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# Effects of Images in Mail Survey Materials for Local Geographic Areas on Survey Participation

Technical Paper

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### **Abstract**

Survey researchers commonly use images on mail questionnaires and accompanying letters to increase saliency or represent the survey sponsor. Images may be particularly salient in surveys of local areas; it is unclear how such images affect survey outcomes. This paper reports the results of two experiments – one including a map of the local area on the questionnaire cover and the other using text-based versus image-based university letterhead logos in mail contacts. Across both experiments, there were no significant differences in response rates overall or in local areas, on most demographic characteristics, or on most survey estimates. Including an image on the cover page reduced item nonresponse on a within-household selection question on that page, but no differences in item nonresponse on other questions occurred. Survey researchers can include images on questionnaire covers and use logos to convey the sponsor of the survey without substantial effects on nonresponse-related outcomes.

## Introduction

Mail surveys of households are an important method to obtain information on residents of small geographic areas such as states, regions, or counties that cannot be obtained from national data alone. Designing local surveys that strategically appeal to local area residents is important when attempting to increase survey participation and quality. One option available to survey researchers is to use images that may appeal to local residents.

Sample members make heuristic decisions about responding to a survey based on cues from the survey participation request. Using an image on a questionnaire cover page may provide a heuristic cue that can motivate more sample members to respond (Dillman et al. 2014; Greenberg and Dillman 2023; Nederhof 1988; Stange et al. 2019), thereby increasing response rates. Yet whether the images displayed on the cover of a questionnaire affect response rates or survey responses has received surprisingly little attention, especially in local area studies where designs targeting the local area can be readily developed.

Similarly, whether different designs of a sponsor's letterhead used for invitation letters affect people's participation decisions is untested. Although many studies have varied the sponsor (Heberlein and Baumgartner 1978), few studies have examined different visual displays for the same sponsor in letterhead, and where available, these tests are in official government surveys (Walker 2015). How representation of a sponsor using text-based logos versus image-based logos in letterhead for the cover letter affects participation decisions and data quality outcomes has not been explored.

We examine two research questions to address these issues in mail surveys of local geographic areas:

RQ1: Does the use of a cover image emphasizing a local area affect response rates, sample composition, survey responses, and item nonresponse?

RQ2: Does the image used on letterhead from a survey sponsor affect response rates, sample composition, survey responses, and item nonresponse?

## Background

*Cover images.* Using a cover page for paper questionnaires with features that have broad appeal to members of the target population and can help personalize the survey and motivate sample members to respond, potentially making the topic more salient to them (Dillman et al. 2014, Guidelines 10.5 and 10.6). One option for surveys of local geographic areas is to include a map of the study region. Maps give an immediate visual signal that the survey is relevant to people living within the shown area. This may be particularly important when the boundaries of an area being surveyed are not obvious or intuitive to the target population. For example, the boundaries of a multi-county region within a state, a watershed that crosses traditional state and county boundaries, or a metropolitan area may be less familiar to residents than the well-known boundaries of states or counties themselves. In these cases, in addition to signaling relevance, the maps may help respondents who live in geographically adjacent areas to the main neighborhood or region of interest [e.g., in Southern West Virginia by Greenberg and Dillman (2023)] understand whether they are part of the survey's target population. Maps may also make a cover more attractive or "likeable," increasing positive affect and trust toward the questionnaire (Gendall 2005).

Few empirical tests of maps on survey covers exist, have been largely limited to well-known geographic boundaries, and have produced conflicting results. Nederhof (1988) tested two different versions of covers containing maps of the Netherlands, finding that a high contrast black map yielded a higher response rate than a low contrast white map. Dillman and Dillman (1995) (in Gendall 2005) included an image of the state of Washington on a questionnaire cover to increase the salience of the survey to the target population of Washington state residents, finding that it yielded a higher response rate than a cover without an image. Others have found no difference in response rates or other survey outcomes with the presence of a map on a survey cover. In a survey of consumer behavior in a Spanish province, Diaz de Rada (2005) found few differences in response rates between those who received the province map on the questionnaire cover and those who did not. Greenberg and Dillman (2023) included two different versions of maps on covers, one as a generic map of the state with no other images and one with the desired geographic area highlighted along with other images of the area, finding no differences in response rates across the two versions of the questionnaire cover. Given the expected increase in perception of relevance and salience for an image of a local area, *we expect higher response rates when the questionnaire cover page displays a map compared to not having any image (H1).*

