

Formal firearm training among adults in the USA: results of a national survey

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ABSTRACT

Despite broad support for policies requiring that prospective firearm owners receive training before acquiring a firearm, little is known about the scope and content of firearm training in the USA. Nationally representative surveys conducted in 1994 estimated that 56%-58% of the US firearm owners had received formal firearm training. We conducted a nationally representative survey in 2015 (n=3932; completion proportion=55%) to update those estimates and characterise training contents. 61% of firearm owners and 14% of non-owners living with a firearm owner reported having received formal firearm training. The most commonly reported combination of training topics was safe handling, safe storage and preventing accidents. 15% of firearm owners reported that their training included information about suicide prevention. The proportion of the US firearm owners with formal firearm training has not meaningfully changed since two decades ago. Training programme contents vary widely. Efforts to standardise and evaluate the effectiveness of firearm training are warranted.

INTRODUCTION

Most US citizens favour policies that would require prospective firearm owners to receive formal firearm training before becoming qualified for ownership,¹ a position supported by medical and public health experts to promote firearm safety and practiced in several other high-income countries.²⁻⁴ Despite this broad support, little is known about the content of formal firearm training programmes, or even about the proportion of the US adults who have ever received formal (including military) firearm training. Indeed, in the peer-reviewed literature, the most recent estimates of the proportion of adult firearm owners with formal firearm training in the USA come from surveys conducted in 1994.^{5,6} In those surveys, 56%-58% of firearm owners reported having received formal firearm training. The current study uses data from a 2015 nationally representative survey of the US adults to update those estimates, characterise adults who reported having received firearm training, identify factors associated with the receipt of training and describe whether specific safety-related topics (eg, preventing firearm accidents, theft or suicide) were covered in the training.

METHODS

Design and participants

We used data from a web-based nationally representative survey, designed by the investigators (DA and MM) to describe firearm ownership, storage and use in the USA, and conducted by the survey firm Growth for Knowledge (GfK) in April 2015. Respondents were drawn from GfK's Knowledge Panel (KP), a rotating panel which includes approximately 55 000 US adults sampled on an ongoing basis.⁷ Invitations to participate were sent by email; one reminder email was sent to non-responders 3 days later. All panel members, except those serving in the US Armed Forces at the time of survey, were eligible to participate. To ensure reliable national estimates, firearm owners were oversampled from the KP. Additional details about the survey design and participants are available elsewhere.⁸ The Northeastern University Institutional Review Board approved the study.

Of the 7318 invited panel members who received the survey, 4165 began the survey and 3949 completed it, excluding 48 active-duty military personnel who began the survey but were ineligible to complete it. This yielded a survey completion proportion of 54.6% based on the formula recommended for calculating response proportion for web panels.⁹ Respondents were more likely than non-respondents to be younger, female, unmarried, less educated and living in metropolitan areas. Respondents were approximately as likely as non-respondents to live in a home with a firearm, but they were more likely to personally own a firearm. We excluded 17 respondents with missing responses to questions about formal firearm training, resulting in a final sample size of 3932 for this analysis.

Measures

For this analysis, our primary outcome measure was survey respondents' answers to two questions about formal firearm training. The first question asked: 'Have you ever had any formal firearm training?'. Those who responded affirmatively were asked if the training included information on safe handling of firearms, safe storage of firearms, preventing firearm accidents, preventing firearm theft and suicide prevention. Respondents could choose all options that applied. Additional survey domains included, among others, respondent demographic characteristics, presence of children in the home, growing up in a firearm-owning household, political views, veteran status, firearm ownership status and characteristics related to firearm ownership

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Table 1 Receipt of formal firearm training by firearm ownership status and selected characteristics

