


Response Variations to Survey Items About Firearms in the 2004 and 2017 Behavioral Risk Factor Surveillance System

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Abstract

Purpose: The aim of this investigation was to document the prevalence and correlates of refusing to answer a US federal health survey item about firearms in the household.

Design: The cross-sectional analysis was conducted with 2004 and 2017 Behavioral Risk Factor Surveillance System (BRFSS) survey data from Texas, Oregon, Idaho, California, Kansas, and Utah states whose surveys included items about firearms in the household.

Participants: Probability-based samples of adults over the age of 18 ($n = 34\,488$ in 2017 BRFSS; $n = 33\,136$ in 2004 BRFSS).

Measures: Dichotomized measure of whether respondents answered versus refused to answer “Are any firearms now kept in or around your home?”

Analysis: Weighted multiple logistic regression was used to assess how sociodemographic and health-related characteristics were associated with item refusal.

Results: Approximately 1.8% (95% CI: 1.6-2.1) of respondents in 2004 and 3.9% (95% CI: 3.4-4.5) of respondents in 2017 sample refused the firearms item ($P < .01$). Men were more likely than women (2004: adjusted odds ratio [aOR] = 1.81, 95% CI: 1.24-2.62; 2017: aOR = 1.60, 95% CI = 1.17-2.18) and Latino/a respondents were less likely than white respondents (2004: aOR = 0.24, 95% CI: 0.10-0.60; 2017: aOR = 0.21, 95% CI: 0.13-0.34) to refuse the firearms question. In 2004, refusal was more likely among older than younger respondents, but in 2017, age was not associated with refusal.

Conclusions: Refusal to firearm-related survey items along sociodemographic characteristics warrants further research. Community-informed strategies (eg, focus groups, cognitive testing, in-depth interviews) could improve the context and wording of firearm-related items to maximize response to these items in public health surveys.

Keywords

firearms, public health surveillance, health surveys

Purpose

The United States has more firearm-related deaths than any other high-income country in the world,¹ prompting some nations to issue travel advisories about firearm violence to their citizens visiting the United States.² Despite firearms causing over 37 000 deaths in the United States in 2016,¹ information about firearms is conspicuously absent in federal health surveys. For instance, the Behavioral Risk Factor Surveillance System (BRFSS) is the largest US health survey, but the last time a firearm-related question was included in the survey was 2004.³

The American College of Physicians deems firearm violence a major public health crisis,⁴ yet estimation of firearm access in the United States remains elusive. Relying on official records about formal background checks for firearm purchases

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underestimates the prevalence of firearms because not all exchanges or procurements require background checks or illegally circumvent background checks.⁵⁻⁸ Studies that rely on innovative methods of specifically estimating illegally procured firearms, such as law enforcement reports of recovered stolen firearms or firearms seized by law enforcement,^{9,10} contribute additional, but limited, estimates of the breadth of firearms. Self-report survey data that include items about firearms ownership or access are important because they produce representative estimates for comparison against other sources (eg, background checks) to triangulate better estimates of firearms access in the general population.¹¹ Unfortunately, the survey opportunities that include firearms data collected from national probability-based samples in the United States are scant, and to our knowledge, over the last 20 years, there have only been 4: General Social Survey, BRFSS, and the 2004 and 2015 National Firearms Surveys.^{3,12-14}

Although the lack of data about firearms in the household stunts health-related research, additional deficits result from the inability to understand the performance of firearm-related items on surveys, most notably around refusals to answer. In 2005, the consensus group for a National Research Council report included concerns around response to firearms items in surveys but that they were “not aware of any research assessing the magnitude or impact of response errors in surveys of firearms ownership and use.”¹⁵ A recent analysis of General Social Survey data found that refusal to answer a firearm-ownership question has significantly increased from 1973 through 2016, being particularly concentrated among respondents who were older and self-identified as politically conservative.¹⁶ This is concerning because these demographic characteristics are among those most associated with firearm ownership,¹² thus suggesting that refusals to firearms questions may not be missing at random. However, the study of firearms lacks research that specifically explores the issue of refusal. Although the General Social Survey is an important source of data,¹⁴ it is not a survey conducted under the auspices of the federal government, a distinction that could impact response to firearms questions (eg, antigovernment bias or privacy concerns).¹⁷ It is critically important to understand the unique performance of survey measures within the practice of federal health surveillance.

