
Depressed	11%	15%	19%
Difficulty dressing	4%	7%	9%
Difficulty walking several blocks	15%	27%	31%

Probability Panels

- Selection probabilities known.
  - Need sampling frame (denominator)

- Get internet access for those without it.

Telepanel (1980's)

- Started by Willem Saris, Professor of sociology at the University of Amsterdam
  - Recruited a sample of 1000 Dutch and gave them computers and modems.
  - Panel asked to download a survey every weekend, answer and upload it to the central modem pool.

- Sold panel to a market research agency.

http://en.wikipedia.org/wiki/Willem_Saris

CentERpanel (1990s)

- Saris started another (larger) panel
  - Panel size = 3k
- Sold to Tilburg Univ. Center for Economic Research
- *CentERpanel* still exists and is the oldest internet probability panel in the world.

Subsequent probability panels

- 1999: Knowledge Networks (now GFK), U.S.
  - Address-based sampling
  - Approximate recruiting response rate = 15%
  - Panel size = 55k
- 2006: Longitudinal Internet Studies for the Social Sciences, Netherlands
  - Population registry-based sampling
  - Recruited face-to-face and telephone
  - Approximate recruiting response rate = 45%
  - Panel size = 7.5k

Subsequent probability panels (2)

- 2006: American Life Panel, U.S.
  - Recruited by RDD, face-to-face, and address-based
  - Approximate recruiting response rate = 15%
  - Panel size = 6k
- 2014: Understanding America Study, U.S.
  - Address-based sampling
  - Approximate recruiting response rate = 20%
  - Panel size = 2k

Patient-Reported Outcomes Measurement Information System (PROMIS®)

- *Polimetrix* (now *YouGov*)
- Non-probability based recruitment of panel
- > 1 million members who regularly participate in online surveys

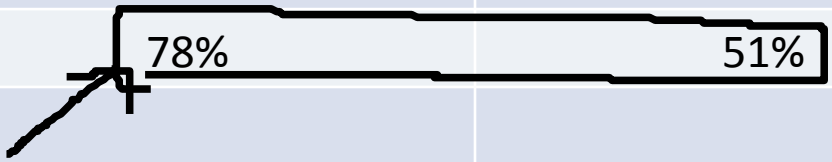
Liu et al. (2010). Representativeness of the Patient-Reported Outcomes Measurement Information System internet panel. J Clinical Epidemiology, 63, 1169-1178.

Sample-Matching Methodology

- Target subset with selected characteristics
  - n = 11,796 overall
  - Subgroups with lower response rates oversampled
- PROMIS targets (“Quota sampling”)
  - 50% female
  - 20% 18-29, 30-44, 45-59, 60-74 and 75+
  - 12.5% black, 12.5% Hispanic
  - 10% < high school graduate

PROMIS Internet Sample versus Census

	PROMIS Sample	2000 Census
% Female	55%	52%
% Hispanic	13%	11%
% Black	10%	11%
% < High school	3%	20%
% High school/GED	19%	29%
% > High school	78%	51%
Mean age	50	45



Analytic Weights (Post-Stratification Adjustment)

- Compensate for nonresponse and non-coverage
- Weight sample to have same distribution on demographic variables
  - Gender, age, race/ethnicity, education, marital status, and income
- Iterative proportional fitting or raking

Raking

- Matches cell counts to the marginal distributions of the variables
- Performs cell-by-cell adjustments
- Repeated iteratively until convergence between the weighted sample and U.S. Census distributions

Raking Algorithm

- Calculate $n\downarrow ij\uparrow(1) = N\downarrow i \times n\downarrow ij\uparrow(0) / \sum j\uparrow n\downarrow ij\uparrow(0)$ → raking over rows
- Calculate $n\downarrow ij\uparrow(2) = N\downarrow j \times n\downarrow ij\uparrow(1) / \sum i\uparrow n\downarrow ij\uparrow(1)$ → raking over columns
- Repeat these 2 steps until $\sum j\uparrow n\downarrow ij = N\downarrow i$ and $\sum i\uparrow n\downarrow ij = N\downarrow j$ for each i and j, i.e. "convergence" is achieved

Raking Example

- Grouping by Gender & Race

Sample	Black	White	Asian	Native American	Other	Sum of Weights	Pop. Sum
Female	300	1200	60	25	30	1615	**6500**
Male	150	1080	93	30	32	1385	**5725**
Sum of Weights	450	2280	150	60	60	3000	
Pop. Sum	**2000**	**9000**	**700**	**250**	**275**		**12225**

