Firearm purchasing and storage during the COVID-19 pandemic

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ABSTRACT

To better understand motivations behind purchase and storage of firearms during the COVID-19 pandemic, we used Amazon Mechanical Turk to conduct an online survey of individuals who did and did not purchase a firearm since 1 January 2020 in response to COVID-19. The survey was fielded between 1 and 5 May 2020. We asked about motivations for purchase, changes in storage practices and concern for themselves or others due to COVID-19. There were 1105 survey respondents. Most people who purchased a firearm did so to protect themselves from people. Among respondents who had purchased a firearm in response to COVID-19 without prior household firearm ownership, 39.7% reported at least one firearm was stored unlocked. Public health efforts to improve firearm-related safety during COVID-19 should consider increasing access to training and framing messages around the concerns motivating new firearm purchase.

The COVID-19 pandemic has impacted many facets of life in the USA, including firearm purchasing, which appeared to increase dramatically from March to May 2020.[1 2] To the extent that firearm purchases resulted in increased firearm access, risk of unintentional injury[3] and suicide,[4] especially for children,[3 5 6] as well as domestic homicide may have increased.[7] Changes in firearm storage due to COVID-19-related concerns may also increase the risk of firearm-related injuries for household members if firearms are made more accessible. Additionally, the social disruption, fear of illness and general uncertainty about the pandemic may contribute to worsened mental health and increased risk of suicide and homicide.[8 9] Other emergencies are likely to occur in the future (eg, natural disasters, global warming-related food scarcity and housing instability), and the public health community, policymakers and firearm retailers may need to develop tailored interventions that promote safe firearm storage and use during crises to reduce risk of firearm-related injury. While the increase in firearms related to COVID-19 has been well documented,[1 2] the motivations for this surge in purchases are not clear. Firearm owners are not a homogeneous group, and understanding the factors associated with recent purchases is necessary to guide the multifaceted efforts at prevention that will be needed to reduce the unintended harms that might occur from the increase in prevalence of firearms in the home. We sought to understand motivations behind firearm purchase and storage during the COVID-19 pandemic to support improved firearm-related safety.

METHODS

Using Amazon Mechanical Turk (MTurk) respondents, we surveyed persons who did and did not purchase a firearm in response to COVID-19 since 1 January 2020, stratified by whether or not they previously owned a firearm or currently lived in a firearm-owning household. Respondents had to be over 18 years of age and US residents, as verified by MTurk. The survey was fielded between 1 and 5 May 2020.

The six groups were: (1) prior owners who purchased a firearm in response to COVID-19 ('prior owners with purchase'), (2) new owners with household firearm ownership who purchased their own firearm in response to COVID-19 ('new owners with household firearm ownership'), (3) new owners without household firearm ownership ('new owners without household firearm ownership'), (4) prior owners who did not purchase a firearm in response to COVID-19 ('prior owners without purchase'), (5) non-owners with household firearm ownership ('non-owners with household firearm ownership') and (6) non-owners without household firearm ownership ('non-owners without household firearm ownership'). We excluded responses from participants who did not meet survey validation requirements (online supplemental appendix A).

Survey questions covered six domains: demographics, concern about the COVID-19 pandemic, purchase of consumer goods in response to COVID-19, reasons for firearm purchase in response to COVID-19, firearm storage and familiarity with firearms including firearm training (online supplemental appendix B). Descriptive statistics were used to summarise survey results. Patients and members of the public were not involved in the design, conduct, reporting or dissemination plans of this research.

RESULTS

The analytic sample included 1105 respondents. There were few demographic differences between the six groups. The mean age was 36.5 (range 18–78) years. Respondents were predominantly white (71.5%). Almost half of respondents had a child aged <18 years living in their household (44.8%). Many new owners and non-owners without current household firearm ownership had

