

2020 United States COVID-19 Vaccination Preference (CVP) Study

Appendix 1. External Validity

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This appendix compares the respondent characteristics of the analytical sample with estimates taken from the 2019 American Community Survey (ACS) 1-year estimate for US adults (age 18 or older) conducted by the U.S. Census Bureau. Its results reflect the observable biases compared to the US general population to aid the interpretation of the results.

Understanding sampling frame, recruitment, and participation biases aids in the interpretation of the survey evidence. Respondents for this study were recruited from an online panel between November 9 to 12, 2020 to achieve specific eighteen demographic quotas (see protocol). Recruitment ended when a minimum number of respondents in each quota was achieved. Due to inherent biases in online panels, the respondents in each quota are not a representative sample of all US adults who might qualify, because some US adults do not participate in online panels. Nevertheless, the respondents in the analytical sample are diverse as shown in these tables, which allows inferences based on observable characteristics and behavioral responses within the analytical sample. Chi-square goodness-of-fit tests were conducted to produce the p-values between the completes and the ACS estimates.

Apart from the limitations of the sampling frame and recruitment, this appendix compares the self-reported characteristics of respondents who dropped out of the 2020 US CVP study before completion and those who completed the survey (i.e., analytical sample). After qualifying for the study, 376 respondents (33%) dropped out: 95 (8%) during the background section; 222 (19%) during the choice tasks; and 59 (5%) during the follow-up. Therefore, the respondents in the analytical sample may differ from the respondents in the panel more generally. Chi-square tests were conducted to produce the p-values between the drop-outs and completes.

All predictions based on the analytical sample must account for the observable and unobservable differences between the analytical sample and the general population of US adults. For example, this study did not include non-English speakers, persons with access to a tablet or computer, or persons in many institutional settings. Although sampling weights may be applied to the quotas, sampling weights cannot address unobservable biases due to the sampling frame, recruitment, and participation. Nevertheless, the predictions are largely generalizable to US adults who share the characteristics described in the analytical sample.

U.S. Census Bureau. (2020). 2019 American Community Survey 1-year Public Use Microdata Samples. Accessed on 10 November 2020. Retrieved from <https://www.census.gov/acs/>

