

A Nonresponse Bias Analysis of the 2021 General Social Survey

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Abstract

The General Social Survey (GSS) is a nationally representative survey that examines US opinions and attitudes on government, religion, the economy, and other key topics. The GSS mode moved from in-person to telephone and online in 2021. Previous studies examined nonresponse bias (Davern, 2020; Kim, 2010; Smith, 1983). This study updates the literature by exploring hard and easy-to-reach respondents utilizing GSS paradata - the number of days between invitation and completing the survey. We first explore differences in socioeconomic and demographic characteristics (i.e., race, ethnicity, age, education, and income). Next, we examine differences on other GSS variables (e.g., political beliefs, mental health, satisfaction with own finances, religious beliefs, level of confidence with various institutions, etc.). Third, we examine these differences after adjusting for socioeconomic and demographic differences using logistic regression. Our study suggests that differences between easy and hard-to-reach respondents may exist. Our results also suggest that limited differences persist after controlling for known differences, but further research is needed.

Key Words: nonresponse bias analysis, response rate, hard-to-reach human populations

1. Background

Survey response rates in the United States have experienced declines over recent decades (Brick and William, 2013; Czajka and Beyler, 2016) as well as during the COVID-19 pandemic (Krieger, 2023). While response rates are considered “an important indicator of non-response bias” (OMB, 2006), evidence that response rate decreases increase non-response bias is mixed (Dillman et al., 2002; Groves, 2006; Groves and Peytcheva, 2008; Hendra and Hill, 2019). That said, Groves and Peytcheva (2008) found evidence of additional factors influencing nonresponse bias including survey sponsor and mode of data collection (self-administered reduced nonresponse bias compared with interviewer-administered surveys).

In response to the COVID-19 pandemic, some surveys changed survey mode to allow data collection to continue (Kreiger, 2023; Ward & Edwards, 2021) including the General Social Survey (GSS, Davern et al. 2022). Decreasing response rates and changes in survey mode leave one to guess at the potential nonresponse bias associated with surveys fielded during this unusual time. While some have started to explore this subject (Ward & Edwards, 2021), much is still unknown about the real and potential impacts to the GSS.

Prior to the pandemic, several nonresponse bias analyses have been conducted on the GSS over the years (Smith, 1983; Smith, 1984; Smith, 2006; Kim, 2010; Davern et al., 2020; Peytchev et al., 2018; Gummer, 2019) each examining a different point in time, survey questions and/or utilizing a different analytic approach. Some studies focused on the subsampling design adopted by GSS in 2004, comparing those obtained before and after the subsampling procedure. Smith (2006) found the 2004 GSS subsampled nonrespondents to differ demographically from the non-subsampled respondents with nonrespondents more likely to be under 65, well educated, employed full time, and align with the Democratic party. Davern et al. (2020) similarly utilized the subsampling design of GSS 2018 and found that “nonrespondents” after subsampling were more likely middle aged,

well educated, to live in a household with fewer adults, and to express general happiness in life. Peytchev et al. (2018) relied on a different approach, weighting GSS 2012 to known benchmarks using respondent's answers to political participation and voter orientation. Comparisons of unadjusted¹ and adjusted estimates were used to approximate potential bias. The analysis found correlation between survey response and voting eligibility, voter turnout, political candidate choice, and volunteering. Kim et al. (2010) found that a mode change² coincided with detectable changes including an increased likelihood for those having lower levels of experience with computer use to be non-responders.

GSS moved to primarily web data collection in response to the COVID-19 pandemic (Davern et al., 2022). Because of this mode change, it is time to re-examine potential nonresponse bias impacts. Moving data collection to the web typically lowers response rates relative to more conventional survey methods (Couper, 2007; Crawford et al., 2001; Kaplowitz et al., 2004) which may increase nonresponse bias (Groves, 2006). In addition, previous studies have discussed potential nonresponse bias impacts to the GSS after mode changes (Kim et al., 2010). We propose examining the 2021 cross-sectional GSS for potential nonresponse bias by answering the following questions: who are nonrespondents and what behaviors or opinions differ between respondents and nonrespondents?