Accurate estimation of and patterns of exposure to firearms is necessary for planning public health efforts to prevent or reduce morbidity and mortality due to firearms. Because survey data are a major component of data sources used to said estimation,¹¹ better understanding patterns of item refusal can facilitate improving survey items and design. After 13 years of no firearm-related survey items, the BRFSS reintroduced firearm-related survey items as an optional module in its 2017 survey administration. Using data from both the 2004 and the 2017 BRFSS, the purposes of this report are to document the prevalence of refusals to a firearm survey item in the context of a federal health survey, examine the demographic characteristics of individuals who refuse to answer, and compare if

and how these demographic characteristics of refusal may have change between 2004 and 2017.

Methods

Data are from the BRFSS, which is managed by the Centers for Disease Control and Prevention (CDC). All states and territories administer the computer-assisted telephone interviews to probability-based samples of noninstitutionalized adults older than 18. In 2004, the survey was administered via household landline telephones, but in 2017, the CDC had since developed a new hybrid administration that included both landline telephones and cellular phones. The CDC contracts with Marketing Systems Group whose proprietary GENESYS program creates samples of landline and cellular phone numbers. For landline-based surveys, an adult in the household was selected randomly by interviewers to complete the survey, and for cellular-based surveys, persons who answered who were adults were interviewed. Detailed information about the BRFSS methodology is available from the CDC.¹⁸

In 2017, states could elect to implement an optional 3-item Firearm Safety Module. Texas, Oregon, and Idaho included the Firearm Safety Module in their core surveys administered to their entire samples, and California, Kansas, and Utah included the Firearm Safety Module in split samples. In 2004, the firearm module was incorporated into the core survey, so every state administered it. However, to accurately gauge prevalence between 2017 and 2004, we limited the analytic sample in 2004 to the same 6 states that included the module in 2017. The median response rate for these states in 2004 was 52.2% (range 39.0%-66.1%) and in 2017 was 46.9% (range 31.4%-56.4%).^{18,19}

The Firearm Safety Module begins with this script to respondents:

The next questions are about safety and firearms. Some people keep guns for recreational purposes such as hunting or sport shooting. People also keep guns in the home for protection. Please include firearms such as pistols, revolvers, shotguns, and rifles; but not BB guns or guns that cannot fire. Include those kept in a garage, outdoor storage area, or motor vehicle.

The first item asked, “Are any firearms now kept in or around your home?” Persons who answered “no” or “don’t know/not sure” to the first item or refused to answer the first item were skipped out of the module. Because this analysis focused on response to firearms in the household, we used data from this first item only. Response options were recoded into “answered” (ie, responded with yes, no, don’t know/unsure) or “refused to answer.”

We selected demographic correlates based on previous research about refusal to answer firearm items in the General Social Survey.¹⁶ Demographic information included age-group (18-29, 30-44, 45-64, and ≥ 65), sex, educational attainment (college graduate or higher, some college, high school diploma, and less than a high school diploma), race/ethnicity (white,

Table 1. Sociodemographic Characteristics of Individuals Who Received the Firearm Survey Item, BRFSS 2004 and 2017.^a

	2004			<i>P</i>	2017			<i>P</i>
	Overall n = 33 136	Answered n = 32 310	Refused n = 826		Overall n = 34 488	Answered n = 32 564	Refused n = 1924	
Sex	%	%	%		%	%	%	
Female	50.8	51.0	38.3	.001	51.1	51.6	37.4	<.001
Male	49.2	49.0	61.7		48.9	48.4	62.6	
Age-group								
18-29	23.7	24.0	10.6	<.001	21.0	21.3	12.3	<.001
30-44	30.8	30.9	24.1		25.9	26.0	23.7	
45-64	30.5	30.4	40.2		33.1	33.0	34.3	
≥65	14.9	14.7	25.1		20.0	19.7	29.7	
Educational attainment								
≥College degree	31.6	31.6	34.0	<.001	27.1	27.1	27.2	<.001
Some college	27.8	27.8	31.4		33.5	32.9	48.1	
High school diploma	24.9	24.8	30.1		23.9	24.1	20.6	
<High school diploma	15.6	15.8	4.5		15.5	15.9	4.1	
Race and ethnicity								
White	58.0	57.6	76.7	<.001	51.1	50.0	77.8	<.001
Black/African American	5.2	5.2	6.5		6.0	6.1	4.3	
Other racial identity	7.6	7.6	8.1		11.8	11.9	10.1	
Latino/a	29.2	29.6	8.7		31.1	32.0	7.7	
Veteran status								
No	87.9	88.1	78.6	<.001	90.5	90.8	81.4	<.001
Yes	12.1	11.9	21.4		9.5	9.2	18.6	
Marital status								
Married/partnered	63.6	63.4	74.2	.023	57.2	56.9	65.6	.023
Separated/divorced	12.1	12.1	10.9		13.2	13.3	9.3	
Widowed	5.8	5.8	5.7		6.2	6.1	7.7	
Never married	18.5	18.7	9.1		23.4	23.7	17.3	
Health indicators								
Binge drinking	14.5	14.5	15.4	.780	17.3	17.4	13.4	.119
Frequent mental distress (FMD14)	10.4	10.4	10.4	.997	11.4	11.7	5.1	<.001