Characteristic	No. (weighted %)	Firearm ownership status, % (95% CI)			Total
		Owner	Non-owner, lives with owner	Non-owner, does not live with owner	
All respondents	3932 (100)	61.4 (58.9 to 63.9)	14.3 (11.2 to 18.0)	12.8 (10.6 to 15.5)	23.9 (21.9 to 26.0)
Sex					
Male	2283 (48.2)	66.3 (63.4 to 69.1)	31.6 (21.4 to 44.0)	19.4 (15.6 to 23.8)	35.6 (32.2 to 39.1)
Female	1649 (51.8)	48.8 (43.9 to 53.7)	11.1 (8.2 to 14.9)	7.2 (4.82 to 10.7)	13.0 (10.9 to 15.5)
Age					
18–29 years	357 (18.9)	60.2 (51.3 to 68.5)	17.9 (10.9 to 28.1)	8.9 (4.5 to 16.9)	17.4 (13.1 to 22.9)
30–44 years	686 (23.6)	64.8 (59.0 to 70.2)	17.5 (10.6 to 27.4)	10.2 (6.4 to 15.9)	22.6 (18.6 to 27.1)
45–59 years	1177 (28.3)	58.3 (53.8 to 62.6)	12.2 (8.0 to 18.1)	12.4 (8.5 to 17.8)	23.9 (20.4 to 27.8)
≥60 years	1712 (29.3)	62.5 (58.6 to 66.2)	9.9 (6.7 to 14.3)	18.3 (14.2 to 23.2)	29.1 (25.6 to 32.8)
Race/ethnicity					
Non-Hispanic White	3286 (70.7)	61.5 (58.8 to 64.1)	15.4 (12.0 to 19.5)	14.3 (11.4 to 17.7)	26.4 (24.1 to 28.9)
Non-Hispanic Black	217 (11.0)	57.5 (46.3 to 68.0)	19.8 (6.1 to 48.3)	12.2 (7.3 to 19.5)	19.5 (14.2 to 26.2)
Non-Hispanic other	199 (6.7)	70.9 (56.9 to 81.9)	5.2 (1.6 to 15.5)	5.2 (2.3 to 11.4)	13.4 (9.0 to 19.5)
Hispanic	230 (11.7)	60.0 (48.4 to 70.6)	8.6 (3.3 to 20.8)	10.8 (5.4 to 20.5)	18.6 (13.1 to 25.7)
Annual household income					
Less than US\$25 000	463 (16.9)	48.8 (40.9 to 56.7)	21.5 (10.0 to 40.3)	11.3 (6.7 to 18.5)	17.3 (12.8 to 23.0)
US\$25 000–US\$74 999	1684 (40.0)	58.5 (54.5 to 62.5)	12.6 (8.1 to 19.0)	11.8 (8.8 to 15.7)	22.5 (19.7 to 25.6)
US\$75 000–US\$124 999	1172 (28.5)	65.0 (60.5 to 69.2)	13.0 (9.1 to 18.4)	17.1 (12.1 to 23.5)	28.6 (24.7 to 32.9)
US\$125 000 or more	613 (14.6)	69.5 (64.0 to 74.5)	17.0 (9.8 to 27.8)	10.1 (6.2 to 16.1)	26.2 (21.5 to 31.5)
Community					
Urban	671 (23.2)	66.1 (59.5 to 72.1)	11.1 (5.5 to 21.1)	16.1 (11.5 to 22.1)	23.5 (19.2 to 28.5)
Suburban	1897 (50.7)	65.8 (62.2 to 69.2)	15.6 (11.1 to 21.4)	12.6 (9.6 to 16.3)	23.3 (20.5 to 26.3)
Rural	1352 (26.1)	54.7 (50.5 to 58.8)	14.1 (9.5 to 20.4)	9.4 (5.9 to 14.7)	25.6 (22.3 to 29.3)
Children (<18 years) in household					
None	3003 (70.3)	60.3 (57.3 to 63.1)	13.7 (10.1 to 18.3)	15.2 (12.3 to 18.5)	25.6 (23.2 to 28.2)
≥1 child in household	929 (29.7)	64.7 (59.6 to 69.5)	15.5 (10.5 to 22.3)	7.5 (4.7 to 11.9)	19.8 (16.7 to 23.4)
≥1 child aged 0–5 years	365 (10.3)	65.2 (57.3 to 72.4)	10.8 (5.4 to 20.5)	6.6 (3.7 to 11.3)	21.4 (16.8 to 26.9)
≥1 child aged 6–12 years	421 (14.2)	61.2 (53.4 to 68.4)	18.8 (10.5 to 31.3)	9.9 (5.2 to 17.9)	20.7 (15.8 to 26.5)