Increased salience of a survey may manifest in a different geographic composition for the survey administered with a cover image map compared to a survey without such an image. Residents on the outskirts of the geographic area may feel that the survey is more relevant or salient to them if their region is highlighted on a map compared to not seeing such a map. Thus, *we expect a higher response rate in outlying geographic areas compared to more centrally-located geographic areas on the version with the map compared to the version without the map (H2).* Because the maps were not designed to specifically appeal to one demographic group over another, *we do not expect that there will be other differences in sample composition for those who received the map versus did not receive the map (H3).* To the extent that the image on the cover communicates information about questions being asked in the survey, it may affect survey responses (Stange et al. 2019). We expect maps to affect how people perceive the geographic area in question. In the employment-themed study examined here, focused on an area within employee commuting distance to an urban center, *a map on the cover may affect responses to questions about commuting time to the extent that maps make commutes more salient, although the direction is unclear (H4).*

Eye-catching images can draw attention away from other elements on a page like text, causing text to be overlooked. Thus, adding a map to a questionnaire cover may draw attention away from any questions on the cover of the questionnaire and increase item nonresponse. If there is a clear visual connection between the image and the text, however, the image may instead draw attention to the text. Visual connections between elements on a questionnaire can be achieved by creating similarity between elements (e.g., similarity in location, size, shape, contrast) (Dillman et al. 2014). Both versions of our questionnaire (Figure 1) had a within-household selection question in a grey box at the bottom of the cover page, connecting the grey map with the grey question area. As a result, *we expect the map to draw attention to the within-household selection question on the cover, decreasing item nonresponse to this question (H5).* The image on the cover, however, is distant from the other survey questions, requiring at

least a turn of the page. Thus, *we expect that there will be no difference in item nonresponse for questions located outside of the question on the cover (H6).*

*Letterhead design.* The letterhead used for a survey invitation letter conveys the legitimacy and trustworthiness of a survey request (Dillman et al. 2014). It is well-established that sponsorship affects survey participation decisions in mail surveys (Edwards et al. 2014; Heberlein and Baumgartner 1978). The limited work on survey logos that emphasize a survey sponsor show that they are quickly perceived on survey envelopes and mailers and convey authority (Ahlmarm et al. 2015), with image-based government sponsor logos attracting respondents' attention in eye-tracking tests over verbal "official" text-based information (Walker 2015). During a web questionnaire administration, displaying a university logo versus no university logo on the webpage itself had no effect on break-off rates (Heerwegh and Loosveldt 2006). To our knowledge, there is no test of presentations of the same university sponsor via verbal elements (the university's name in words) versus images (a logo) for the same university in invitation letters on survey participation decisions.

University branding decisions affect people's perceptions of the university's competence or excitement and conveys information about a university's image and reputation (Idris and Whitfield 2014; Kim and Lim 2019; Watkins and Gonzenbach 2013). Perceptions of brands and logos vary across academic (academic logos tend to be text-based and emphasize the university name) and athletic (athletic logos tend to be graphics-based) logos (Watkins and Gonzenbach 2013). For instance, the use of an academic logo may connote greater trust in the scholarship and legitimacy of the work as being sponsored by researchers at the university than an athletics logo. There are two somewhat common situations in which the university logo can become a challenge to survey researchers. The first is when, as has historically been the case, a university has different logos for academics and athletics and the researcher needs to choose which to use on their letterhead. The second is when a university decides to establish a single shared logo for both athletics and academics or to change or refresh their logo (Ruoff 2017). Thus, it is important to understand whether using a different logo for a university leads to differences in survey outcomes.