Raking Example (-con't)

- Adjust rows first. Multiply each row by $true\ row\ pop/estimated\ row\ pop = 6500/1615$ for female row, $5725/1385$ for male row

	Black	White	Asian	Native American	Other	Sample Sum	Pop. Sum
Female	1207	4830	241	101	121	**6500**	**6500**
Male	620	4464	384	124	132	**5725**	**5725**
Sample Sum	**1827**	**9294**	**626**	**225**	**253**	**12225**	
Pop. Sum	**2000**	**9000**	**700**	**250**	**275**		**12225**

- Now row margins are right, but column margins aren't. So, we rake over columns
- Repeat, until convergence

Raking--Summary

- Response probabilities depend only on the row and column and not on the specific cell
- Allow to include more variables
- Converge to Cell weighting if the auxiliary variables are independent
- Convergence can be slow, and occasionally impossible

PROMIS Weighted Sample

- A raking benchmarking to variables (gender, age, race/ethnicity, education, marital status and income) common to both the PROMIS and the 2000 Census.
- The weights assigned to individual respondents
- Marginal distributions on auxiliary variables were equivalent between the PROMIS and 2000 Census.

PROMIS Internet Sample (Weighted) versus Census

	PROMIS Sample	2000 Census
% Female	52%	52%
% Hispanic	11%	11%
% Black	11%	11%
% < High school	20%	20%
% High school/GED	29%	29%
% > High school	51%	51%
Mean age	45	45

PROMIS General Population Sub-sample

- A subset of the PROMIS internet sample
- Sub-sample approximated the joint distributions of key demographic variables in the 2000 U.S. Census:
  - Age
  - Gender
  - Race/ethnicity

Algorithm to Obtain PROMIS General Sub-sample

1. Obtain the marginal distribution of gender, age, and race/ethnicity of the PROMIS Internet general population
2. Create grids of cells: 2 (gender: Male, Female) × 5 (age: 18 to 29, 30 to 44, 45 to 59, 60 to 74, 75+) × 4 (race/ethnicity: African American, White, Hispanic, Other race) = 40 cells
3. Calculate the frequency of responses for each cell for the PROMIS sample: n_{ijk} with i = 1,2; j = 1,2,3,4,5; k = 1,2,3,4.
4. Calculate the corresponding percentage for each cell based on census data (SF4): c_r_{ijk} with i = 1,2; j = 1,2,3,4,5; k = 1,2,3,4 with general U.S. population.
5. Compute the sample size for each cell for the sub-sample:

$$nn_{ijk} = c\_r_{ijk}\{\min(\frac{n_{ijk}}{c\_r_{ijk}})\}$$

6. Within each cell, draw random sample from general population.

GENERAL HEALTH

In general, how would you rate your health? (5 = excellent; 4 = very good; 3 = good; 2 = fair; 1 = poor)

Sample	Mean (1-5 possible score)
PROMIS general population sub-sample	3.53
PROMIS (Weighted)	3.42
2004 Medical Expenditure Panel Survey (MEPS)	3.56
2001-2002 National Health and Nutrition Examination Survey (NHANES)	3.50
2005 Behavioral Risk Factor Surveillance System (BRFSS)	3.52

Tests of Equivalence

- The non-significance of the traditional differences testing between groups does not allow us to conclude equivalence
  - The observed p-value can only be used as a measure of evidence against H0, not for proving H0
  - Having a small sample would allow us to retain the null hypothesis
  - Need **Equivalence Test**

Two One-Sided Tests (TOST)

- To test the joint null hypothesis
  - H_{0a}: $\mu_1 - \mu_2 > \delta$ OR
  - H_{0b}[1]: $\mu_1 - \mu_2 < -\delta$
- By rejecting *both* of these hypotheses, we can conclude that $|\mu_1 - \mu_2| < \delta$, or that our difference falls within the range specified
- The null hypothesis is usually tested by performing two tests at the α level:

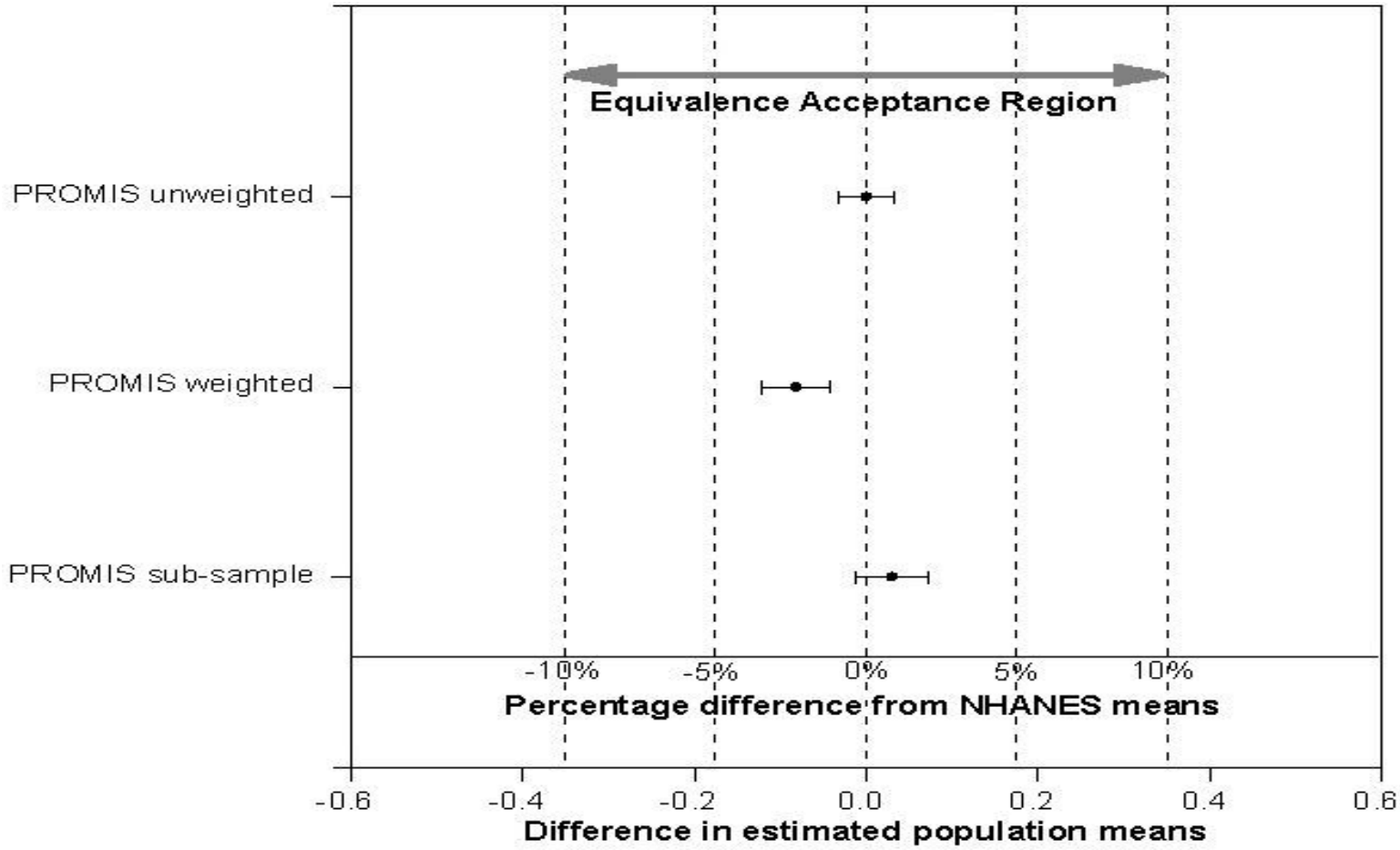
$$\frac{\overline{y_1} - \overline{y_2} + \delta}{\sigma\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} > z_{1-\alpha} \qquad \frac{\overline{y_1} - \overline{y_2} - \delta}{\sigma\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \leq -z_{1-\alpha}$$

Confidence Interval Approach (CI)

- Specify a range of values that would constitute equivalence among groups
  - $-\delta$ to δ
- Determine the appropriate confidence interval for the mean difference between the groups
- See if the CI for the difference between means falls entirely within the range of equivalence
  - If lower/upper end falls out of [$-\delta$ to δ] range, do not claim equivalent
- This is equivalent to the TOST

General Health Comparisons

- PROMIS vs NHANES



Indeterminancy

- Judgment must be suspended as there is no evidence for or against the hypothesis
- One may not be able to come to a solid conclusion
- May help to avoid the trend of interpretation of ‘marginally significant’ findings