≥1 child aged 13–17 years	427 (14.0)	70.5 (62.8 to 77.2)	18.0 (11.0 to 28.0)	7.9 (3.8 to 15.8)	20.6 (15.9 to 26.4)
Veteran					
Yes	1043 (9.8)	88.8 (84.7 to 92.0)	78.1 (51.0 to 92.4)	75.7 (70.1 to 80.6)	81.7 (78.2 to 84.8)
No	2889 (90.2)	54.7 (51.8 to 57.6)	12.5 (9.6 to 16.2)	7.6 (5.5 to 10.4)	17.6 (15.7 to 19.7)
Identifies as					
Liberal	624 (20.6)	54.6 (47.6 to 61.5)	15.1 (7.9 to 26.9)	12.7 (8.3 to 18.8)	19.2 (15.2 to 24.0)
Moderate	1696 (47.2)	59.0 (55.0 to 62.8)	16.6 (12.1 to 22.5)	12.3 (9.2 to 16.2)	22.1 (19.3 to 25.2)
Conservative	1548 (32.2)	66.5 (62.8 to 70.1)	11.5 (7.6 to 17.0)	13.7 (9.8 to 18.9)	29.6 (26.0 to 33.4)
Region*					
New England	141 (4.4)	78.5 (66.2 to 87.2)	9.3 (3.2 to 24.2)	20.0 (9.1 to 38.6)	27.1 (16.6 to 40.9)
Mid-Atlantic	429 (13.7)	64.7 (56.8 to 71.8)	31.3 (19.4 to 46.4)	9.0 (5.0 to 15.6)	20.4 (15.7 to 26.0)
East-North Central	663 (14.8)	63.4 (57.3 to 69.2)	8.1 (4.3 to 14.9)	16.4 (10.4 to 25.0)	26.2 (21.0 to 32.2)
West-North Central	383 (7.6)	64.1 (56.3 to 71.2)	17.9 (10.3 to 29.4)	15.7 (8.1 to 28.0)	28.5 (21.7 to 36.4)
South Atlantic	778 (19.5)	60.4 (54.7 to 65.9)	13.0 (7.2 to 22.3)	14.3 (9.5 to 20.9)	24.8 (20.5 to 29.7)
East-South Central	256 (5.8)	49.9 (41.0 to 58.8)	7.8 (2.5 to 21.5)	10.0 (2.8 to 30.3)	23.2 (15.8 to 32.8)
West-South Central	440 (11.5)	55.5 (47.9 to 62.8)	5.2 (2.1 to 12.3)	12.8 (6.5 to 23.6)	23.4 (17.8 to 30.0)
Mountain	320 (7.3)	64.4 (55.6 to 72.3)	16.0 (6.4 to 34.6)	13.5 (7.6 to 22.9)	27.4 (20.9 to 35.0)
Pacific	522 (15.3)	65.1 (57.9 to 71.7)	14.5 (7.8 to 25.3)	8.7 (5.5 to 13.3)	19.4 (15.5 to 24.0)
Education					
Less than high school	239 (10.6)	44.7 (34.4 to 55.6)	12.3 (4.1 to 31.8)	3.5 (0.8 to 13.8)	9.4 (5.7 to 15.2)
High school	1097 (29.4)	52.8 (47.9 to 57.6)	9.4 (5.4 to 16.1)	11.0 (7.5 to 16.0)	20.8 (17.5 to 24.5)
Some college	1221 (28.5)	65.7 (61.4 to 69.8)	14.5 (9.9 to 20.8)	16.4 (11.9 to 22.2)	29.3 (25.3 to 33.5)
College degree	1375 (31.5)	68.9 (64.7 to 72.7)	19.9 (13.7 to 28.1)	15.2 (11.2 to 20.3)	26.8 (23.1 to 30.8)
Firearms in the household while growing up					
Yes	2596 (49.7)	62.7 (60.0 to 65.5)	14.2 (10.6 to 18.9)	22.1 (17.2 to 27.8)	35.5 (32.4 to 38.9)
No	1190 (50.3)	59.5 (53.6 to 65.1)	12.5 (7.8 to 19.5)	7.5 (5.5 to 10.2)	12.7 (10.6 to 15.1)
Believe everyone should have firearm safety training before buying their first firearm					
Disagree or strongly disagree	164 (4.7)	43.1 (32.0 to 55.0)	17.8 (3.9 to 53.5)	6.1 (2.2 to 15.6)	15.2 (9.6 to 23.1)
Neutral	449 (14.1)	25.6 (20.3 to 31.6)	2.1 (0.5 to 8.3)	4.6 (2.3 to 8.9)	9.5 (7.0 to 12.8)
Agree or strongly agree	3301 (81.3)	69.2 (66.5 to 71.7)	15.5 (12.2 to 19.5)	14.9 (12.2 to 18.1)	27.1 (24.7 to 29.5)