Overall, we expect that *text-based university logos in letterhead that connote academics will increase perceptions of trust in the scholarship of a university, increasing response rates over the use of a graphics-based logo that connotes university athletics (H1a).* This effect may differ by geographic location in a state – *people in areas that are more geographically proximate to the university may be more likely to respond than those in more distant areas, and the text-based academic-oriented logo is likely to yield a higher response rate than an athletics-oriented image-based logo in geographically proximate areas to the university (H2a).* We do not expect differences based on demographic characteristics other than geography (H3a). However, *the athletics-oriented image-based logo may positively change how people perceive the state with athletics in mind, affecting affective responses about Nebraska overall (e.g., summer excitement over an upcoming athletic season), but that other domains are not likely to be affected (H4a).* To the extent that the text-based academic-oriented logo conveys legitimacy and trust in the institution, we expect that *item nonresponse rates will be lower when the logo is text-based (academic) compared to image-based (athletic) (H6a).*

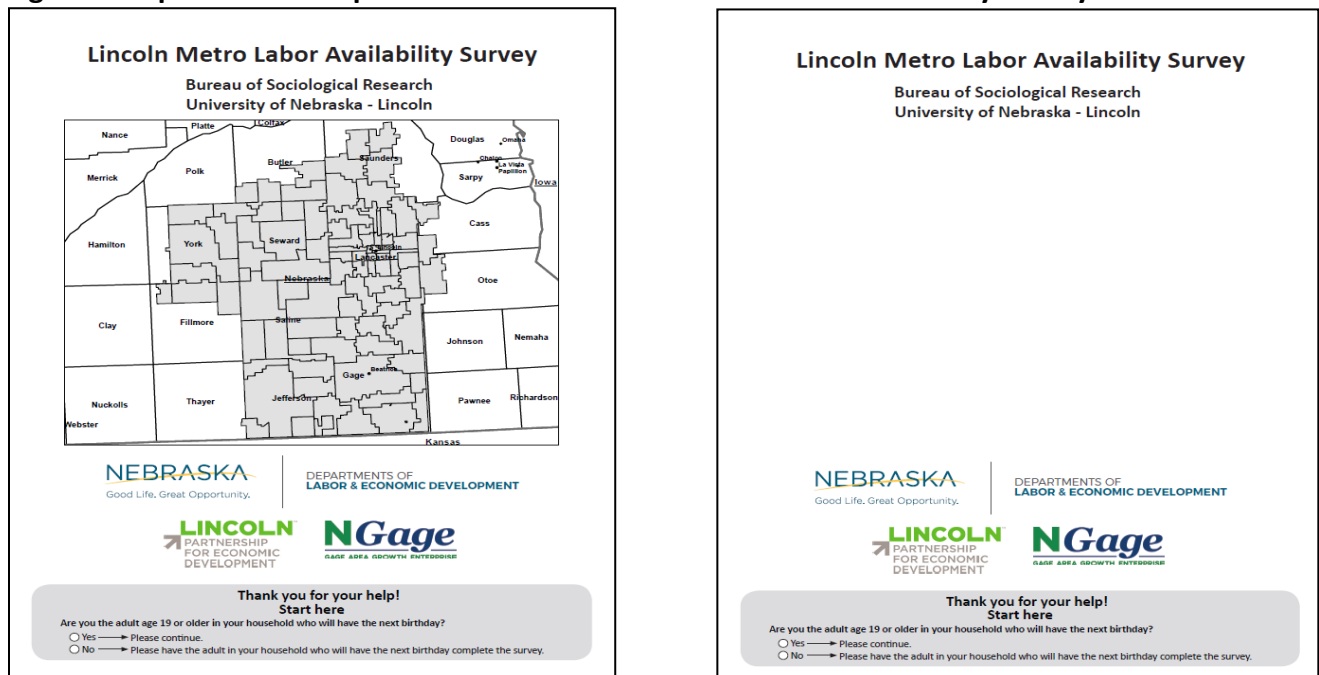
## Data and Methods

Two survey experiments are used to address these research questions.