Table 1 Participant demographics and concern about COVID-19 by survey group

	Persons with COVID-19-related firearm purchase			Persons without COVID-19-related firearm purchase			
		New owners			Non-owners		
	Prior owners n=158	Household firearm ownership n=178	No household firearm ownership n=179	Prior owners n=192	Household firearm ownership n=176	No household firearm ownership n=222	Total n=1105
Age, mean (SD)	35.7 (10.1)	33.5 (9.5)	35.0 (9.4)	41.8 (12.8)	34.8 (11.5)	37.6 (12.2)	36.5 (11.4)
Sex							
Male	119 (75.3)	89 (50.0)	116 (64.8)	111 (57.8)	64 (36.4)	125 (56.3)	624 (56.5)
Female	36 (22.8)	88 (49.4)	62 (34.6)	78 (40.6)	109 (61.9)	92 (41.4)	465 (42.1)
Prefer not to say	3 (1.9)	1 (0.6)	1 (0.6)	3 (1.6)	3 (1.7)	5 (2.3)	16 (1.4)
Race/Ethnicity							
American Indian/Alaskan Native	2 (1.3)	3 (1.7)	2 (1.1)	1 (0.5)	0 (0.0)	0 (0.0)	8 (0.7)
Asian	21 (13.3)	17 (9.6)	15 (8.4)	5 (2.6)	14 (8.0)	23 (10.4)	95 (8.6)
Hispanic	5 (3.2)	11 (6.2)	10 (5.6)	5 (2.6)	5 (2.8)	12 (5.4)	48 (4.3)
Multiracial	7 (4.4)	8 (4.5)	10 (5.6)	12 (6.2)	8 (4.5)	13 (5.9)	58 (5.2)
Non-Hispanic black	25 (15.8)	17 (9.6)	23 (12.8)	14 (7.3)	14 (8.0)	9 (4.1)	102 (9.2)
Non-Hispanic white	98 (62.0)	122 (68.5)	116 (64.8)	155 (80.7)	135 (76.7)	164 (73.9)	790 (71.5)
Other	0 (0.0)	0 (0.0)	3 (1.7)	0 (0.0)	0 (0.0)	1 (0.5)	4 (0.4)
Currently working*							
Working at your usual job	50 (32.3)	56 (31.8)	63 (35.6)	84 (44.2)	49 (28.2)	80 (36.4)	382 (35.0)
Working remotely, when your job is not usually remote	84 (54.2)	89 (50.6)	85 (48.0)	75 (39.5)	80 (46.0)	99 (45.0)	512 (46.9)
Laid off/furloughed due to COVID-19	15 (9.7)	26 (14.8)	28 (15.8)	20 (10.5)	37 (21.3)	35 (15.9)	161 (14.7)
Working a different job than you normally do	6 (3.9)	5 (2.8)	1 (0.6)	11 (5.8)	8 (4.6)	6 (2.7)	37 (3.4)
Classified as an essential worker	33 (20.9)	38 (21.3)	36 (20.1)	31 (16.1)	26 (14.8)	27 (12.2)	191 (17.3)
Household member with a chronic illness	60 (38.0)	49 (27.5)	39 (21.8)	51 (26.6)	44 (25.0)	38 (17.1)	281 (25.4)
Household member with diagnosed mood disorder	66 (41.8)	59 (33.1)	40 (22.3)	43 (22.4)	51 (29.0)	53 (23.9)	312 (28.2)
Household member with dementia or other memory loss disorder	52 (32.9)	20 (11.2)	21 (11.7)	4 (2.1)	9 (5.1)	5 (2.3)	111 (10.0)
Household with children under the age of 18	77 (48.7)	95 (53.4)	86 (48.0)	83 (43.2)	74 (42.0)	80 (36.0)	495 (44.8)
>1 child aged 0–5 years	42 (54.6)	49 (51.6)	38 (44.2)	41 (49.4)	37 (50.0)	39 (48.8)	246 (49.7)
>1 child aged 6–12 years	32 (41.6)	51 (53.7)	37 (43.0)	43 (51.8)	35 (47.3)	35 (43.8)	233 (47.1)
>1 child aged 13–17 years	18 (23.4)	21 (22.1)	25 (29.1)	25 (30.1)	25 (33.8)	26 (32.5)	140 (28.3)
Have you ever lived in a home with a firearm?	158 (100.0)	178 (100.0)	75 (41.9)	192 (100.0)	176 (100.0)	47 (21.2)	826 (74.8)
Firearm belonged to respondent	158 (100.0)	0 (0.0)	22 (29.3)	192 (100.0)	0 (0.0)	6 (12.8)	378 (34.2)
Firearm belonged to family member	125 (79.1)	159 (89.3)	61 (81.3)	90 (46.9)	164 (93.2)	40 (85.1)	639 (57.8)
Firearm belonged to roommate	8 (5.1)	23 (12.9)	10 (13.3)	4 (2.1)	8 (4.5)	2 (4.3)	55 (5.0)
Firearm belonged to other	0 (0.0)	2 (1.1)	0 (0.0)	0 (0.0)	5 (2.8)	3 (6.4)	10 (0.9)

*Data missing for 13 respondents.

lived in a firearm-owning home at some point in their lives (41.9% and 21.2%, respectively) (table 1).