2. Methods

2.1 Data Sources

The GSS is a series of nationally representative cross-sectional interviews conducted in the United States about every two years since 1972. The GSS sample is comprised of adults aged 18 and older living in the United States who live in noninstitutional housing at the time of interview. Historically, interviews have been primarily conducted face-to-face, supplemented by telephone. However, due to the global COVID-19 pandemic, the cross-section intended for 2020 needed significant methodological adaptations for the safety of respondents and interviewers (Davern et al., 2022). The GSS moved to an address-based sampling frame using a primarily mail push-to-web collection design, supplemented with telephone. With the switch to primarily self-administration, the GSS used a last birthday method (Salmon and Nichols, 1983) for within-household respondent selection, another change from previous cross-sections that used the Kish method (Kish, 1949) which is considered too complex for self-administered modes (Smyth, Olson, & Stange, 2019). The 2021 GSS cross-section, referred to as such given the majority of data collection was in 2021, field period was from December 1, 2020 to May 3, 2021. The 2021 cross-sectional GSS had a response rate of 17.4% (AAPOR RR3) with a final sample of 4,032 respondents. The response rate was less than previous GSS (Figure 1) including 59.5% in 2018, 60.2% in 2014, and 70% or greater from 1975 to 2012 (Morgan, 2020).

2.2 Measures

A dichotomized dependent variable was used for our nonresponse bias analysis. We first calculated the number of days between when the mail survey invitation was received and the date the survey was completed (Table 2). Next, respondents were characterized as easy-to-reach if they completed the survey on the day the invitation was received (day zero, $n = 2,216$, 64% of respondents). Alternatively, respondents were characterized as hard-to-reach if they completed the survey 30 or more days after the invitation was received ($n = 200$, 6% of respondents). All other respondents were excluded from the analysis.

Independent variables included socioeconomic and demographic characteristics including the respondent's age, sex, race, ethnicity, family income, marital status, and highest educational degree obtained. In addition, a wide range of opinion and behavioral questions were assessed. A full list of

¹ Unadjusted include weighting to “demographic population controls that account for selection probability and the geographic nonresponse adjustment.”

² Paper-based to computer-assisted self-interview of the self-administered GSS survey supplement.

survey questions used as independent variables is included in the appendix. Each independent variable was dichotomized.

2.3 Analysis

Within our analysis, we examine the amount of effort necessary to elicit a response. Nonresponse could be thought of as a continuum: with enough effort, nonrespondents maybe converted to respondents. Thus, if one were to assume hard-to-reach or late respondents could have been nonrespondents themselves if collection efforts were more limited, they maybe compared with those who completed the survey with less effort (Beimer and Link, 2008; Kypri et al., 2004; Lin and Schaeffer, 1995; O'Neil 1979; Smith 1984). Thus, we contrast easy-to-reach respondents from those who were hard-to-reach, using the differences between the two as a proxy for estimating the difference respondents and nonrespondents. If this assumption holds in our case, respondents who took 30+ days after initial invitation to complete are similar to nonrespondents, and differences between the hard-to-reach and easy-to-reach respondents are indicative of nonresponse bias (Lin & Schaeffer, 1995).

To help answer the question “who are nonrespondents,” a comparison of socioeconomic and demographic characteristics is performed between easy-to-reach and hard-to-reach respondents. Differences in distributions by socioeconomic and demographic characteristics of the respondents were examined. The goal of this analysis was to demonstrate differences between the respondents (easy-to-reach respondents) and nonrespondents (hard-to-reach respondents). T-tests were performed to evaluate the relationship between level-of-effort and characteristics of the respondents. Unweighted and weighted t-tests with a Bonferroni correction were performed accounting for the complex survey design.