Table 1. Demographic Characteristics

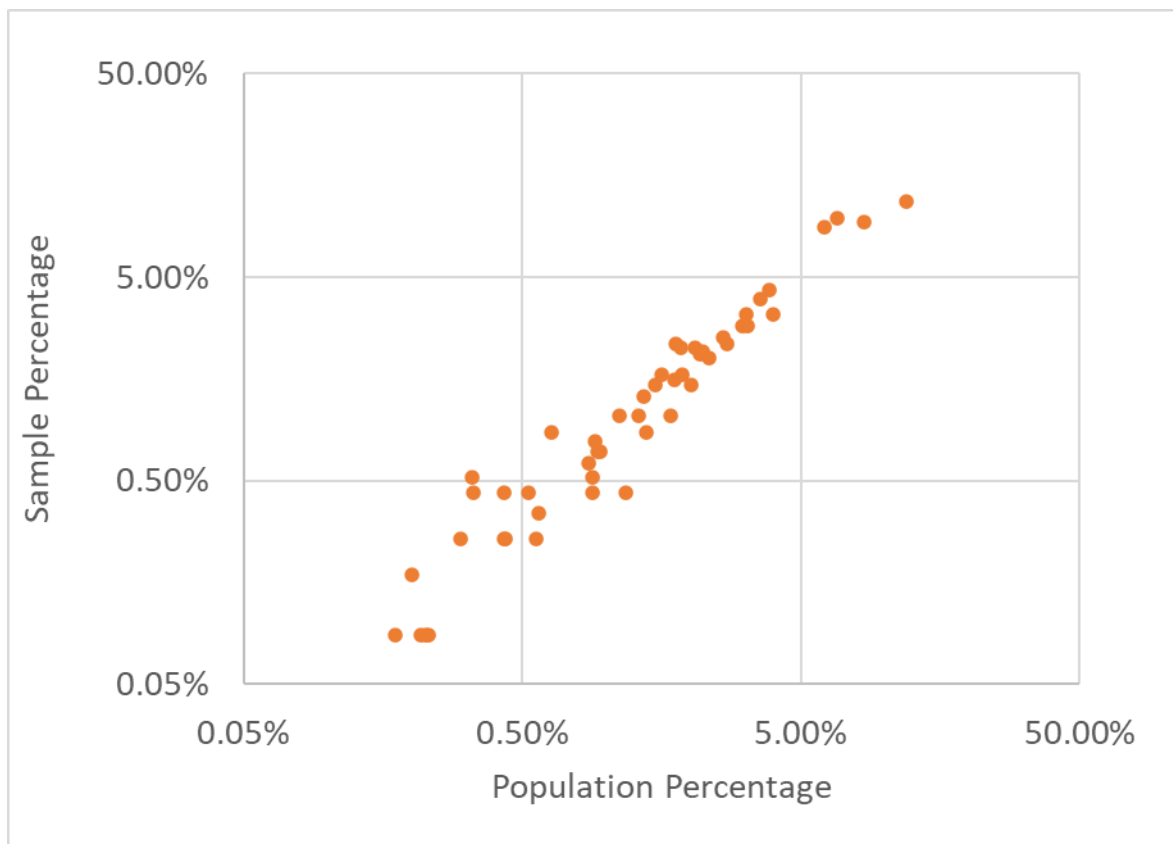
	dropouts	completes	p-value	ACS	p-value
	100.00 (376)	100.00 (1153)			
Age in years					
18 to 34	22.07 (83)	29.14 (336)	<0.001	29.75	<0.001
35 to 54	29.52 (111)	38.68 (446)		32.43	
55 and older	48.40 (182)	32.18 (371)		37.82	
Gender					
Male	46.81 (176)	48.74 (562)	0.158	48.68	0.993
Female	52.39 (197)	51.08 (589)		51.32	
other/prefer not to say	0.80 (3)	0.17 (2)			
Race					
White alone	74.47 (280)	76.67 (884)	0.502	73.61	0.004
Black or African American alone	12.23 (46)	12.06 (139)		12.45	
American Indian or Alaska Native alone	1.60 (6)	0.87 (10)		0.83	
Asian alone	6.38 (24)	6.24 (72)		5.92	
Native Hawaiian or Other Pacific Islander alone	0.00 (0)	0.26 (3)		0.18	
Some other race alone	3.72 (14)	2.17 (25)		4.56	
Two or more races	1.60 (6)	1.73 (20)		2.46	
Ethnicity					
Hispanic or Latino	11.70 (44)	12.75 (147)	0.594	16.40	0.001
Other	88.30 (332)	87.25 (1006)		83.60	