The sum of frequencies may not add up to the total of 3932 due to missing values.

*New England includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. Mid-Atlantic includes New Jersey, New York and Pennsylvania. East-North Central includes Illinois, Indiana, Michigan, Ohio and Wisconsin. West-North Central includes Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota. South Atlantic includes Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, District of Columbia and West Virginia. East-South Central includes Alabama, Kentucky, Missouri and Tennessee. West-South Central includes Arkansas, Louisiana, Oklahoma and Texas. Mountain includes Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming. Pacific includes Alaska, California, Hawaii, Oregon and Washington.

Table 2 Associations between selected firearm ownership characteristics and receipt of formal firearm training among firearm owners

Characteristic	No. (weighted %)	Formal firearm training % (95% CI)	Prevalence ratio (95% CI)	
			Unadjusted	Adjusted*
Firearm type†				
Handgun only	463 (27.6)	54.6 (49.1 to 59.9)	1.00 (Reference)	1.00 (Reference)
Long gun only	433 (23.4)	54.9 (49.3 to 60.4)	1.01 (0.87 to 1.16)	0.99 (0.87 to 1.14)
Long gun and handgun	942 (49.1)	67.9 (64.3 to 71.3)	1.24 (1.11 to 1.39)	1.23 (1.10 to 1.37)
Number of handguns‡				
One handgun	681 (46.7)	53.7 (49.3 to 58.1)	1.00 (Reference)	1.00 (Reference)
More than one handgun	836 (53.3)	70.8 (66.9 to 74.4)	1.32 (1.20 to 1.45)	1.23 (1.12 to 1.35)
Reason for owning a handgun‡				
Protection only	597 (41.8)	56.9 (52.1 to 61.6)	1.00 (Reference)	1.00 (Reference)
Hunting/sporting only	121 (7.7)	67.7 (56.9 to 76.9)	1.19 (1.00 to 1.41)	1.10 (0.93 to 1.30)
Other§	795 (50.4)	67.0 (63.1 to 70.8)	1.18 (1.06 to 1.30)	1.13 (1.03 to 1.25)
Number of long guns¶				
One long gun	490 (33.1)	57.0 (51.8 to 62.1)	1.00 (Reference)	1.00 (Reference)
More than one long gun	988 (66.9)	67.3 (63.8 to 70.7)	1.18 (1.06 to 1.31)	1.18 (1.06 to 1.30)
Reason for owning a long gun¶				
Protection only	143 (9.9)	46.5 (36.9 to 56.4)	1.00 (Reference)	1.00 (Reference)
Hunting/sporting only	558 (37.8)	67.9 (63.1 to 72.4)	1.46 (1.17 to 1.83)	1.43 (1.16 to 1.75)
Other§	773 (52.3)	64.3 (60.3 to 68.2)	1.38 (1.10 to 1.73)	1.35 (1.10 to 1.66)
Concealed carry weapon (CCW) permit				
Does not have CCW	1467 (70.8)	52.7 (49.7 to 55.7)	1.00 (Reference)	1.00 (Reference)
Has CCW	586 (29.2)	82.9 (78.9 to 86.3)	1.57 (1.46 to 1.69)	1.55 (1.45 to 1.67)
Carried a loaded handgun in past 30 days‡				
Did not carry	1159 (73.3)	56.7 (53.2 to 60.0)	1.00 (Reference)	1.00 (Reference)
Carried	405 (26.7)	82.5 (77.5 to 86.5)	1.46 (1.34 to 1.58)	1.43 (1.32 to 1.55)
Reason for carrying a loaded handgun in past 30 days**				
Protection	293 (75.4)	81.0 (74.8 to 86.1)	1.00 (Reference)	1.00 (Reference)
Transportation	32 (7.3)	84.0 (64.2 to 93.9)	1.04 (0.86 to 1.25)	1.03 (0.86 to 1.23)
Other	71 (17.3)	86.6 (74.9 to 93.3)	1.07 (0.94 to 1.21)	1.02 (0.91 to 1.15)

*Adjusted for age, sex, presence of children (<18 years) in household, urban/rural, region and veteran status.