To help examine if behaviors or opinions differ between respondents and nonrespondents, we examined survey questions unique to the GSS. Specifically, multivariate logistic regressions were used to examine the relationship between outcomes (behaviors or opinions) and hard-to-reach respondents both with and without adjusting for potential confounding of socioeconomic and demographic variables (sex, age, income, race, ethnicity, marital status, and education). Weights were used to account for the complex survey design.

3. Results

Table 3 presents results of a descriptive analysis. In general, an analysis between “respondents” and “nonrespondents” showed nonrespondents using our definitions were more likely to be female, working age (25 to 44 years of age), Hispanic, and non-White. In addition, nonrespondents were more likely to have an income less than \$75,000 or hold a high school degree, and less likely to hold a bachelor's degree or more.

Figures 3 through 6 presents Odds Ratios (OR), Adjusted Odds-Ratios (AOR), and 95% confidence intervals for hard-to-reach versus easy-to-reach respondents. Figure 3 presents results using survey questions previously examined by other studies such as happiness, religious beliefs and habits, newspaper reading habits, highest priorities for the US as well as marital and gender attitudes. All Figure 3 comparisons showed insufficient evidence of nonresponse bias.

Figure 4 includes additional topics previously presented in the literature: political beliefs and behaviors as well as satisfaction with financial situation. Our analysis indicated hard-to-reach respondents were less likely to say they were satisfied with their financial situation (OR = 0.57) and less likely to say they have voted in the 2016 election (OR = 0.61) although there is insufficient evidence of differences after adjusting for socioeconomic and demographic characteristics (financial situation AOR = 0.70, election AOR = 0.72).

Figures 5 and 6 examine survey questions not reviewed by other referenced nonresponse bias studies. Figure 5 examines respondent's attitudes and confidence in institutions. All Figure 5

comparisons showed insufficient evidence of nonresponse bias. Figure 6 examines personal beliefs where our analysis found hard-to-reach respondents were less likely to say they believe there is no conflict between the poor and rich (AOR = 0.52, OR = 0.46). Also, nonrespondents were more likely to believe there are strong conflicts between the working and middle classes (AOR = 5.12, OR = 3.77).

4. Conclusion and Discussion

The 2021 GSS was conducted in a context which could have substantially altered or increased the impacts of nonresponse bias in its results. The (biennial) survey in its 2021 administration was changed to a push-to-web survey design, and thus survey results were collected primarily via an online questionnaire (although supplemented by phone), rather than the face-to-face interviews by which the questionnaire was administered in previous survey cycles. This was simultaneously accompanied in the 2021 cycle by an uncharacteristic, marked decrease in response rate from 59.5% to 17.4%.

Our analysis provides insufficient evidence of a substantial increase in nonresponse bias to the 2021 GSS. Some previously reported nonresponse bias conclusions remained unchanged, for example, Smith (2006) found nonrespondents were more likely to be under age 65 and our study found nonrespondents were more likely to be age 25 to 44. Our analysis was also consistent with Peytchev et al's (2018) findings that nonrespondents were less likely to have reported voting although in our analysis this finding was relaxed after accounting for socioeconomic and demographic characteristics.

We also present some unique findings. For example, Smith (2006) and Davern et al. (2020) found nonrespondents were more likely well educated; whereas our analysis found nonrespondents were less likely to be college educated and more likely to hold a high school diploma. This difference may be related to findings that more highly educated persons are overrepresented in web surveys relative to interviewer-administered surveys (Olson et al., 2019). We further found nonrespondents were more likely to be female, Hispanic, non-White, and have a lower income. Income differences may have been a factor that played a role in other findings. For example, nonrespondents were less likely to say they were satisfied with their financial situation although there is insufficient evidence of differences after adjusting for socioeconomic and demographic characteristics. Nonrespondents were less likely to say they believe there is no conflict between the poor and rich and nonrespondents were more likely to believe there are strong conflicts between the working and middle classes.