The primary reason for recent firearm purchase was for protection against people (70.5%). Purchasers reported crime (38.5%), supply chain disruptions (35.3%), health (33.8%) and the economy (27.6%) as the most common COVID-19-specific concerns that contributed to their decision to purchase a firearm. A higher proportion of respondent groups with firearm purchase stocked up on household supplies and home security products and reported concern about the economy and crime as the reason for stocking up than respondent groups without firearm purchase (table 2). Most respondents thought COVID-19 was 'a big deal' (68.2%) and reported concern for their family (82.7%), themselves (56.4%) and their friends (52.9%). For respondents who live in a home with another firearm owner, the owner is most often their partner (39.4%) or family member (42.5%) (table 3).

Among prior owners, many reported storing all firearms locked (44.3% prior owners with purchase and 53.7% prior owners without purchase) on 1 January 2020. When they took the survey, 48.1% of prior owners with purchase and 54.2% prior owners without purchase reported storing all firearms

Table 2 Purchasing supplies and firearms during the COVID-19 pandemic

	Persons with COVID-19-related firearm purchase			Persons without COVID-19-related firearm purchase			
		New owners			Non-owners		
	Prior owners n=158	Household firearm ownership n=178	No household firearm ownership n=179	Prior owners n=192	Household firearm ownership n=176	No household firearm ownership n=222	Total
Respondent or household member stocked up on the following (n=1105)							
Toilet paper	106 (67.1)	128 (71.9)	133 (74.3)	100 (52.1)	101 (57.4)	104 (46.8)	672 (60.8)
Hand sanitizer	121 (76.6)	129 (72.5)	113 (63.1)	66 (34.4)	78 (44.3)	73 (32.9)	580 (52.5)
Household cleaners	91 (57.6)	105 (59.0)	98 (54.7)	62 (32.3)	73 (41.5)	82 (36.9)	511 (46.2)
Masks/Gloves	111 (70.3)	105 (59.0)	98 (54.7)	47 (24.5)	67 (38.1)	64 (28.8)	492 (44.5)
Non-perishable foods	61 (38.6)	107 (60.1)	101 (56.4)	110 (57.3)	80 (45.5)	120 (54.1)	579 (52.4)