†Excludes those who responded affirmatively to the question on owning a firearm but did not determine its type.

‡Among those who owned a handgun.

§Example: for work, for declaration of rights or multiple reasons.

¶Among those who owned a long gun.

**Among handgun owners who carried a loaded handgun in the past 30 days.

Table 3 Combination of different training topics among respondents who had received firearm training

Safe handling	Safe storage	Preventing accidents	Preventing theft	Suicide prevention	% (95% CI)
					32.24 (28.45 to 36.28)
					29.16 (25.82 to 32.75)
					18.73 (16.12 to 21.66)
					6.96 (5.26 to 9.15)
					6.14 (4.78 to 7.85)
					4.77 (3.00 to 7.48)
					1.23 (0.73 to 2.07)
					0.21 (0.06 to 0.78)
					0.13 (0.04 to 0.43)
					0.11 (0.03 to 0.46)
					0.10 (0.02 to 0.48)
					0.09 (0.03 to 0.30)
					0.06 (0.01 to 0.40)
					0.03 (0.00 to 0.22)
					0.03 (0.00 to 0.22)

No respondent had received the combinations not shown in the table.

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(eg, type of firearm owned). Firearm ownership status was determined based on responses to two questions. The first question asked: 'Do you or does anyone else you live with currently own any type of gun?' Those who answered affirmatively were then asked: 'Do you personally own a gun?' Based on these responses, firearm ownership status for this analysis was classified into three prespecified subgroups of firearm owner, non-owner living with a firearm owner and non-owner not living with a firearm owner. Key survey questions related to this analysis are available in the online supplementary appendix.

Statistical analysis

All statistical analyses were based on individual-level data. GfK provided final survey weights that combined presample and study-specific poststratification weights to account for oversampling and non-response. Weights were applied such that estimates from the survey are representative of the US adults aged ≥ 18 years. We calculated weighted percentages and their corresponding 95% CIs for each measure. To examine the association between firearm ownership characteristics and receipt of firearm training among firearm owners, we used multivariable Poisson regression models to obtain adjusted prevalence ratios. A prespecified set of covariates including age, sex, presence of children in household, urbanicity, region of residence and veteran status was used for adjustment in the models. All analyses were conducted in Stata V. 14 (StataCorp) using the 'svy' suite of commands.

RESULTS

Approximately one in four US adults (23.9%; 95% CI 21.9% to 26.0%), and three in five firearm owners (61.4%; 95% CI 58.9% to 63.9%) reported having received formal firearm training. Among non-owners, 14.3% (95% CI 11.2% to 18.0%) of those living with a firearm owner, and 12.8% (95% CI 10.6% to 15.5%) of those not living with a firearm owner reported having received training. Receipt of formal firearm training varied by respondent characteristics (table 1). Among firearm owners, 66.3% (95% CI 63.4% to 69.1%) of males compared with 48.8% (95% CI 43.9% to 53.7%) of females had received training. Among firearm owners, those who owned both handguns and long guns, owned more than one firearm within each type of firearm (handgun and long gun), had a concealed carry weapon permit or had carried a loaded handgun in the past 30 days were more likely to have received training. Those who owned a firearm for protection only were generally less likely to have received training than those who owned a firearm for

other or multiple reasons (eg, hunting/sporting among long gun owners; table 2).

The most commonly reported combination of training topics was safe handling, safe storage and preventing accidents (table 3). Safe handling and suicide prevention were, respectively, the most and least commonly reported topic of training regardless of firearm ownership status (figure 1). Among firearm owners, 61.1% (95% CI 58.6% to 63.6%) had received training in safe handling, and 14.7% (95% CI 13.0% to 16.7%) had received training in suicide prevention.