Careful consideration of the limitations of this study are warranted. First, it is unclear whether conclusions drawn from this analysis may be relevant to future GSS studies if the response rate and/or mode change post-pandemic. Yet, we feel presentation of this analysis is important and timely to help researchers understand the potential impacts to the 2021 changes. Second, multiplicity corrected confidence intervals for odds ratios were not calculated. We would expect some results to be statistically significant by chance alone. Third, our analysis examines the differences between "nonrespondents" and "respondents." An alternative approach would be calculate estimates with and without "nonrespondents." Such an approach could be used to examine the potential impacts of nonrespondents to research findings. This study instead contrasts the two groups.

Fourth, this methodology relies on responses to the survey invitation. There are many reasons a person may have not complete the survey during the pandemic including perception of public health threat, access to technology to complete the survey online, and incorrect mailing address to name a few. This paper does not examine this known limitation. Fifth, nonresponse bias analyses take a multitude of forms, each with unique limitations. Examination with alternative nonresponse bias analysis methods using the same survey year and questions could result in different conclusions. This methodology assumes nonrespondents are like the hard-to-reach population. Yet, it is important to note that we do not have information on the 82.6% of nonrespondents. We also did not examine survey estimates over time to determine if there was a significant or uncharacteristically large change in responses to questions over time. Further work is needed.

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Table 1: Survey Questions Assessed Against Ease to Collect

Survey Question and Dichotomization

Generally speaking, do you usually think of yourself as a Republican, Democrat, Independent, or what? DEMOCRAT

Generally speaking, do you usually think of yourself as a Republican, Democrat, Independent, or what? REPUBLICAN

Generally speaking, do you usually think of yourself as a Republican, Democrat, Independent, or what? INDEPENDENT

In 2016, you remember that Hillary Clinton ran for President on the Democratic ticket against Donald Trump for the Republicans. Do you remember for sure whether or not you voted in that election? VOTED

Did you vote for Hillary Clinton or Donald Trump? CLINTON

Did you vote for Hillary Clinton or Donald Trump? TRUMP

Do you favor or oppose the death penalty for persons convicted of murder? FAVOR

We are interested in how people are getting along financially these days. So far as you and your family are concerned, would you say that you are pretty well satisfied with your present financial situation, more or less satisfied, or not satisfied at all? PRETTY WELL SATISFIED

Next, here are issues that some people tell us are important. Some people think that the government in Washington should do everything possible to improve the standard of living of all poor Americans, they are at Point 1 on the scale below. Other people think it is not the government's responsibility, and that each person should take care of himself, they are at Point 5. Where would you place yourself on this scale, or haven't you made up your mind on this? GOVERNMENT SHOULD HELP

Please tell us the one thing you think should be America's highest priority, the most important thing it should do. GIVE PEOPLE MORE SAY IN GOVERNMENT DECISIONS

Please tell us the one thing you think should be America's highest priority, the most important thing it should do. MAINTAIN ORDER IN THE NATION

There's been a lot of discussion about the way morals and attitudes about sex are changing in this country. If a man and a woman have sexual relations before marriage, do you think it is always wrong, almost always wrong, wrong only sometimes, or not wrong at all? ALWAYS WRONG, ALMOST ALWAYS WRONG, WRONG ONLY SOMETIMES

Taken all together, how would you say things are these days--would you say that you are very happy, pretty happy, or not too happy? VERY HAPPY, PRETTY HAPPY

Please read the following statements and indicate whether you strongly agree, agree, disagree, or strongly disagree with each statement. For example, here is the statement: A working mother can establish just as warm and secure a relationship with her children as a mother who does not work. DISAGREE, STRONGLY DISAGREE

To what extent do you consider yourself a religious person? Are you very religious, moderately religious, slightly religious, or not religious at all? VERY RELIGIOUS

Table 1: Survey Questions Assessed Against Ease to Collect

Survey Question and Dichotomization

To what extent do you consider yourself a religious person? Are you very religious, moderately religious, slightly religious, or not religious at all? NOT RELIGIOUS AT ALL

