

An Empirical Process for Using Nonprobability Surveys for Inference

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An Empirical Method to Establish Usability of Nonprobability Surveys for Inference

Overview

Motivation behind method moving to Non-Probability Survey (NPS) for inference

Probability Survey (PS)

Increasingly more expensive

Increasing nonresponse rates

Current State

Comparisons to PS

How to push beyond comparisons with PS, deciding on a priori decision rule

Comparison – illustrate how to do it

At later time how can NPS stand alone, another a priori decision rule

Further research

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NPS

Qualitative

Not Inferential - Accepted in market research, several academic disciplines but no accepted statistical theory

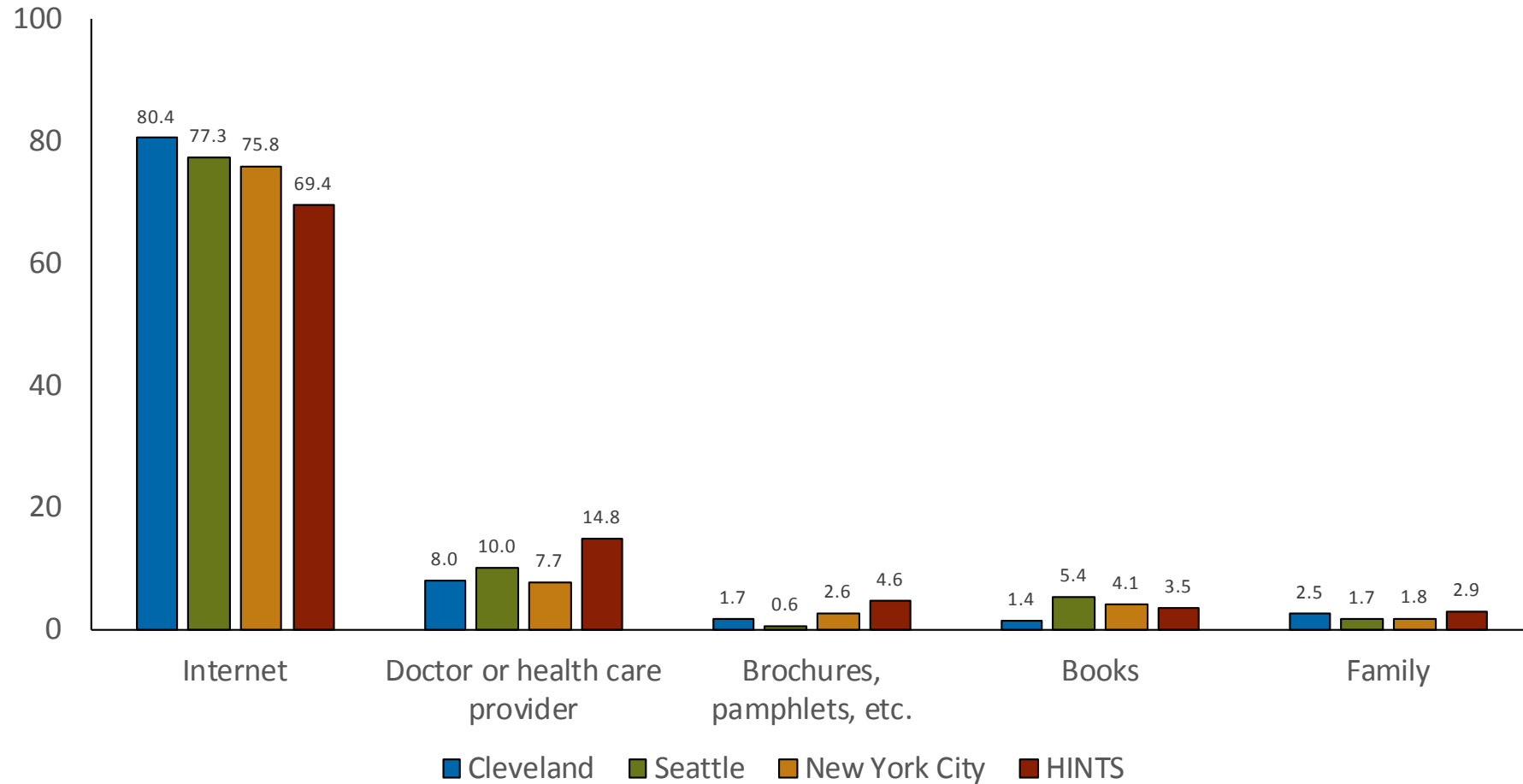
Fast (500 interviews, nationwide, with parents in hh with 19 – 35 month old children in 24 hours, 200 interviews in NYC for correlational study in 12 hours)

Low cost, relatively, even when paying an incentive

Hard to reach to survey (19 – 35 month children)

The CHINTS Pilot: A Comparison of national estimates with site level data

The most recent time you looked for information about health or medical topics, where did you go first?



Compare 2 NPS designs to PS (the Kott situation)

Telephone Probability Survey

LA BRFSS

n = 1,000

Spanish Language interviewing

2 years earlier than NPS surveys

Non-probability Web Panel Surveys – no Spanish language questionnaire, some wording differences

1. NPS quota design based on panel firm survey method – start with hardest to fill quota cells – called Quota, **n = 689** (an aside – inverse sampling with its different estimators for proportions and sampling error)
2. NPS based on random sample selected before fielding, based on census demos – called Census – select large enough initial sample to allow for reminders and obtained finalize sample size, **n = 553**

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This is a proposed method to push beyond just comparing NPS to PS and to allow for use of NPS for inference, i.e., in manner of a PS

1) Motivated by risk tolerance as in design based surveys where we design a survey and select a sample with the risk α (generally = 0.05) of getting a bad sample, that is, in 1 out of 20 surveys, using predefined (a priori) decision rule and 2) motivated by Statistics Sweden Aspire system (Bergdahl, H., Biemer, P. and Trewin, D. (2014)).