Abbreviation: BRFSS, Behavioral Risk Factor Surveillance System surveys.

^aPercentages are weighted.

black/African American, other racial identity, and Hispanic/Latino/a), ever having served in the US military (yes/no), and marital status (married/partnered, separated/divorced, widowed, or never married). Because mental distress and alcohol use²⁰ are often associated with misuse of firearms, we included measures of frequent mental distress (having 14 or more days of poor mental health in the last 30 days) and binge drinking.

The CDC indicates complete or partial interviews (ie, terminated the interview before the end). We limited the analytic sample to individuals who had completed interviews because (1) it is not possible to ascertain where in the survey a person terminated the interview and (2) the study focused on response to a survey item, so individuals had to have received the item. We used design-corrected Pearson χ^2 tests to assess demographic differences among individuals who answered or refused the firearm item. We used bivariate logistic regression to examine unadjusted associations between individual demographic variables and the dependent variable. We then constructed multiple logistic regression models to assess the odds of answering or refusing the firearm survey item as a

function of sociodemographic information, health-related factors, and state (California as reference). All variables were entered into regression models simultaneously. Analyses were conducted in Stata/SE version 15, using Taylor-linearized variance estimation and were weighted according to survey version to account for the complex sampling design. The institutional review board of the VA Pittsburgh Healthcare System approved this study.

Results

There were 34 488 individuals in the 2017 BRFSS survey (after 10 observations were omitted due to missing data on the firearms question) and 33 136 individuals in the 2004 BRFSS. In 2004, approximately 1.8% (95% CI: 1.6-2.1) of respondents in 2004 refused to answer the firearms item, and in 2017, 3.9% (95% CI: 3.4-4.5) refused to answer the firearms item.

Across both survey years, there were similar patterns of demographic differences between prevalence of respondents who answered versus refused the firearm item. Among respondents who had greater prevalence than other respondents to

Table 2. Unadjusted and Adjusted Odds of Refusing to Answer Presence of Firearms in the Household in the 2004 and 2017 Behavioral Risk Factor Surveillance System surveys.^a