Bottled water	79 (50.0)	99 (55.6)	95 (53.1)	81 (42.2)	71 (40.3)	72 (32.4)	497 (45.0)
First aid supplies	80 (50.6)	88 (49.4)	72 (40.2)	19 (9.9)	32 (18.2)	31 (14.0)	322 (29.1)
Medications and prescriptions	67 (42.4)	83 (46.6)	58 (32.4)	49 (25.5)	47 (26.7)	52 (23.4)	356 (32.2)
Pepper spray	24 (15.2)	42 (23.6)	24 (13.4)	4 (2.1)	7 (4.0)	4 (1.8)	105 (9.5)
Home security products (not including a gun)	41 (25.9)	65 (36.5)	44 (24.6)	10 (5.2)	14 (8.0)	4 (1.8)	178 (16.1)
None of the above	1 (0.6)	2 (1.1)	8 (4.5)	35 (18.2)	28 (15.9)	46 (20.7)	120 (10.9)
COVID-19-specific concerns that contributed to decision to stock up on items listed above (n=1105)							
Economy	66 (41.8)	83 (46.6)	63 (35.2)	55 (28.6)	47 (26.7)	52 (23.4)	366 (33.1)
Supply chain disruptions	93 (58.9)	124 (69.7)	128 (71.5)	137 (71.4)	117 (66.5)	148 (66.7)	747 (67.6)
Health	84 (53.2)	112 (62.9)	96 (53.6)	66 (34.4)	72 (40.9)	89 (40.1)	519 (47.0)
Crime	33 (20.9)	50 (28.1)	52 (29.1)	13 (6.8)	13 (7.4)	8 (3.6)	169 (15.3)
Social activities	30 (19.0)	40 (22.5)	40 (22.3)	13 (6.8)	15 (8.5)	24 (10.8)	162 (14.7)
Other	1 (0.6)	1 (0.6)	3 (1.7)	1 (0.5)	6 (3.4)	9 (4.1)	21 (1.9)
None of the above	4 (2.5)	2 (1.1)	3 (1.7)	3 (1.6)	3 (1.7)	1 (0.5)	16 (1.4)
Primary reason you purchased a firearm in response to COVID-19* (n=515)							
For protection against people	83 (52.9)	138 (78.0)	139 (78.5)	–	–	–	360 (70.5)
For protection against animals	21 (13.4)	11 (6.2)	15 (8.4)	–	–	–	47 (9.2)
For hunting	26 (16.6)	9 (5.1)	10 (5.7)	–	–	–	45 (8.8)
For other sporting use	14 (8.9)	8 (4.5)	8 (4.5)	–	–	–	30 (5.9)
For a collection	11 (7.0)	7 (4.0)	4 (2.3)	–	–	–	22 (4.3)
For some other reason	2 (1.3)	4 (2.3)	1 (0.6)	–	–	–	7 (1.4)
COVID-19-specific concerns that contributed to decision to purchase a firearm (n=515)							
Economy	55 (34.8)	0 (0.0)	87 (48.6)	–	–	–	142 (27.6)
Supply chain disruptions	55 (34.8)	62 (34.8)	65 (36.3)	–	–	–	182 (35.3)
Health	60 (38.0)	54 (30.3)	60 (33.5)	–	–	–	174 (33.8)
Crime	38 (24.1)	75 (42.1)	85 (47.5)	–	–	–	198 (38.5)
Social activities	29 (18.4)	28 (15.7)	26 (14.5)	–	–	–	83 (16.1)
Other	1 (0.6)	1 (0.6)	0 (0.0)	–	–	–	2 (0.4)