*Cover page image.* The cover image experiment was embedded in the Lincoln Metro Labor Availability Survey (hereafter the “workforce study”), a mail survey sponsored by the State of Nebraska and conducted by the Bureau of Sociological Research (BOSR) at the University of Nebraska-Lincoln (UNL) between January and April 2018. The survey included questions about current employment, employment history, commuting, education, skills and training, salary, work schedule, and benefits. It was sent to a stratified random sample selected by Survey Sampling International (now Dynata) of 8,500 addresses from the US Postal Service’s Delivery Sequence File with a target population of adults 19 and older (Nebraska’s age of majority) living in the Lincoln, Nebraska metropolitan area.

Sample members were randomly assigned to either receive a questionnaire with a map on the cover or a questionnaire with no image on the cover (Figure 1). The map shows which areas are included in the Lincoln, Nebraska metro area. The goal of the map was to provide sample members with a visual representation of the area under study, including indicating why those who do not live in Lincoln proper are included in the sample. Thus, the key independent variable for this experiment is whether the respondent received the questionnaire with the map (=1, n=4250) or without the map (=0, n=4250).

**Figure 1. Experimental map conditions for Lincoln Metro Labor Availability Survey**



*Letterhead Logo.* The letterhead logo experiment was embedded in BOSR’s summer 2019 Nebraska Annual Social Indicators Survey (NASIS), an annual statewide omnibus mail survey. The 2019 NASIS contained 12 pages of questions about public opinion in Nebraska, public media, health care utilization, alcohol and drug use, climate change, immigration, and 4-

H programs. NASIS used an address-based sample of 4,800 Nebraska households and asked the adult aged 19 and older with the next birthday to complete in the survey.

In 2019, UNL started using a new letterhead template as part of a rebranding campaign. The original letterhead, long used by the university, had a text-based (i.e., academic) logo (Appendix Figure 1) in the visually prominent upper left of the page and BOSR's contact information in both the upper right and footer. The new letterhead centered an image-based logo (i.e., largely associated with athletics at the time) at the top of the page and moved the contact information and the text-based logo to the less visually prominent footer. The key independent variable for this experiment is whether the sampled household received the text-based logo letterhead (=0, n=2400) or the image-based logo letterhead (=1, n=2400), which was randomly assigned.

*Geographic Area.* The geographic areas for the two studies differ. The Lincoln Metropolitan area for the Workforce Study was stratified into three strata: urban (n=5500, 65%), suburban (the area immediately adjacent to Lincoln's center, n=1800, 21%), and rural (outside Lincoln but still within commuting distance, n=1200, 14%). Thus, the survey is expected to be most salient to those living in the urban area, while those living in the rural areas may not realize they are part of the target population.

The NASIS is a statewide survey. We define three regions of Nebraska to explore the salience of the letterhead: the Southeast region where the sponsor (UNL) is located (n=1179, 25%); the Midland area, constituting the greater Omaha area and containing two University of Nebraska campuses (n=2055, 43%); and the rest of the state (n=1566, 33%), which is geographically distant from the UNL campus, largely rural, and may be less supportive of UNL. Thus, we expect that the effect of the letterhead change will be largest in the Southeast and Midland areas and smaller in the rest of the state.

#### *Dependent Variables.*

*Response rates.* We calculate response rates using the American Association for Public Opinion Research's (AAPOR) Response Rate 2 in both studies (Table 1). Ineligible sampled households are excluded, yielding a total of 7940 eligible addresses in the Workforce Study (n=2540, RR2=32.0%) and a total of 4479 eligible addresses in the NASIS (n=1227; RR2=27.4%).

*Sample Composition.* For both studies, we examine respondent sample composition on five demographic variables (Table 2). Age is measured in five categories – a64, and 65 and older. Sex is measured as a binary male and female variable. Race/ethnicity is categorized as non-Hispanic White and People of Color. Education is measured as some college or less versus a bachelor's degree or higher. Marital status is measured as married, single, divorced, or widowed.