How often do you attend religious services? EVERY WEEK, SEVERAL TIMES A WEEK

How often do you attend religious services? NEVER

How often do you read the newspaper--every day, a few times a week, once a week, less than once a week, or never? EVERY DAY

(In all countries, there are differences or even conflicts between different social groups. In your opinion, in America how much conflict is there between . . .) Poor people and rich people?
NOT VERY STRONG CONFLICTS, NO CONFLICTS

(Do you agree or disagree?) Homosexual couples should have the right to marry one another.
STRONGLY AGREE

(In all countries, there are differences or even conflicts between different social groups. In your opinion, in America how much conflict is there between . . .) The working class and the middle class? VERY STRONG CONFLICTS

(In all countries, there are differences or even conflicts between different social groups. In your opinion, in America how much conflict is there between . . .) The working class and the middle class? THERE ARE NO CONFLICTS

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN THE SCIENTIFIC COMMUNITY

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN BANKS AND FINANCIAL INSTITUTIONS

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN CONGRESS

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN EDUCATION

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN EXECUTIVE BRANCH OF THE FEDERAL GOVERNMENT

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some

Table 1: Survey Questions Assessed Against Ease to Collect

Survey Question and Dichotomization

confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN MAJOR COMPANIES

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN MEDICINE

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN MILITARY

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN ORGANIZED LABOR

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN ORGANIZED RELIGION

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN PHARMACEUTICAL COMPANIES

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN PRESS

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN TV

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN U.S. SUPREME COURT

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? A GREAT DEAL OF CONFIDENCE IN THE FEDERAL GOVERNMENT ENSURING THE SAFETY OF VACCINES TO PROTECT THE PUBLIC AGAINST SERIOUS DISEASES

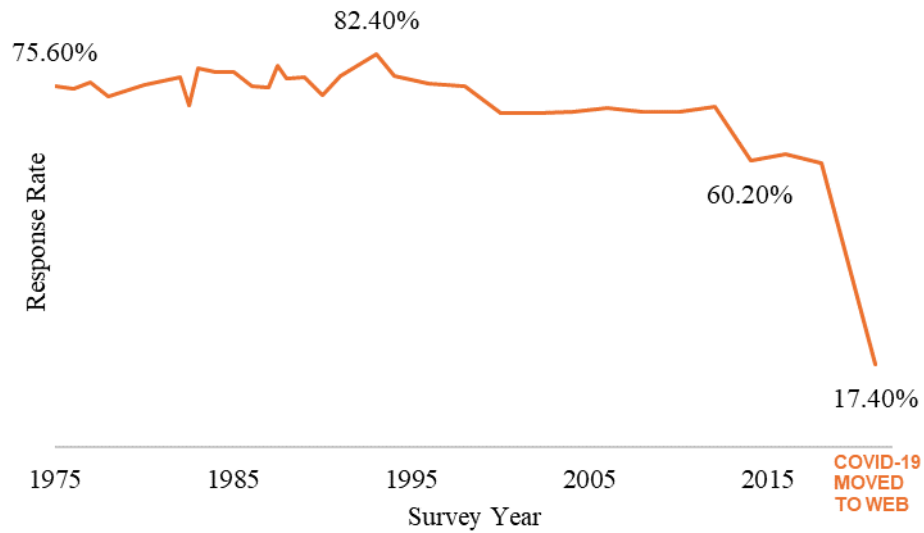


Figure 1: General Social Survey Response Rates 1975 to 2021*.
 *GSS 2021 includes cross-sectional respondents only.