*Data missing for four respondents (one prior owner with purchase, one new owner in firearm-owning household and two new owners in firearm-naïve households)

locked, indicating almost no change in the overall proportion of prior owners kept all firearms locked. However, 36.5% prior owners with purchase and 5.7% prior owners without purchase reported making some change in their firearm storage primarily to prevent child access (54.4%), reduce risk of mishandling and accidental discharge (38.6%), allow for quick access in case of a robbery, theft or burglary (33.3%) and reduce risk of suicide (28.1%). About 40% of respondents had received some form of firearm safety training in their lifetime, and training was more common among new owners and prior owners (46.9%–62.0%) than non-owners (9.9%–17.6%) (table 4).

DISCUSSION

Our findings suggest that most respondents with a COVID-19-related firearm purchase did so to protect themselves from people and were more likely to have stocked up on other household supplies than respondents who did not purchase a firearm,

Table 3 Concern about COVID-19

	Persons with COVID-19-related firearm purchase			Persons without COVID-19-related firearm purchase			
		New owners			Non-owners		
	Prior owners n=158	Household firearm ownership n=178	No household firearm ownership n=179	Prior owners n=192	Household firearm ownership n=176	No household firearm ownership n=222	Total n=1105
When thinking about the COVID-19 pandemic, are you concerned about any of the following							
Economy	85 (53.8)	131 (73.6)	126 (70.4)	151 (78.6)	144 (81.8)	173 (77.9)	810 (73.3)
Supply chain disruptions	80 (50.6)	110 (61.8)	113 (63.1)	137 (71.4)	120 (68.2)	142 (64.0)	702 (63.5)
Health	103 (65.2)	137 (77.0)	136 (76.0)	137 (71.4)	136 (77.3)	174 (78.4)	823 (74.5)
Crime	42 (26.6)	92 (51.7)	92 (51.4)	60 (31.2)	51 (29.0)	53 (23.9)	390 (35.3)
Social activities	64 (40.5)	87 (48.9)	88 (49.2)	95 (49.5)	99 (56.2)	117 (52.7)	550 (49.8)
Other	1 (0.6)	2 (1.1)	0 (0.0)	3 (1.6)	5 (2.8)	7 (3.2)	18 (1.6)
None of the above	9 (5.7)	3 (1.7)	3 (1.7)	10 (5.2)	2 (1.1)	13 (5.9)	40 (3.6)
When thinking about the coronavirus and its spread since January 2020, do you think…?*							
It is not a big deal	22 (13.9)	6 (3.4)	13 (7.3)	11 (5.7)	8 (4.5)	6 (2.7)	66 (6.0)
It is a big deal to some people. It is not a big deal to me	64 (40.5)	36 (20.2)	48 (26.8)	55 (28.6)	32 (18.2)	48 (21.6)	283 (25.6)
It is a big deal	71 (44.9)	136 (76.4)	118 (65.9)	126 (65.6)	136 (77.3)	167 (75.2)	754 (68.2)
When thinking about the risk of coronavirus to you and your family/friends please select the following							
I am worried for myself	86 (54.4)	118 (66.3)	105 (58.7)	96 (50.0)	94 (53.4)	124 (55.9)	623 (56.4)
I am worried for my family	121 (76.6)	147 (82.6)	151 (84.4)	152 (79.2)	149 (84.7)	194 (87.4)	914 (82.7)
I am worried for my friends	61 (38.6)	108 (60.7)	93 (52.0)	103 (53.6)	93 (52.8)	127 (57.2)	585 (52.9)
I am not worried	13 (8.2)	6 (3.4)	13 (7.3)	34 (17.7)	21 (11.9)	22 (9.9)	109 (9.9)
Perceived stress score, mean (SD)	22.4 (5.8)	20.9 (4.5)	20.6 (4.3)	18.8 (4.3)	19.7 (4.0)	18.3 (4.4)	20.0 (4.7)
In the last month, has your mental health generally*							
Improved a lot	23 (14.6)	17 (9.6)	12 (6.7)	4 (2.1)	4 (2.3)	10 (4.5)	70 (6.3)
Improved a little	60 (38.0)	36 (20.2)	40 (22.3)	22 (11.5)	37 (21.0)	23 (10.4)	218 (19.7)
No different	51 (32.3)	58 (32.6)	68 (38.0)	114 (59.4)	69 (39.2)	120 (54.1)	480 (43.4)
Gotten a little worse	17 (10.8)	57 (32.0)	51 (28.5)	45 (23.4)	56 (31.8)	56 (25.2)	282 (25.5)
Gotten a lot worse	6 (3.8)	10 (5.6)	8 (4.5)	7 (3.6)	10 (5.7)	13 (5.9)	54 (4.9)
Over the last month, have your concerns about COVID-19 generally:†							
Increased	83 (53.9)	107 (60.8)	92 (51.4)	54 (28.3)	66 (37.5)	78 (35.1)	480 (43.7)
Remained the same	61 (39.6)	58 (33.0)	70 (39.1)	101 (52.9)	87 (49.4)	121 (54.5)	498 (45.4)
Decreased	10 (6.5)	11 (6.3)	17 (9.5)	36 (18.9)	23 (13.1)	23 (10.4)	120 (10.9)

*Data missing for two respondents
†Data missing for seven respondents

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Table 4 Change in storage practices and training for firearms in the household between 1 January 2020 and 5 May 2020