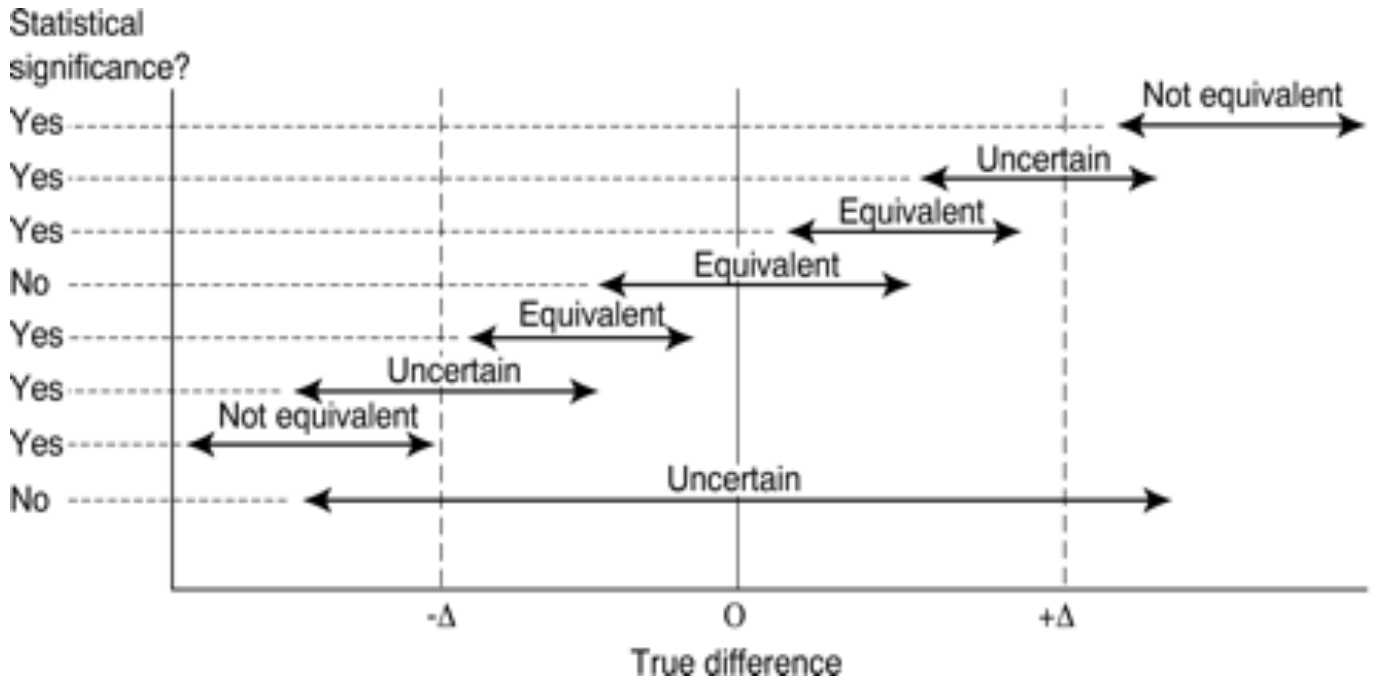


Figure from Jones et al (BMJ 1996) showing relationship between equivalence and confidence intervals.

Thank you and

Appendix: Are probability internet panels with low response rates superior to convenience panels?

- Coverage of non-internet population
- Selectivity of respondents who sign up for convenience panels.
  - 30% of online surveys completed by 0.25% of the U.S. population (Miller, 2006)
  - 15-25% of vendor samples from a common pool of respondents (Craig et al., 2013)
  - Panel participants belong to 7 online panels (Tourangeau, Conrad, and Couper, 2013)

Appendix: Comparing probability and convenience panels

- Same questionnaire (on politics) administered to a probability-based telephone (OSU center for survey research), probability-based internet sample (Knowledge Networks) and to a convenience internet sample (Harris Interactive).
- "The probability samples were more representative of the nation than the nonprobability sample in terms of demographics … even after weighting."

Chang, L. and J.A. Krosnick (2009), National surveys via RDD telephone interviewing versus the Internet: Comparing sample representativeness and response quality, Public Opinion Quarterly, 73, 641-678.

Appendix: Average errors for Harris Interactive and Knowledge Networks Versus 2000 Current Population Survey

	Harris Interactive	Knowledge Networks
Education	5%	4%
Income	2%	6%
Age	2%	2%
Race	2%	2%
Gender	2%	3%

Comparison is for weighted panel estimates.