Social desirability bias and mixed-mode public opinion surveys about health-related taxation
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Background

The relationship between sugar sweetened beverage (SSB) consumption and increased risk of obesity, diabetes, and heart disease at the population level is strong[1]. And, increasingly, there is evidence that taxes on SSBs are an effective means for reducing consumption and potentially improving public health[2]. As a result, SSB taxes have been implemented in Albany, Berkeley, Oakland, and San Francisco, California, Boulder, Colorado, Chicago, Philadelphia, and now Seattle, Washington. In order for these taxes to be effective, however, it is necessary for consumers to see the price they pay for SSBs to increase. This direct connection between a public health policy and prices paid by consumers can make such policies difficult to implement, or, as in the recent case of Chicago, difficult to keep in place once anti-tax advocates are able to place a petition to repeal on the ballot (source).

Pre-tax surveys of Seattle residents show that the majority favor the tax[3] , but policy-makers run the risk of repeating Chicago's experience and having their efforts cut short if they overestimate support for SSB taxes. Of particular concern to these policy-makers is the social desirability bias that may lead survey respondents to skew their answers toward opinions and values that they perceive to be more socially acceptable than their true opinions. This type of bias is well-known in surveys related to health behaviors when respondents under state their engagement in socially stigmatized activites[4]. It can also show up when policy makers are trying to determine demand for public goods or support for a policy change. For example, survey respondents tend to overstate their willingness to pay for public works projects when their responses are compared to their actual voting behavior[5].

Social desirability bias in survey responses, and its potential to create a gap between stated values and actual beliefs and behavior, should concern policy-makers who want to shape health behavior through policy and predict voter response to these policy proposals. This is especially true of responses to mixed mode surveys or surveys conducted by phone only. In both the case of surveys on sensitive health topics and polling about public good voting behavior, discrepancies between stated and actual behavior are found much less frequently in web-based polling[4]. This result suggests that social desirability bias is most strongly at work when respondents are given a survey by phone or in person and have to speak to another person. Given that mixed-mode surveys are in increasingly common use, the ability to accurately interpret their results is more important than ever.

In this paper, we investigate whether a gap exists between phone and web respondents who are asked for their consumption of SSBs and their views on SSB taxes. We interpret the gap in favorable responses to taxes between phone and web survey respondents, once the effect of income and demographic characteristics have been controlled for, as social desirability bias. Then we build a model to predict approval ratings for SSB in the absence of social desirability bias, a procedure that could be used in the future for mixed mode surveys on any subject. Our context is a survey of over 1711 respondents in four regions of the U.S.: Seattle, Minneapolis, Arlington, Virginia, and the Bethesda and Rockville, Maryland, conducted in late 2017 and early 2018 as part of the City of Seattle's evaluation of its Sugar Sweetened Beverage Tax, implemented January 1, 2018.

Data and Methods

Data: Between October 2017 and January 2018 we surveyed 1714 adult respondents about their perceptions and attitudes around sugar sweetened beverage (SSB) consumption and sugar sweetened beverage taxes. The survey was conducted online and on the telephone in Seattle and three comparison areas drawn from Minneapolis, Minnesota and the District of Columbia metropolitan area. The survey was conducted as part of the City of Seattle's evaluation of the Sweetened Beverage Tax it implemented on January 1, 2018[6].

The respondents were evenly split between Seattle (N=851) and the comparison area (N=863) and across phone (N=703) and web (N=1011) responses. The sample was stratified by race and ethnicity in order to be representative of the local. We also stratified by income, oversampling the population who report making less than 260% of the federal poverty line for their household size (N=805). This cutoff was chosen because it is consistent with the income eligibility cutoff for Apple Health, Washington's Medicaid program. Finally, we set income targets separately for phone and web respondents in order to ensure that we had sufficient numbers of low and high income respondents in each mode. This was done to avoid potential confounding between the impact of income on response with the impact of survey mode on response. Table 1 shows respondents' economic and demographic characteristics by mode.

Table 1- Respondent Characteristics by Response Mode

	Mean Phone (N=703)	Mean Web (N=1011)
Resides in Seattle	0.60	0.43
	[0.49]	[0.49]
Income <260% FPL	0.49	0.56
	[0.50]	[0.50]
Non-Hispanic White	0.73	0.70
	[0.44]	0.46
Non-Hispanic Black	0.08	0.10
	0.27	0.30
Non-Hispanic Asian	0.04	0.12
	0.20	0.33
Hispanic	0.13	0.09
	0.33	0.29
Age under 50	0.38	0.65
	0.49	0.48
Education (Some College or below)	0.42	0.38
	0.49	0.49
Education (Completed College or above)	0.58	0.62
	0.49	0.49

Note: Standard deviations in parentheses.

Key Outcomes: The survey contained a series of questions on respondents' opinions of sugar sweetened beverage taxes, as well as their perceptions of the health and economic consequences of such taxes.

Respondents were also asked for their perceptions surrounding the healthfulness of sugar sweetened beverages as well as their typical consumption of these drinks. For this study, we look at respondent opinions and self-reported SSB consumption directly, and aggregate questions about perceived tax impacts into a score[3]. The key outcomes are defined as follows:

1. Overall approval of SSB taxes (measured with four category Likert scale with options of strongly approve, somewhat approve, somewhat disapprove, and strongly disapprove. These were reduced to three categories – approve, disapprove, and don't know)
2. Typical SSB consumption (options are none or <1/week, 1/week, 2-6/week, >1/day)
3. An impact score designed to summarize perceptions of the health and economic impacts of the tax. The scores range from -9 to +9 and lower scores reflect less positive attitudes. (Answers to questions about child well-being, public health, cross border shopping, small businesses, local economy, job loss, family finances, impacts on low income residents and people of color, and autonomy over beverage choice are included.)