	2004				2017			
	Odds of refusing to answer firearm item				Odds of refusing to answer firearm item			
	n = 32 031				n = 32 620			
	Unadjusted ^b		Adjusted ^c		Unadjusted		Adjusted	
	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI
Sex								
Female	Ref		Ref		Ref		Ref	
Male	1.67^d	(1.25-2.24)	1.81^d	(1.24-2.62)	1.78^d	(1.37-2.31)	1.60^d	(1.17-2.18)
Age-group								
18-29	Ref		Ref		Ref		Ref	
30-44	1.76	(0.95-3.25)	1.29	(0.72-2.28)	1.58	(0.89-2.79)	1.26	(0.69-2.30)
45-64	3.00^d	(1.67-5.38)	2.23^{dd}	(1.25-3.96)	1.80^d	(1.05-3.06)	1.29	(0.73-2.31)
≥65	3.86^d	(2.15-6.95)	3.31	(1.87-5.89)	2.61^d	(1.52-4.48)	1.66	(0.89-3.08)
Educational attainment								
≥College degree	Ref		Ref		Ref		Ref	
Some college	1.05	(0.75-1.47)	1.24	(0.84-1.82)	1.46^d	(1.10-1.94)	1.93^d	(1.42-2.63)
High school diploma	1.13	(0.77-1.66)	1.50^d	(1.01-2.25)	0.85	(0.60-1.21)	1.25	(0.86-1.80)
<High school diploma	0.27^d	(0.14-0.50)	0.65	(0.30-1.43)	0.25^d	(0.16-0.41)	0.60	(0.34-1.06)
Race and ethnicity ^d								
White	Ref		Ref		Ref		Ref	
Black/African American	0.94	(0.41-2.19)	1.16	(0.51-2.64)	0.46^d	(0.22-0.97)	0.48	(0.22-1.06)
Other racial identity	0.80	(0.38-1.68)	0.99	(0.45-2.17)	0.55	(0.30-1.00)	0.73	(0.38-1.38)
Latino/a	0.22^d	(0.11-0.43)	0.24^d	(0.10-0.60)	0.15^d	(0.10-0.24)	0.21^d	(0.13-0.34)
Veteran status	2.02^d	(1.47-2.78)	0.82	(0.57-1.20)	2.27^d	(1.66-3.10)	1.20	(0.80-1.78)
Marital status								
Married/partnered	Ref		Ref		Ref		Ref	
Separated/divorced	0.77	(0.51-1.15)	0.72	(0.47-1.09)	0.61^d	(0.41-0.91)	0.64^d	(0.42-0.96)
Widowed	0.84	(0.38-1.89)	0.61	(0.24-1.55)	1.09	(0.69-1.72)	0.91	(0.54-1.56)
Never married	0.42^d	(0.23-0.76)	0.49^d	(0.25-0.96)	0.63^d	(0.41-0.98)	0.82	(0.50-1.35)
Health indicators								
Binge drinking	1.07	(0.66-1.74)	1.33	(0.78-2.27)	0.74	(0.51-1.08)	0.82	(0.55-1.23)
Frequent mental distress	1.00	(0.56-1.80)	1.15	(0.63-2.10)	0.41^d	(0.27-0.62)	0.47^d	(0.30-0.75)

Abbreviation: aOR, adjusted odds ratio.

^aAll models adjusted for state (California as reference); all analyses are weighted. Frequent mental distress defined as reporting >14 days of poor mental health in the last 30 days.

^bUnadjusted models include only individual variables in a separate bivariate logistic regression models.

^cAdjusted models include all variables in the logistic regression model simultaneously.

^dStatistical significance denoted at $p < .05$.

refuse the item, men had greater prevalence than women, older respondents had greater prevalence than younger respondents, and white respondents had greater prevalence than racial/ethnic minority respondents (Table 1). Unadjusted analyses revealed fairly consistent associations of demographic factors across both survey years. For example, in both 2004 and 2017, sex, age, and veteran status were positively associated with refusal to answer the firearm item (Table 2).

However, in multivariable models, patterns of demographic and health-related characteristics associated with refusing the firearm item varied between 2004 and 2017. For example, in 2004, older respondents had 2 to 3 times higher odds of refusing the firearm item compared to younger respondents, adjusting for other sociodemographic characteristics (Table 2), but this association was not observed in 2017. In 2017, individuals with some college education had nearly twice the odds of

refusing the firearm item (adjusted odds ratio [aOR] = 1.93, 95% CI: 1.42-2.63) compared to people with a college degree, but this association was not observed in 2004.

Two patterns consistent in both survey years were that men had over 1.5 times higher odds than women to refuse the firearm item, and Latino/a respondents had nearly 80% lower odds of refusing the firearm item compared to white respondents. The findings for marital status were somewhat consistent in that widowhood was not significantly associated with refusal, but measures of being unmarried differed between the 2 years. In 2004, individuals who were never married had lower odds of refusing the firearm item compared to married respondents, but in 2017 individuals who were separated or divorced had lower odds of refusing the firearm item compared to married respondents.

The 2 health indicators (ie, binge drinking and frequent mental distress) were largely not associated with refusal.

Although in 2017, after adjusting for other characteristics, persons with mental distress had 53% lower odds of refusing the firearm question than persons without mental distress.

Discussion

Using 2 unique instances from the largest health surveys in the United States, we found several patterns—some consistent and some variant—of sociodemographic correlates associated with refusal to answer a question about firearms in the home. It is important to emphasize that the majority of respondents—over 95% in both 2004 and 2017—answered the firearm question. Although a seemingly minor point, the history of politics behind firearms research^{21,22} warrants a simple, empirical statement: Most respondents, when presented a survey question about firearms in a health survey, will answer the question.