*Survey Responses.* We examine three questions from each study that may be particularly affected by the images presented. In the Workforce Survey, we examine three questions on commuting time – satisfaction with commuting time, importance of commuting time when choosing a job, and maximum one-way commuting time in minutes. Questions on commuting time were only asked of employed respondents; satisfaction with commuting time was only asked of employed respondents not working at home. In the NASIS, we examine three public

opinion questions about Nebraska asked of all respondents – satisfaction with living in Nebraska, whether Nebraska is on the right track or wrong track, and trust in local and statewide news.

*Item Nonresponse.* We examine item nonresponse as a data quality measure. In the Workforce Survey only (not asked in NASIS), we examine item nonresponse to the within-household selection confirmation question on the questionnaire cover. Item nonresponse was operationalized as a dichotomous variable indicating that a response was given (=0, 60.5%) versus not given (=1, 39.5%).

The second item nonresponse measure is the percent of questions asked of all respondents that the respondent failed to answer. In the Workforce Study, the item nonresponse rate excluded questions that were part of skip patterns or were check-all-that-apply. As a result, most of the questions examined are demographic questions. On average, 2.01 of 33 questions (SD=5.73) were not answered yielding an average item nonresponse rate of 6.1%. In the NASIS, we examined only questions that were part of the NASIS “core” items, thus also reflecting primarily demographic questions. On average, 2.48 of 44 questions (SD=5.33) were not answered yielding an average item nonresponse rate of 5.6%.

*Analysis.* We examine whether the outcomes of interest vary across the experimental conditions using multiply-imputed and design-adjusted F-tests in Stata 17.0 using the mi estimate and svy commands. Response rate analyses are unweighted. All analyses of survey outcomes are weighted by probability of selection weights. Item nonresponse rates were generally low (<6%). Multiple imputation is used for missing data on the demographic characteristics in the Workforce Study and on both demographic characteristics and survey estimates in NASIS. Imputation could not be carried out for the substantive questions in the Workforce study due to difficulties created by skip patterns. For the survey participation analyses, we test whether the effects of the experimental condition vary by locality using logistic regression models with an interaction term between experimental treatment and geographic area. Given small sample sizes, we do not explore differences in the effects of the experiments on demographic variables or item nonresponse across the geographic strata.

## **Results**

*Response rates.* There is no significant difference in response rate across the questionnaire cover page conditions or across the letterhead conditions (Table 1). Neither including a map on the cover page nor using the text-based logo motivate sample members to respond, leaving no support for H1/H1a. For the workforce study, respondents in the urban area were somewhat less likely to participate than those in the suburban or rural areas, although this did not meet traditional  $p < .05$  significance levels, although those in the Southeast were more likely to participate in NASIS19 than those in other regions. There were no differences in the effect of either experimental condition (Map\*Area:  $\chi^2=2.79$ ,  $p=0.25$ ; Letterhead\*Area:  $\chi^2=1.18$ ,  $p=0.55$ ) on response rates across geographic areas, with only partial support for H2/H2a.



Table 1. AAPOR Response Rate 2 Overall and by Experimental Condition and Stratum

Workforce Study	Cover Image Experiment (n=7940)			$\chi^2$	p-value
	Overall	No Map	Map		
Overall	32.0%	31.8%	32.2%	0.194	0.66
Geographic Area					
Urban	31.1%	30.3%	31.9%	1.45	0.23
Suburban	33.4%	33.5%	33.2%	0.01	0.90
Rural	34.1%	35.8%	32.3%	1.52	0.22
$\chi^2=5.42, p=0.07$					
NASIS19	Letterhead Experiment (n=4479)			$\chi^2$	p-value
	Overall	Text logo	Image logo		
Overall	27.4%	27.1%	27.7%	0.198	0.66
Geographic Area					
Southeast	30.1%	29.4%	30.7%	0.230	0.63
Midland	25.4%	25.9%	24.9%	0.284	0.59
Rest of state	28.0%	27.0%	29.1%	0.853	0.36
$\chi^2=8.08, p=0.02$					