Table 2. Respondents by US State

	Drop-outs	Completes	p-value	ACS	p-value
	100.00 (376)	100.00 (1153)			
Alabama	1.06 (4)	1.47 (17)	0.169	1.50	0.026
Alaska	0.80 (3)	0.09 (1)		0.22	
Arizona	3.19 (12)	2.17 (25)		2.21	
Arkansas	0.80 (3)	0.78 (9)		0.91	
California	10.90 (41)	11.71 (135)		12.00	
Colorado	1.33 (5)	1.56 (18)		1.76	
Connecticut	1.86 (7)	1.04 (12)		1.11	
Delaware	0.80 (3)	0.26 (3)		0.30	
District of Columbia	0.27 (1)	0.09 (1)		0.23	
Florida	10.64 (40)	9.71 (112)		6.76	
Georgia	3.19 (12)	3.30 (38)		3.18	
Hawaii	0.80 (3)	0.26 (3)		0.44	
Idaho	0.80 (3)	0.43 (5)		0.52	
Illinois	4.52 (17)	4.34 (50)		3.86	
Indiana	1.60 (6)	1.47 (17)		2.02	
Iowa	0.53 (2)	0.69 (8)		0.95	
Kansas	1.33 (5)	0.61 (7)		0.87	
Kentucky	1.60 (6)	1.30 (15)		1.36	
Louisiana	0.53 (2)	0.87 (10)		1.40	
Maine	0.80 (3)	0.26 (3)		0.43	
Maryland	2.39 (9)	2.25 (26)		1.85	
Massachusetts	0.80 (3)	2.08 (24)		2.17	
Michigan	1.86 (7)	2.86 (33)		3.07	
Minnesota	1.60 (6)	1.04 (12)		1.70	
Mississippi	0.80 (3)	0.43 (5)		0.89	
Missouri	0.80 (3)	1.65 (19)		1.87	
Montana	0.00 (0)	0.52 (6)		0.33	
Nebraska	0.00 (0)	0.35 (4)		0.57	
Nevada	1.06 (4)	0.69 (8)		0.94	
New Hampshire	0.53 (2)	0.43 (5)		0.43	
New Jersey	2.66 (10)	2.34 (27)		2.72	
New Mexico	0.53 (2)	0.87 (10)		0.64	
New York	12.23 (46)	8.85 (102)		6.05	
North Carolina	3.72 (14)	2.86 (33)		3.21	
North Dakota	0.53 (2)	0.09 (1)		0.23	
Ohio	2.13 (8)	3.90 (45)		3.57	
Oklahoma	0.53 (2)	0.43 (5)		1.18	
Oregon	0.80 (3)	1.04 (12)		1.31	

Pennsylvania	3.99 (15)	3.30 (38)	3.98
Rhode Island	0.27 (1)	0.43 (5)	0.34
South Carolina	2.13 (8)	1.65 (19)	1.58
South Dakota	0.00 (0)	0.00 (0.00)	0.23
Tennessee	0.27 (1)	2.25 (26)	2.08
Texas	5.59 (21)	9.37 (108)	8.46
Utah	1.06 (4)	0.52 (6)	0.89
Vermont	0.27 (1)	0.17 (2)	0.20
Virginia	1.86 (7)	2.52 (29)	2.62
Washington	1.86 (7)	1.99 (23)	2.33
West Virginia	0.80 (3)	0.26 (3)	0.56
Wisconsin	1.33 (5)	2.34 (27)	1.79
Wyoming	0.27 (1)	0.09 (1)	0.17

Figure 1. Concordance between the analytical sample and population percentage by US state*



* Each dot represents a US state or the District of Columbia. The axes are on a log scale to better illustrate concordance. South Dakota is not shown, because its sample percentage is zero.

Table 3. SES characteristics within the analytical sample

	Completes	ACS	p-value
	100.00 (1153)		
Marital status			
Married	53.69 (619)	53.07	0.090
Divorced	8.67 (100)	11.47	
Separated	1.91 (22)	1.89	
never married	33.04 (381)	33.56	
don't know/not sure/refuse	2.69 (31)		
Educational attainment			
Less than 9th grade	0.43 (5)	4.26	<0.001
9th to 12th grade, no diploma	1.56 (18)	5.78	
High school graduate	12.58 (145)	23.69	
Some college, no degree	15.18 (175)	17.59	
Associate's degree	9.45 (109)	7.59	
Bachelor's degree	49.61 (572)	17.91	
Graduate or professional degree	5.03 (58)	11.27	
Age 18 to 24 years	6.16 (71)	11.9	
Household income in 2019			
Less than \$10,000	11.71 (135)	5.80	<0.001
\$10,000 to \$49,999	23.24 (268)	32.61	
\$50,000 to \$74,999	17.61 (203)	17.37	
\$75,000 to \$99,999	17.17 (198)	12.83	
\$100,000 to \$149,999	18.65 (215)	15.73	
\$150,000 or more	11.62 (134)	15.65	
Work status in the last week*			
Working	47.96 (553)		
employed, not working	6.16 (71)		
looking for work	8.93 (103)		
not working, not looking	9.80 (113)		
Retired	23.50 (271)		
don't know/not sure/refuse	3.64 (42)		
Current community*			
urban, 1,000,000 persons or more	16.05 (185)		
urban, less than 1,000,000 persons	19.17 (221)		
Suburban	47.79 (551)		
Rural	15.87 (183)		
don't know/not sure/refuse	1.13 (13)		

* Work status and current community is not part of the 2019 ACS.

