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Understanding Demand for COVID-19 Antibody Testing

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Demand for COVID-19 Antibody Testing, and Why It Should Be Free

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Abstract

We study individual demand for COVID-19 antibody tests in an incentivized study on a representative sample of the US population. Almost 2,000 participants trade off obtaining an at-home test kit against money. At prices close to zero, 80 percent of individuals want the test. However, this broad support of testing falls sharply with price. Demand decreases by 19 percentage points per $10 price increase. Demand for testing increases with factors related to its potential value, such as age, increased length and strength of protective immunity from antibodies, and greater uncertainty about having had the virus. Willingness to pay for antibody tests also depends on income, ethnicity and political views. Trump-supporters demonstrate significantly lower willingness to pay for testing. Black respondents, even if critical of Trump's approach to the crisis, pay less for testing than white and Hispanic respondents. If policy makers want a broad take-up of testing, the results suggest that tests should be for free.

JEL: D81, D91, I12, I18

Keywords: Coronavirus, COVID-19, Antibody Tests, Testing Markets, Information Preferences, Beliefs, Uncertainty

The COVID-19 pandemic has led to one of the largest death tolls in history and an unprecedented shutdown of economic activity worldwide. Having reduced the spread of the virus, some governments are starting to carefully open up again. As a major part of the return to "new normal", testing is discussed in many countries, e.g., Germany (Dorn et al., 2020) or the US (Altmann et al., 2020). Forcing such tests or requiring "immunity passports" is also discussed yet highly controversial (Kofler and Baylis, 2020; Miller, 2020; Studdert and Hall, 2020). In a country of over 300 million inhabitants such as the US, knowledge about antibody status may ultimately depend on individuals' willingness to test themselves privately.

This paper measures individual willingness to pay for private COVID-19 antibody tests. We conducted an incentivized study on a representative sample of almost 2,000 U.S. participants. When the study was launched, no at-home testing kit had been approved by the U.S. Food and Drug Administration (FDA) (U.S. FDA, 2020). Yet, at-home antibody tests were expected to become available in upcoming weeks. We confronted participants with different scenarios. In each of them, we elicited willingness to pay for antibody testing. A random subset of those who chose the test will actually receive it, once tests are available.

Four in five individuals would like to get tested, if it was basically for free. Yet, this changes drastically with price. For example, demand drops by half when the price of the test is $20 or more. Thus, the data demonstrate that price plays an important role.

Demand for the test is influenced by test value and by experiences (Malmendier and Nagel, 2016). Older people and those who have experienced more deaths due to COVID-19 demand the test more frequently. Beliefs about antibody status also matter for demand. It has been argued that people may overestimate chances of having had COVID-19 (Mandavilli, 2020). Our data reveals that indeed, compared to the US Center for Disease Control and Prevention (CDC) estimates, most people tend to overestimate chances of having been infected. Yet most people feel uncertain. Test demand increases with this uncertainty.

Several personal factors affect the demand for testing as well, such as income, age, ethnicity, and political views. We document that people of black ethnicity have significantly less demand. They are willing to pay approximately $5 less than whites for testing, even though they may be at higher risk of infection (Hlavinka, 2020). The data also show that Trump-supporters demonstrate lower test demand, while those who approve of Dr. Fauci's performance display significantly higher interest.

Many studies on the prevalence of COVID-19 antibodies in populations so far rely on volunteers. Participation may often come with an effort and in this sense, with a cost. Thus, our data indicate that studies based on volunteers will unlikely lead to a representative picture

of antibody status in a society (e.g., Vogel, 2020). Preferences for testing vary with many socio-economic characteristics. Even when controlling for some, such as age, gender and ethnicity, other factors such as supporting Trump's approach in this crisis will unlikely be controlled for. For instance, supporters of Trump's approach may not only display a lower interest in testing, but also protect themselves less from COVID-19. If they take the disease less seriously but also test less, voluntary testing will systematically underestimate the prevalence of infection rates in the US population.