*Sample Composition.* We have no expectations about whether the composition of the sample varies across these two sets of experimental conditions, and that is largely confirmed empirically (H3/H3a). There are no significant differences ( $p>0.05$ ) in age, sex, education, or marital status between those who received the map and those who did not or between those who received the text-based logo versus those who received the image-based logo (Table 2). We did see slight differences in racial composition across the letterhead conditions – the proportion of people of color is higher with the text-based letterhead (10.8%) versus the image-based letterhead (6.1%,  $p=0.006$ ), but there is no difference ( $p=0.09$ ) for the questionnaire cover experiment. We do not have good theoretical explanations for this pattern. Thus, the questionnaire cover page and the letterhead largely did not affect the composition of the sample.

Table 2. Demographic characteristics overall and by experimental condition, map versus no map and text-based logo versus image-based logo

Variable	Cover Image Experiment					Letterhead experiment				
	Overall (%)	No Map (%)	Map (%)	Design-adjusted F	p-value	Overall (%)	Text logo (%)	Image logo (%)	$\chi^2$	p-value
Age				1.22	0.30				0.44	0.78
19-34	14.2	15.4	13.0			11.4	11.3	11.6		
35-44	12.9	13.4	12.5			11.8	12.7	11.0		
45-54	14.4	14.7	14.1			14.7	15.5	14.0		
55-64	22.1	20.5	23.8			24.3	24.3	24.2		
65+	36.3	36.1	36.6			37.8	36.2	39.3		
Gender				0.24	0.63				0.67	0.41
Female	53.4	54.0	52.9			58.4	57.2	59.6		
Male	46.6	46.0	47.1			41.6	42.8	40.4		
Race										
Non-Hispanic White	93.8	94.8	92.8	2.96	0.09	91.6	89.2	93.9	7.52	0.006
People of color	6.2	5.2	7.2			8.4	10.8	6.1		
Education				0.07	0.80				0.33	0.57
Some college or less	50.9	50.6	51.2			51.7	50.9	52.6		
Bachelor's or higher	49.1	49.4	48.8			48.3	49.1	47.4		
Marital Status				0.24	0.87				1.32	0.26
Married	69.5	69.6	69.4			72.3	72.0	72.7		
Single	14.1	14.4	13.7			13.4	13.9	13.0		
Divorced	8.7	8.4	9.0			7.8	8.7	6.9		
Widowed	7.7	7.5	7.9			6.4	5.5	7.4		

Note: Estimates are multiply-imputed and design adjusted.

*Survey responses.* We examine responses to survey questions across each of the experimental groups (Appendix Table 1, H4/H4a). In the Workforce Study, there are no statistical differences across the questionnaire cover experimental conditions in responses to questions about commuting among employed respondents. Thus, the map did not affect responses to questions that appeared later in the survey. In the NASIS, there was a statistically significant increase in reported satisfaction with living in Nebraska with the image-based logo (4.38 out of 5) over the text-based logo (4.24 out of 5;  $F=637$ ,  $p=0.01$ ). However, the difference is small and does not change the conclusions about overall satisfaction with Nebraska. No other differences were observed.

*Item nonresponse.* We start by examining item nonresponse to the within-household selection question from the cover of the questionnaire in the Workforce Survey. Respondents who received the version of the questionnaire with the map on the cover have a lower item nonresponse rate on this question (36.0%) than those with no map (40.0%;  $F=3.64, p=0.06$ ), consistent with H5. Thus, the presence of an image of a map on the cover of the questionnaire reduced item nonresponse to the within-household selection question.

Consistent with H6, there is no significant difference in item nonresponse rates for the cover image experiment overall (Map: 4.5%, No map: 4.8%;  $F=0.26, p=0.61$ ). Inconsistent with H6a, there was no difference in item nonresponse rates across the two letterhead conditions overall (Text: 4.6%, Image: 4.7%;  $F=0.02, p=0.90$ ). Thus, the presence of a cover image and use of different letterhead did not deleteriously affect the completeness of the reported data in either of these studies. However, as expected, the cover page image improved the completeness of reports for the question on the cover page.