DISCUSSION

The proportion of the US firearm owners who report having received formal firearm training (61%) has not meaningfully changed since >20 years ago. To our knowledge, this study provides the first national estimates of the proportion of the US adults with formal firearm training among both firearm owners and non-owners in more than 20 years. Considering that firearm access is a well-established risk factor for firearm injury among all members of firearm-owning households,¹⁰ it is noteworthy that only 14% of non-owners living in firearm-owning households reported having received any firearm training. Our national estimates of the frequency with which training programmes cover specific safety-related content (eg, preventing accidents, theft or suicide) also has not been previously presented in the literature. Despite the link between firearm access and suicide,¹¹ and the fact that about two-thirds of all firearm deaths in the USA are suicides,¹² only one in seven firearm owners reported that the training they received included information about suicide prevention.

As with results from all self-reported surveys, our findings are potentially subject to recall and social desirability bias. Prior research suggests, however, that online panel surveys may reduce social desirability bias and yield more accurate estimates of respondent characteristics compared with telephone surveys.¹³ Our survey completion proportion (55%) was substantially greater than the proportion for typical non-probability opt-in online surveys which range from 2% to 16%.⁹ Fewer than 1% of respondents declined to answer our stem question about

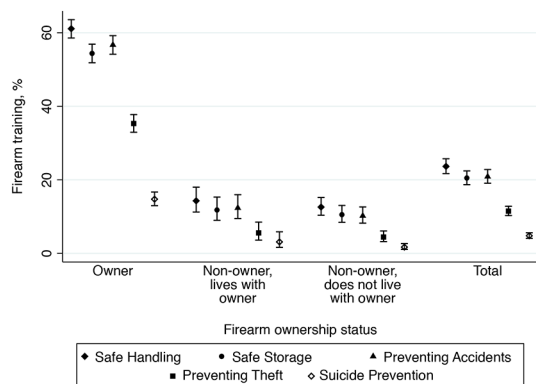


Figure 1 Topics of formal firearm training by firearm ownership status.

What is already known on this subject

- ▶ Most US citizens favour requiring training to qualify for firearm ownership, a position supported by medical and public health experts to promote firearm safety.
- ▶ Nationally representative surveys conducted in 1994 found that 56%–58% of the US firearm owners had received formal firearm training.

What this study adds

- ▶ Based on this nationally representative survey conducted in 2015 (n=3932), the contemporary proportion of the US firearm owners who report having received any formal firearm training (61%) has not meaningfully changed since >20 years ago.
- ▶ Only 14% of non-owners living with a firearm owner report having received any formal firearm training.
- ▶ Only 15% of firearm owners report having received formal training in suicide prevention.

household firearm ownership, no one declined to answer the subsequent question regarding whether they personally owned a firearm and fewer than 0.5% declined to answer the firearm training question. We asked a limited number of questions about firearm training; future work extending our findings should focus on additional characteristics of training programmes including their timing, setting and duration.

In some other high-income countries (eg, Canada, Australia and Germany), an understanding of firearm safety, tested in a theoretical or practical training course, is required to legally own a firearm.^{4 14} For instance, classroom participation in the full Canadian Firearms Safety Course and passing a test are mandatory for first-time Possession and Acquisition License applicants in Canada.¹⁵ In contrast, the US adults can lawfully own firearms without receiving any formal training. While some form of training may be required in certain circumstances (eg, to obtain a CCW permit or hunting license), no national standards or requirements for firearm training in the USA exist. Individuals may receive firearm training through different means, such as attending classes at gun shops, hunting clubs or shooting ranges¹⁶; counselling at healthcare settings or community events¹⁷; taking online courses.¹⁸ Some firearm advocacy groups have developed curricula on safety practices as part of responsible firearm ownership.^{19–21} Systematic collection of information on the content of these training programmes to identify gaps, and an evaluation of their effectiveness to change behaviour and reduce injury, is warranted. Given the link between the availability of household firearms and the risk of suicide for all household members, increasing the number of training programmes that provide information about suicide prevention should also be encouraged.

Contributors ARR, DA and MM contributed to the study concept and design. DA and MM led the acquisition of data. All authors contributed to the interpretation of data. ARR drafted the manuscript. All authors contributed to the critical revision of the manuscript for important intellectual content. VHL led the statistical analyses. DA and MM obtained funding. JAS, DA and MM contributed to the administrative, technical or material support. ARR, DA and MM contributed to the study supervision.

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