	Persons with COVID-19-related firearm purchase			Persons without COVID-19-related firearm purchase			
		New owners			Non-owners		
	Prior owners n=158	Household firearm ownership n=178	No household firearm ownership n=158	Prior owners n=192	Household firearm ownership n=176	No household firearm ownership n=222	Total
All of respondent's firearms stored locked on 1 January 2020 (n=350)	70 (44.3)	–	–	103 (53.7)	–		173 (49.4)
All of respondent's firearms stored locked on 5 May 2020 (n=686)	76 (48.1)	113 (63.5)	108 (60.3)	104 (54.2)	–	–	401 (56.7)
Household owner's firearms storage on 1 January 2020 (n=704)							
All firearms stored locked	58 (36.7)	97 (54.5)	–	59 (30.7)	96 (54.6)	–	310 (44.0)
At least one firearm stored unlocked	95 (60.1)	62 (34.8)	–	132 (68.8)	49 (27.8)	–	338 (48.0)
I do not know how their firearm(s) were stored	5 (3.2)	19 (10.7)	–	1 (0.5)	31 (17.6)	–	56 (7.8)
Household owner's firearms storage on 5 May 2020 (n=704)							
All firearms stored locked	56 (35.4)	96 (53.9)	–	60 (31.3)	97 (55.1)	–	309 (43.9)
At least one firearm stored unlocked	97 (61.4)	74 (41.6)	–	132 (68.8)	49 (27.8)	–	352 (50.0)
I do not know how their firearm(s) were stored	5 (3.2)	8 (4.5)	–	0 (0.0)	30 (17.1)	–	43 (6.1)
Respondents reported some change in their own firearm storage behaviour (n=350)	57 (36.1)	–	–	11 (5.7)	–	–	68 (19.5)
To prevent child access	31 (54.4)	–	–	1 (9.1)	–	–	32 (47.1)
To reduce risk of mishandling and accidental discharge	22 (38.6)	–	–	2 (18.2)	–	–	24 (35.3)
To reduce risk of suicide	16 (28.1)	–	–	1 (9.1)	--	–	17 (25.0)
To prevent access to persons newly living with you	18 (31.6)	–	–	2 (18.2)	–		20 (29.4)
To allow for quick access in case of a robbery, theft or burglary	19 (33.3)	–	–	7 (63.6)	–	–	26 (38.2)
Ran out of room in the gun safe	8 (14.0)	–	–	2 (18.2)	–	–	10 (14.7)
No longer have usual storage means available	5 (8.8)	–	–	1 (9.1)	–	–	6 (8.8)
Moved temporarily due to COVID-19	4 (7.0)	–	–	1 (9.1)	–	–	5 (7.4)
Other	0 (0.0)	–	–	1 (9.1)	–	–	1 (1.5)
Current household member owns a firearm (n=704)	132 (83.5)	178 (100.0)	–	93 (48.4)	176 (100.0)	–	
Current household member is a partner	61 (46.2)	83 (46.6)	–	59 (63.44)	74 (42.0)	–	277 (39.4)
Current household member is a family member	83 (62.9)	88 (49.4)	–	36 (38.7)	92 (52.3)	–	299 (42.5)
Current household member is a roommate	8 (6.1)	23 (12.9)	–	4 (4.3)	8 (4.5)	–	43 (6.11)
Other current household member	0 (0.0)	2 (1.1)	–	0 (0.0)	5 (2.8)	–	7 (1.0)
Ever received firearm safety training (n=1105)	89 (56.3)	91 (51.1)	84 (46.9)	119 (62.0)	31 (17.6)	22 (9.9)	436 (39.5)
Training included: safe handling of firearms	63 (70.8)	83 (91.2)	78 (92.9)	115 (96.6)	28 (90.3)	20 (90.9)	387 (88.8)
Training included: safe storage of firearms	64 (71.9)	69 (75.8)	66 (78.6)	98 (82.4)	17 (54.8)	14 (63.6)	328 (75.2)
Training included: preventing firearm accidents	53 (59.6)	63 (69.2)	65 (77.4)	103 (86.6)	21 (67.7)	16 (72.7)	321 (73.6)
Training included: preventing firearm theft	38 (42.7)	37 (40.7)	36 (42.9)	48 (40.3)	5 (16.1)	5 (22.7)	169 (38.8)
Training included: suicide prevention	22 (24.7)	26 (28.6)	22 (26.2)	24 (20.2)	5 (16.1)	2 (9.1)	101 (23.2)
Training since 1 January 2020 (n=436)	15 (9.5)	48 (27.0)	29 (16.2)	7 (3.7)	2 (1.1)	1 (0.5)	102 (9.2)

potentially highlighting broader pandemic purchasing patterns. We found patterns of both increasing and decreasing firearm access in response to COVID-19. For those new owners who brought a gun into a household in which there was not a gun previously (new owners without household firearm ownership), compelling evidence suggests that the household risk of firearm unintentional injury,[3] suicide[4] and domestic homicide[7] increased. The risk could be highest for individuals in households with less restricted firearm access and less firearm familiarity.