Table 5. General health characteristics of the analytical sample

	completes
	100.00 (1153)
EQ-5D-5L	
No health problems	41.89 (483)
One or more problems	58.11 (670)
EQ-VAS	
90 to 100 (best health imaginable)	30.44 (351)
80 to 89	26.97 (311)
70 to 79	18.73 (216)
60 to 69	9.71 (112)
1 (worst health imaginable) to 59	14.14 (163)

Table 6. Risk for COVID-19 within the analytical sample*

	Completes	Essential workers	High risk	Reduced access	None	p-value
Critical populations:	100.00 (1153)	16.05 (185)	29.75 (343)	2.69 (31)	51.52 (594)	
None of these statements	53.25 (614)	58.92 (109)	15.16 (52)	25.81 (8)	74.92 (445)	<0.001
a person age 65 years or older	24.11 (278)	4.86 (9)	49.27 (169)	9.68 (3)	16.33 (97)	<0.001
a person with diabetes, a heart condition, or severe obesity	13.01 (150)	17.30 (32)	27.41 (94)	12.90 (4)	3.37 (20)	<0.001
a person with asthma, breathing difficulties, or lung problems	10.67 (123)	9.73 (18)	20.12 (69)	25.81 (8)	4.71 (28)	<0.001
a person with a severe illness placing them at higher risk, such as a weakened immune system	8.59 (99)	11.35 (21)	17.49 (60)	16.13 (5)	2.19 (13)	<0.001
a person who resides in a nursing home or long-term care facility	3.47 (40)	5.41 (10)	5.25 (18)	6.45 (2)	1.68 (10)	0.008
a person with chronic kidney or liver disease	2.78 (32)	2.70 (5)	5.25 (18)	12.90 (4)	0.84 (5)	<0.001
a woman who is pregnant or breastfeeding	0.35 (4)	0.54 (1)	0.29 (1)	0.00 (0)	0.34 (2)	0.952

* The definitions of critical populations and at-risk groups were taken from the CDC and self-reported (see screenshots of the survey instrument). For this table, respondents were categorized into critical populations hierarchically (e.g., high risk excludes essential workers).

Table 7. Diagnosis and symptoms of COVID-19*

	Completes	Tested positive	Recommended to self-quarantine	None	p-value
Clinical diagnosis:	100.00 (1153)	3.30 (38)	11.62 (134)	85.08 (981)	
no symptoms	71.12 (820)	42.11 (16)	21.64 (29)	79.00 (775)	<0.001
cough	11.01 (127)	31.58 (12)	44.03 (59)	5.71 (56)	<0.001
fever	10.67 (123)	42.11 (16)	50.00 (67)	4.08 (40)	<0.001
headache	7.89 (91)	18.42 (7)	26.87 (36)	4.89 (48)	<0.001
congestion or runny nose	6.85 (79)	21.05 (8)	12.69 (17)	5.50 (54)	<0.001
fatigue	6.16 (71)	7.89 (3)	15.67 (21)	4.79 (47)	<0.001
muscle or body aches	5.98 (69)	13.16 (5)	19.40 (26)	3.87 (38)	<0.001
shortness of breath or difficulty breathing	3.99 (46)	15.79 (6)	12.69 (17)	2.34 (23)	<0.001
diarrhea	3.73 (43)	7.89 (3)	11.94 (16)	2.45 (24)	<0.001
sore throat	3.12 (36)	0.00 (0)	13.43 (18)	1.83 (18)	<0.001
nausea or vomiting	2.43 (28)	10.53 (4)	9.70 (13)	1.12 (11)	<0.001
new loss of taste or smell	2.17 (25)	7.89 (3)	9.70 (13)	0.92 (9)	<0.001

* The definitions of clinical diagnosis and symptom were taken from the CDC and self-reported (see screenshots). For this table, respondents were categorized by clinical diagnosis hierarchically (e.g., those recommended to self-quarantine excludes those who tested positive).