Table 2: Survey completion, count, percent respondents, and analytical assignment by groups of days

Days to complete	Percent	Count	Dependent Variable Assignment
0	64%	2,216	Easy-to-Reach
1 to 7	24	821	N/A (excluded)
8 to 19	4	154	N/A (excluded)
20+	8	291	N/A (excluded)
30+	6	200	Hard-to-Reach

Source: General Social Survey, 2021 cross-sectional respondents only

Table 3: Respondent socioeconomic and demographic characteristics by ease to reach, percent*

Characteristics	Description	Easy-to-Reach “Respondents”	Hard-to-Reach “Nonrespondents”
Sample	Unweighted	64%	6%
	Weighted	63	6
Gender	Male [†]	46	35
	Female [†]	54	65
Age	18 – 24	5	5
	25 - 44 [†]	34	38
	45 to 54	14	16
	55 to 64	19	19
	65+	28	22
Race	White [†]	83	75
	Black	11	14
	Asian	4	5
	American Indian/ Alaskan Native	3	2
Ethnicity	Hispanic [†]	9	15
Income	\$75,000+ [†]	45	36
Degree	<High School	5	4
	High School [†]	38	48
	Associates	9	10
	Bachelors+ [†]	48	38
Home Ownership	Renters	30	33
	Owners	70	67
Marital Status	Married	50	51
	Divorced	18	15
	Never Married	22	25

Source: General Social Survey, 2021, cross-sectional respondents only

*Hard-to-reach respondents completed the survey 30 days or more after initially emailed. easy-to-reach respondents completed the survey on the same day the invitation was emailed.

[†]Hard-to-reach is significantly different from easy-to-reach using a t-test, accounting for the complex survey design, $p \leq 0.05$.

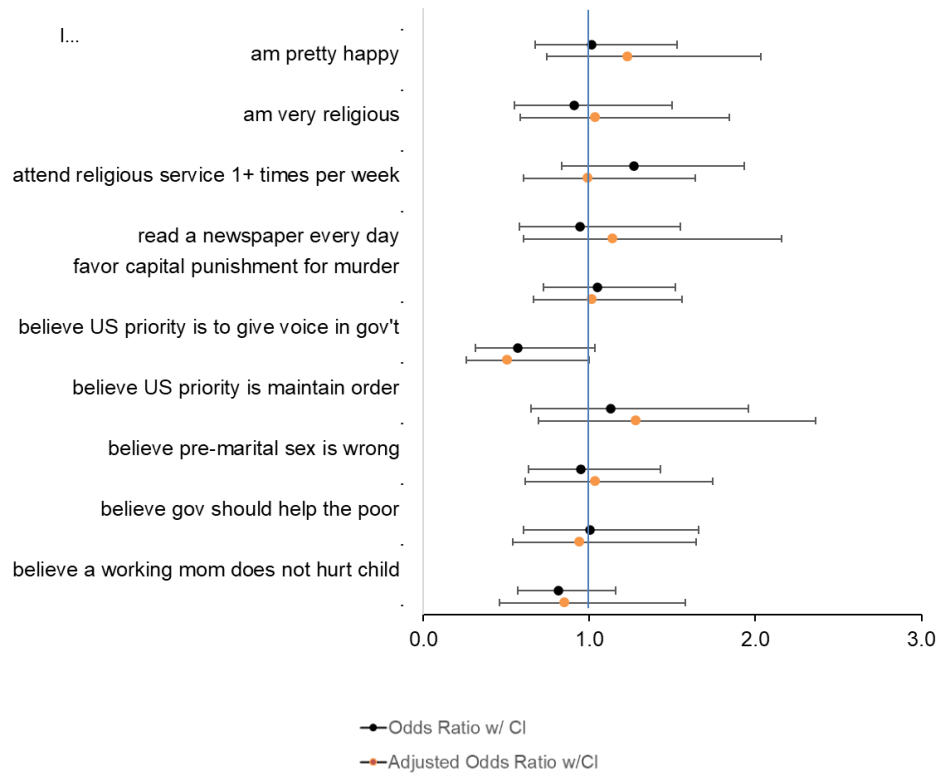


Figure 3: Odds Ratios and Adjusted Odds Ratios hard-to-reach vs. easy-to-reach respondents
 Source: General Social Survey 2021, cross-sectional respondents only.