While 40% of new owners reported having at least one unlocked gun, new owners reported safer storage practices than prior owners, about half of whom reported at least one firearm was unlocked. Among all prior owners who reported a change in storage behaviour, however, many reported the motivation for the change was to reduce access to children (47.1%), reduce risk of mishandling and accidental discharge (35.3%) and reduce risk of suicide (25.0%), although some reported changes that increased access in case of a robbery, theft or burglary (33.3%)

Among new owners in non-firearm owning households, 42% had never lived in a firearm-owning household and may have little experience or training with guns. New owners without household firearm ownership, unlike new owners with household firearm ownership, do not have the opportunity of asking the firearm owner(s) in their home to provide training or advice on storage and other safety practices. And while the majority of firearm owners reported some lifetime firearm training, less than one-third of new owners recently received training since 1 January 2020.

This study was limited by the use of a non-representative sample, generalisability of MTurk surveys.[10 11] Nonetheless, our findings offer important insight into the motivations of persons who purchased firearms in response to COVID-19, findings

which can inform public health messaging and improve firearm safety during this pandemic.

PUBLIC HEALTH IMPLICATIONS

Public health efforts to improve firearm-related safety during COVID-19 should consider framing firearm-related injury prevention messages around the concerns motivating firearm purchase (eg, crime, supply chain disruptions, health and the economy). Firearm retailers, local governments and departments of public health could also consider providing additional information and incentives during the pandemic for storage and locking mechanisms, as well as mental health resources and firearm safety training options which can be accessed remotely. As almost half of respondents with COVID-19-related firearm purchase reported living with children, a group at particularly high risk,[6] messaging should also focus on the importance of reducing child access to firearms. With the continuing pandemic and recent increase in firearm purchasing, there is a critical need to invest in creating or expanding public health campaigns to promote firearm safety and firearm injury prevention strategies that discuss the increased risk of unintentional firearm injuries, suicide and domestic homicide associated with firearm access.

What is already known on the subject

- There has been an increase in firearm-purchasing in response to the COVID-19 pandemic.
- Presence of a firearm in the home increases risk of firearm-related injury and death.

What this study adds

- This is the first study to assess specific motivations for firearm purchase in response to the COVID-19 pandemic.
- Findings can inform public health messaging to reduce firearm injuries during COVID-19 and other crises.

Correction notice This article has been corrected since it was first published. The 'Male' and 'Female' labels in Table 1 have been swapped, and the sentence '… and the high proportion of females suggesting our sample is not representative of most firearm owners.' has been removed.

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REFERENCES

1 Lang BJ, Lang M. *Pandemics, protests and firearms*, 2020.
2 Schleimer JP, Mccort CD, Pear VA, *et al*. Firearm purchasing and firearm violence in the first months of the coronavirus pandemic in the United States. *medRxiv* 2020.
3 Fowler KA, Dahlberg LL, Haileyesus T, *et al*. Childhood firearm injuries in the United States. *Pediatrics* 2017;140:e20163486.
4 Spicer RS, Miller TR. Suicide acts in 8 states: incidence and case fatality rates by demographics and method. *Am J Public Health* 2000;90:1885–91.
5 Azrael D, Cohen J, Salhi C, *et al*. Firearm storage in Gun-Owning households with children: results of a 2015 national survey. *J Urban Health* 2018;95:295–304.
6 Grossman DC, Mueller BA, Riedy C, *et al*. Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA* 2005;293:707–14.
7 Campbell JC, Webster D, Koziol-McLain J, *et al*. Risk factors for femicide in abusive relationships: results from a multisite case control study. *Am J Public Health* 2003;93:1089–97.
8 Galea S, Merchant RM, Lurie N. The mental health consequences of COVID-19 and physical distancing: the need for prevention and early intervention. *JAMA Intern Med* 2020. doi:10.1001/jamainternmed.2020.1562. [Epub ahead of print: 10 Apr 2020].
9 Reger MA, Stanley IH, Joiner TE. Suicide mortality and coronavirus disease 2019-A perfect storm? *JAMA Psychiatry* 2020. doi:10.1001/jamapsychiatry.2020.1060. [Epub ahead of print: 10 Apr 2020].
10 Huff C, Tingley D. "Who are these people?" Evaluating the demographic characteristics and political preferences of MTurk survey respondents. *Research & Politics* 2015;2:205316801560464.
11 Azrael D, Hepburn L, Hemenway D, *et al*. The stock and flow of U.S. firearms: results from the 2015 national firearms survey.. *RSF Russell Sage Found J Soc Sci* 2017;3:38–57.