Although refusals were minimal, our results suggest that they were not random; several demographic associations emerged. For example, Latino/a respondents across both survey years were significantly less likely to refuse the firearm question compared to white respondents. We are unaware of firearm response analyses that include race/ethnicity results that are directly comparable to the present study. Urbatsch analyzed nonresponse to firearms items in the GSS and did not find racial differences; however, he did not report specifically about Latino/a ethnicity. Urbatsch did find that persons born outside the United States were significantly more likely to give a response to the firearm question in the GSS than persons born in the United States.¹⁶ Unfortunately, the BRFSS does not include a question about place of birth, and of course, being born outside of the United States and reporting Latino/a ethnicity are not synonymous. Further research is necessary to understand Latino/a respondents' greater willingness to answer these items in the BRFSS compared to white respondents. For instance, firearm owners may have distrust about disclosing information about their firearms,^{14,23} and if Latino/a individuals are less likely to own firearms than white respondents,²⁴ they may have fewer reservations answering a question about firearms than white respondents.

Moreover, the reciprocal of lower odds for Latino/a respondents to refuse to answer the firearm item than white respondents is that white respondents have much greater odds of refusing to answer than Latino/a respondents. For example, in 2017, when Latino/a respondents are the reference group, white respondents have nearly 5 times higher odds of refusing the firearm item (aOR = 4.82, 95% CI: 2.95-7.88; data not shown), which is concerning if white respondents are much more likely to have firearms compared to racial/ethnic minority individuals.^{12,24} Thus, although there may be lessons to learn about why Latino/a respondents seem more willing to answer firearms items, more pertinent questions may be around discovering why white respondents seem less willing to answer this item.

Male respondents were much more likely than women to refuse to answer the firearm item, which is concerning because men are much more likely to own firearms than women.²⁵

Thus, men's greater likelihood of refusal may reduce the accuracy of estimating firearms in the household from BRFSS data. Tailored studies—such as in-depth qualitative inquiry specifically with men—could help to understand refusal motivations and explore strategies to facilitate item completion.

Item wording notwithstanding *routine* assessment is the other necessity to accurately monitor public health risks. Without consecutive years of data, there is no way to examine trends over time or factors that may reduce firearm injuries and death among at-risk populations (eg, firearm safety legislation²⁶). For example, 60% of all firearm deaths in 2017 were suicides,²⁷ highlighting the need for population-level firearms data to guide prevention for vulnerable populations. However, in a seeming perversion of reality, the paucity of firearms data has forced researchers to rely on suicides by firearm as a method to estimate firearm ownership.²⁸ Consequently, recurrent self-

So What?

What is already known on this topic?

Analyses of a nonfederal non-health-related survey suggests sociodemographic difference in refusing to answer firearm items.

What does this article add?

Using data from a federal health surveillance survey, we noted differential refusal along sociodemographic characteristics.

What are the implications for health promotion practice or research?

The evolution of firearms items in health surveys—the formative item development and testing—would be a helpful history for health promotion discourse. Further research about potential causes of item refusal and community-informed solutions to improve item response are needed. For example, the BRFSS utilizes language specific to firearms in the household. With the steady proliferation of firearms in the United States, coupled with quick access (eg, borrowing from a friend, gun shows, and illicit means), perhaps survey questions about firearms should be around general access and not solely on household-based access to maximize health promotion research.

Specific to the states in the present analysis, there is a wide range of firearm safety laws and differing public opinions about firearms.^{30,31} More intensive research efforts in these states could explore if and how state-specific contexts related to firearms might be associated with willingness to respond to firearm items in state health surveys.

report firearms data may facilitate timelier research to inform universal strategies to reduce firearm injury.

We note several limitations. Because we restricted analyses to only states that asked the firearm question in both 2004 and 2017, the results may not generalize to other states or the nation. Analyses of firearm survey item refusal in the GSS found several other salient characteristics associated with refusal, such as political party affiliation.¹⁶ The BRFSS does not include the same breadth of personal characteristics as the GSS, and thus omitted variable bias may reduce the accuracy of estimates and their comparability across extant studies. Relatedly, the 13-year gap between inclusion of the firearm items in the BRFSS increases the potential for historical factors to impact estimates in ways that could not be accounted for in the present analyses (eg, increase in mass shootings in the United States²⁹).

Authors' Note

The views expressed are those of the authors and do not necessarily reflect the position or policy of the institutions, the Centers for Disease Control and Prevention, U.S. Department of Veterans Affairs or the United States Government.

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