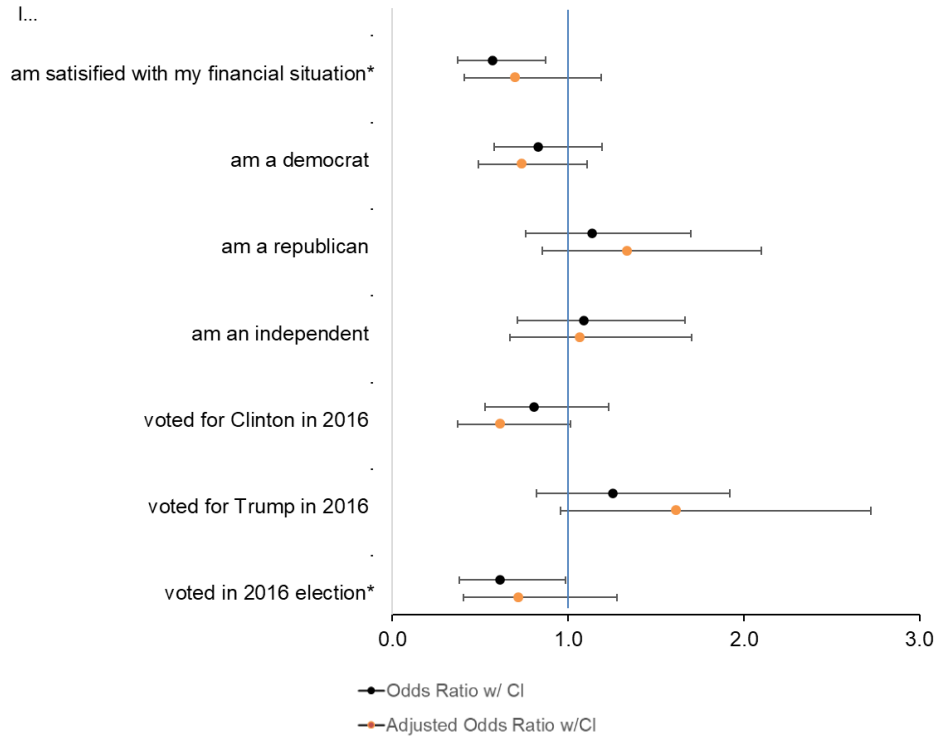


Figure 4: Odds Ratios and Adjusted Odds Ratios hard-to-reach vs. easy-to-reach respondents
 Source: General Social Survey 2021, cross-sectional respondents only.

* hard-to-reach (30+ days) is significantly different from the easy-to-reach (0 days) using a logistic regression, accounting for the complex survey design, $p \leq 0.05$.