Assumes NPS from a panel “quota sample” (NOT a river sample, or other convenience sample), a sample design that is repeatable

Dropping the PS

Assuming successful comparison to PS on the first occasion the NPS stands alone at later times if 1) panel demos only change marginally (user decides acceptable level of change) and 2) the same quota sample design is used

Continue on with NPS until panel demos change too much

The organization that is responsible for making these estimates, selects the level of risk they are willing to accept by deciding on what to compare

1. Make overall population estimates, PE, or
2. Make sub-population estimates, SPE, or
3. Conduct multivariate analysis, MA
4. Include post stratification adjustment, PSW

If the organization

- I. only want overall estimates then a rule using comparisons at the overall level and defined a priori.
- II. wants overall estimates and sub-population estimates then a rule covering overall comparisons and sub-population comparisons and defined a priori.
- III. wants overall estimates, sub-population estimates and multivariate relationships then a rule covering overall estimate comparisons, sub-population comparisons and “correlational” comparisons and defined a priori.
- IV. Considers the overall impact of adjusting – how much

Method

Rules are developed in the form of indices I_k , $k = PE, SPE, MA$ and PSW

I_k is calculated based on comparisons where a “good” comparison results in a 0 added to the index and a “bad” comparison results in some positive number added to the index.

Since the rule is defined a priori the organization knows in advance the maximum possible “bad” score, say I_{MAX} and can assign the level of risk at some cutoff, say I_C , where if $I_k \leq I_C$ the NPS is acceptable for inference.

The organization is free to decide on the risk that is acceptable, if I_C near 0 then the organization is not willing to tolerate much risk and when I_C nears I_{MAX} the organization is willing to tolerate more risk.

Determining level of risk may include factoring in mode differences, timing, etc. This may increase the level of risk willing to tolerate

Decision Rules

Points assign as individual comparisons within the predefined rule(s)

Create index(s) and every time a comparison fails add to the index. If the index score is over a predefined acceptable level of risk the comparison of the NPS to the PS is not successful

Assume data user chooses rules based on:

comparing ever asthma, ever diabetes, ever cancer, ever smoker, current smoker, excellent/very good health, flu shot last year and visited doctor in past year

1. overall, 95% confidence intervals (Stephan and McCarty (1958), Sudman (1966))

adding 1 for each unsuccessful comparison

2. by gender, 95% confidence intervals

adding 1 for each unsuccessful comparison

3. ratio of cv of post-stratification weights, if ≤ 1.2 , 0 added to index, if ≥ 1.21 added 1 to index

Max score for index is 25 if add 1 for each failed comparisons, user decides a priori cut off - if $I_c > k$ NPS not acceptable

Overall Comparisons to PS

Overall Estimates	PS			NPS Census			NPS Quota	
	Estimate	95% C. I.		Estimate	95% C. I.		Estimate	95% C. I.
Asthma Ever	0.14	0.13		0.12	0.08		0.15	0.10
		0.14			0.16			0.19
Cancer Ever	0.12	0.12		0.07	0.04		0.09	0.07
		0.13			0.10			0.12
Diabetes Ever	0.13	0.12		0.12	0.06		0.10	0.06
		0.13			0.17			0.13
Excellent/Very Good Health	0.51	0.50		0.52	0.41		0.57	0.52
		0.51			0.64			0.63
Flu Shot Last Year	0.29	0.29		0.41	0.32	v	0.44	0.38
		0.30			0.50			0.50
Smoke Ever	0.36	0.36		0.32	0.22		0.34	0.29
		0.37			0.42			0.38
Smoking Now	0.09	0.09		0.10	0.03		0.07	0.03
		0.09			0.16			0.10
Checkup Last 12 Months	0.67	0.66		0.64	0.47		0.69	0.63
		0.67			0.80			0.74

Sub-population estimates by gender: Census NPS and Quota NPS both have total score of 4 out of 16.

Census NPS

Male Flu Shots

Female Flu shoots

Male ever cancer

Male smoker ever

Quota NPS

Male Flu Shots

Female Flu shoots

Male ever cancer

Female ever diabetes

Ratio of cv of post-stratification weights

Census NPS/PS - 0.03, add 0 to index

Quota NPS/PS - 2.54, add 1 to index

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Index score for Quota NPS and Census NPS is 6 (1 + 4 + 1) and (2 + 4 + 0), respectively

1. For later occasions compare panel demos from time 1 based on a priori decision rule
2. If not substantial change, again user determined, no need to have a comparison PS, conduct NPS using same quota sample design – data is acceptable for use
3. For even later use repeat 1 and 2.
4. When panel demos change too much repeat NPS and PS comparison.

Moving On

Remove differences

- use self-administered mode for PS and NPS

- conduct same time

- eliminate question wording differences

Combine comparisons

Large urban health department deciding on rule and cutoff

- April/May 2017 fielding

 - assuming successful comparison

- Compare panel demos in April 2018 and conduct NPS alone

Thank You

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