## **Conclusion**

Survey best practice recommendations encourage researchers to make survey requests appealing to potential respondents. In local area studies, images that connote information about the area are often used to attempt to influence participation decisions. We examined the effect of two such images here – a map on the cover of a mail questionnaire and an image-based university logo in an invitation letter – on response rates, sample composition, survey estimates, and item nonresponse (summary in Appendix Table 2). Overall, we saw no significant differences in response rates, most demographic characteristics, most survey estimates, or item nonresponse across the questionnaire when images were used versus text alone for either the questionnaire cover or the letterhead logo. We did see a decrease in item nonresponse to a within-household selection question on the cover page when the image was present, perhaps drawing visual attention to the question and differentiating it from the more general footer information on the cover, and a slight increase in satisfaction with life in Nebraska with the image logo compared to the text logo, perhaps cuing optimism about the upcoming athletic season.

The results are reassuring. Decisions about what images to place on the cover of a mail survey or branding information for an organization in letterhead (holding the sponsoring organization constant) largely did not affect survey participation, survey estimates, or reporting completeness in the studies examined here, and where there were differences, the image improved the quality of reporting. Overall, these findings are consistent with previous studies that found no differences in nonresponse-related survey outcomes when maps are included on questionnaire covers. Perhaps a map on the survey cover would be beneficial when the survey is administered over a larger area where there is not a straightforward connection between outlying areas and the survey's primary focus area. To our knowledge, this is the first test of text-based versus image-based logos in letterhead for an academic-sponsored study. University rebranding decisions did not affect the quality of data from this study, a desirable outcome.

Local area studies often contain other types of images on a survey's cover, such as photographs of memorable landmarks or scenic areas (e.g., Dillman et al. 2014, Figures 10.7/10.8). This study was limited in that it did not explore how other types of images may affect survey participation decisions, although others have found variation in the effectiveness

of other images across subpopulations and survey topics (see review in Stange et al. 2019). Future research could examine images other than maps for the cover page of paper questionnaires in local area studies.

This study was also constrained to two types of letterhead for one academic sponsor. It is possible that the university itself was salient in both brands, and thus variation in the branding did not change perceptions of trust or legitimacy of the university sponsor. Additionally, the image-based letterhead included the text-based logo at the bottom of the letter. Although the overall format of the letter changed substantially, the dual logo with the image at the top and the text at the bottom may have doubly reinforced the university's brand. Yet this shift in branding did not change survey participation decisions or most survey outcomes. We note that a test of letterhead and branding cannot typically be done when organizations constrain the use of image, branding, and logos to whatever is approved for public dissemination; the nexus of survey fielding dates and changes in branding facilitated this experiment. This experiment was limited to only one university. It is possible that text-based logos versus image-based logos would have a different effect at different universities or with other companies for which the image is the recognizable part of the brand.

Neither study notably changed sample composition when using an image, although there were slight but statistically significant shifts in race/ethnicity composition when different letterhead designs were used. We had no reason to anticipate this pattern. Both surveys were limited to being offered only in English, limiting representation of groups that speak other languages. Future research should explore the role of images such as maps and logos among groups that speak languages other than English.

The presence of a map on the cover lowered item nonresponse rates to a within-household selection question on the cover of the questionnaire. Both covers had logos from the sponsors of the study above this question. We speculate that the similarity in grey shading between the map and the background for the question created strong visual grouping between these elements, increasing the perceived importance of the question and therefore decreasing the item nonresponse rate. Future research could change how this question is displayed relative to the adjacent logos and cover image to further test this explanation.

Survey practitioners use images and logos to motivate survey participation, convey eligibility for a particular study, and encourage perceptions of trust and legitimacy among potential participants. The experiments here demonstrate that the use of maps and different logos in a university-sponsored survey do not generally affect survey quality. It is possible that web modes of data collection may see different patterns, especially to the extent that a mail questionnaire is not included in the survey packet at the initial request. Future research should explore the role of images in local geography web- and mixed-mode surveys.

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