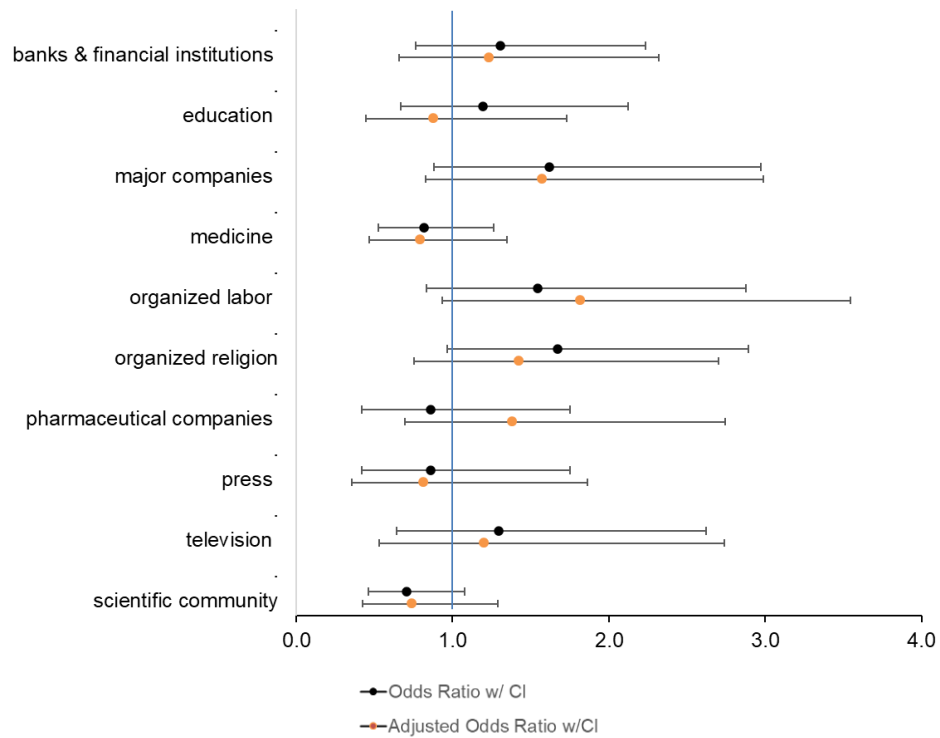


Figure 5: Odds Ratios and Adjusted Odds Ratios hard-to-reach vs. easy-to-reach respondents
 Source: General Social Survey 2021, cross-sectional respondents only.

* hard-to-reach (30+ days) is significantly different from the easy-to-reach (0 days) using a logistic regression, accounting for the complex survey design, $p \leq 0.05$.

† hard-to-reach (30+ days) is significantly different from the easy-to-reach (0 days) using a logistic regression, accounting for the complex survey design and adjusting by age, income, race, ethnicity, $p \leq 0.05$.

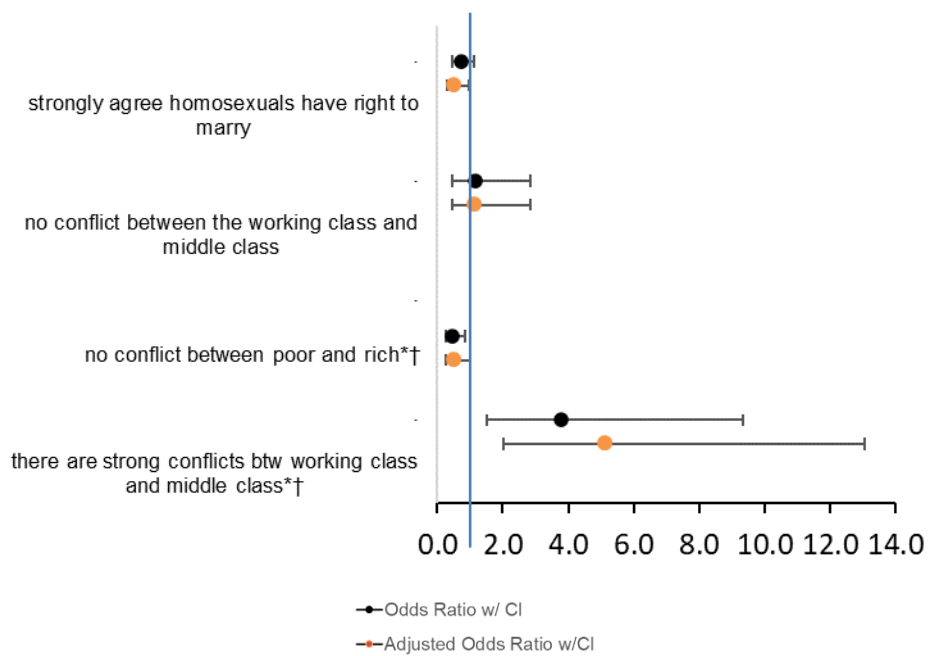


Figure 6: Odds Ratios and Adjusted Odds Ratios hard-to-reach vs. easy-to-reach respondents
Source: General Social Survey 2021, cross-sectional respondents only.

* hard-to-reach (30+ days) is significantly different from the easy-to-reach (0 days) using a logistic regression, accounting for the complex survey design, $p \leq 0.05$.

† hard-to-reach (30+ days) is significantly different from the easy-to-reach (0 days) using a logistic regression, accounting for the complex survey design and adjusting by age, income, race, ethnicity, $p \leq 0.05$.