Analysis plan: In the first part of our analysis, we use linear regression to examine the impact of response mode on these three outcomes, to detect whether there are systematic differences in reporting by response mode. In this initial analysis, we will also control for demographic and economic characteristics of the respondents. In order to control for any unobservable characteristics that may be related to these observables, we will also investigate using propensity score methods for obtaining more accurate measures of the impact of response type on outcomes.

In the second part of our analysis, we will create a model to predict and individual's response to the three key outcomes based on their income, race, education, and other characteristics. We will calibrate this model using data from only those who responded to our survey on the web, treating the web responses as an unbiased reflection of the respondents' behavior and opinions. We will then use this model to predict how the phone respondents would have been expected to answer if they had instead responded on the web. This procedure then gives us two sets of outcomes for the phone respondents: their actual responses and what we believe to be their responses in the absence of social desirability bias. We will compare theses sets of outcomes in order to estimate the degree to which public opinion phone surveys and mixed mode surveys may overestimate public support for health-related taxes such as Seattle's SSB tax.

Preliminary Results: Table 2 shows the breakdown of the three key outcomes by response type. In it, we find that mean responses do vary by response mode. Web respondents are less likely to report that they approve of the tax and have a lower impact score, a reflection of their opinion of the positive health and economic impacts of the tax. Web respondents also report higher weekly consumption of sugar sweetened beverages. Table 3 shows the results of the regression of the key outcomes on response mode, income, race, education, age, and city of residence. These results show that responding via the web is associated with higher reported weekly consumption of sugar sweetened beverages, a lower likelihood of agreeing with the tax, and a lower overall opinion of the positive health and economic impacts of the tax.

Ongoing Efforts: In the coming months, we will be testing the sensitivity of the results shown above and exploring replacing or supplementing our linear regression with propensity score matching techniques. We will develop and fine tune a model for calculating the degree of social desirability bias in the survey,

based on the procedure outlined above. We are confident that we can complete these tasks by the time of the 2019 PAA meeting.

Additionally, in January of 2019, we will conduct a follow up round of data collection to test whether attitudes have changes in Seattle after one year of the tax. We will collect responses from approximately 1600 individuals across Seattle and the three comparison areas and incorporate this data into our analysis. We plan to incorporate these data into the final analysis if they are available for use before the 2019 PAA meeting.

Table 2 - Key Outcomes by Response Mode

	Mean Phone (N=703)	Mean Web (N=1011)
Approves of Tax	0.60	0.57
	(0.49)	(0.49)
Weekly SSB Consumption	2.49	3.55
	(3.83)	(4.44)
Impact Score	2.79	2.08
	(4.67)	(4.70)

Note: Standard deviations in parentheses. Impact score ranges from -9 to +9. A higher score indicates that the respondent has more positive opinions of the impact of the tax.

Table 3- Results of Linear Regression of Outcomes on Response Mode

	Approves of Tax	Weekly SSB Consumption	Impact Score
Web Respondent	-0.04*	0.73***	-0.70***
	[0.03]	[0.21]	[0.24]
Income <260% FPL	-0.01	-0.29	0.15
	[0.03]	[0.21]	[0.24]
Non-Hispanic White	0.04	-0.01	0.05
	[0.04]	[0.34]	[0.38]
Non-Hispanic Black	-0.04	0.57	-0.35
	[0.06]	[0.45]	[0.51]
Non-Hispanic Asian	-0.04	-0.77*	-0.19
	[0.06]	[0.46]	[0.52]
Seattle Resident	0.04	-0.80***	0.36
	[0.02]	[0.20]	[0.23]
Age under 50	0.08***	1.10***	0.01
	[0.03]	[0.21]	[0.24]
Some College or below	0.15***	-0.81***	1.53***
	[0.03]	[0.22]	[0.25]
Observations	1,618	1,714	1,714
R-squared	0.03	0.06	0.04

Note: Standard errors in brackets. Impact score ranges from -9 to +9. A higher score indicates that the respondent has more positive opinions of the impact of the tax.

Works Cited

1. Malik VS, Popkin BM, Bray GA, Després J-P, Hu FB. Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. *Circulation*. 2010;121(11):1356-1364. doi:10.1161/CIRCULATIONAHA.109.876185

2. Falbe J, Thompson HR, Becker CM, Rojas N, McCulloch CE, Madsen KA. Impact of the Berkeley excise tax on sugar-sweetened beverage consumption. *Am J Public Health*. 2016;106(10):1865-1871. doi:10.2105/AJPH.2016.303362

3. a. Vanessa M Oddo, James Krieger, Melissa Knox, Brian E Saelens, Nadine Chan, Lina Pinero Walkinshaw, Mary Podrabsky JCJ-S. Seattle is Sweet on the Sugary Beverage Tax. *Under Rev*.

4. Burkill S, Copas A, Couper MP, et al. Using the Web to Collect Data on Sensitive Behaviours: A Study Looking at Mode Effects on the British National Survey of Sexual Attitudes and Lifestyles. Cardoso MA, ed. *PLoS One*. 2016;11(2):e0147983. doi:10.1371/journal.pone.0147983

5. Schläpfer F, Roschewitz A, Hanley N. Validation of stated preferences for public goods: a comparison of contingent valuation survey response and voting behaviour. *Ecol Econ*. 2004;51(1-2):1-16. doi:10.1016/J.ECOLECON.2004.04.006

6. Nadine Chan, Roxana Chen, Jessica Jones-Smith, Melissa Knox, Jim Krieger, Vanessa M. Oddo, Mary Podrabsky, Maya Rowland, Brian E. Saelens LPW. *The Evaluation of Seattle's Sweetened Beverage Tax: Baseline Report*. Seattle, WA; 2018.