Existing research has demonstrated that in some cases people avoid medical testing. For example, people at risk of the severe genetic Huntington's Disease often opt against testing (see Caplin and Leahy 2001, Oster et al. 2013, Schweizer and Szech 2018). The same is true for people at risk of HIV, other STDs, or Alzheimer's (see Caplin and Eliaz 2003, Ganguly and Tasoff 2017, Hertwig and Engel 2016, Golman et al. 2017). In light of these findings, it may be good news that four out of five US citizens want an antibody test for COVID-19 when it comes for free. Thunström et al. (2020a, b) find similar willingness to get tested for the disease or vaccine take-up in hypothetical (and costless) decisions.[1] Yet, our results demonstrate that this demand falls sharply with price. This is important for policymakers that are "opening up" their economies and societies. If they want a broad take-up of testing, it should be free.

Experimental Design

Our study is based on 1,984 participants, selected to represent the US population, who took part in our anonymous study. Each individual decided, in eight different testing scenarios, whether they preferred an antibody at-home testing kit or a voucher. The value of the voucher varied from $0.50 to $30 in each scenario, and came in the form of an Amazon gift card. Across scenarios, the protective immunity of antibodies varied. A positive test result could lead to a likelihood of protection from COVID-19 with 50%, 70%, 90%, or 99% chance. The expected length of protection also varied. It was either 3, 6, or 12 months. Eight out of the 12 possible testing scenarios were randomly chosen and presented to the individual in random order. Individuals knew that about 1 in 25 of them would be chosen randomly and one of their decisions would be implemented. We explained that their decisions would be implemented, i.e. the test, if chosen, would be delivered to them, based on the scenario that

[1] This is reassuring news in the sense that low vaccine take-up is common for influenza, even if it is offered for free (Beshears et al. 2016).

most closely fits the tests that become available in upcoming weeks. At the time of the study, it was uncertain which scenario would fit best to the test that would eventually become available on the market, and the protective immunity a positive test result may provide. Therefore, all scenarios were potentially relevant based on existing research (Altmann et al., 2020; Sheridan, 2020). We calculate each individual's willingness to pay for the test in each scenario based on the first voucher value for which the individual chooses the voucher over the test. This provides a maximum willingness to pay. More than 94% of individuals make consistent decisions and the analyses focus on them. After making their testing decisions, individuals responded to several questions about their beliefs and experiences with COVID-19, and individual characteristics. They were also presented with the choice between 2 antibody tests, instead of 1, and vouchers ranging between $0.50 and $75. It took about 12 minutes to participate in our study. Data elicitation took place from May 6 to May 18, 2020. The experiment was pre-registered on Aspredicted.org (details in SOM).

Results

Most people express an interest in testing for antibodies. About 80 percent of individuals demand a test when it costs less than $2. This result is robust to the different strength and length of protective immunity a positive test result may provide. As price increases demand drops, down to less than 20% when the price is $30 and the chance of protective immunity is rather low, 50% (see Figure 1). On average, a $10-dollar increase in the cost of the antibody test reduces demand by 19 percentage points (see Table 1, $p<0.001$).

Increases in the length of the protective immunity offered by the test increase demand. As shown in Table 1, an increase in the length of immunity of 1 month increases test demand by 0.8 percentage points. In other words, people pay $0.95 more for a test if a positive result indicates protection from COVID-19 for 12 months than for 6 months. The increase in willingness to pay is not linear: it is stronger when immunity increases from 3 to 6 months ($1.45) than when immunity increases from 6 to 12 months. This suggests that, given the current ambiguity on what the next months may bring, individuals mostly focus on the near future (Laibson, 1997).

Protection levels affect demand. An increase of 1 percentage point in the chance of protection increases demand by 0.3 percentage points. For example, people pay $0.90 more for a test, if a positive test result leads to a protection level of 99 percent than of 90 percent. For comparison, according to the CDC, the vaccine against measles has led to more than a 99 percent reduction of cases (Center for Disease Control and Prevention 2019). In contrast,

the flu vaccine needs to be adapted to each new flu season and often displays an effectiveness of about 50 percent (Center for Disease Control and Prevention 2020). Our results demonstrate that for COVID-19, people care a lot about protection levels.

Using our elicitation method, we can further compare how individuals trade off increases in length and strength of protection. An increase in the chance of protection of 27 percentage points is equivalent to an increase in the length of protection of 10 months. Increases in strength and length of protective immunity also decrease the effect of price on demand (see columns (2)-(4) of Table 1). For example, even at a price of $30, 50% of individuals demand the test when the length of immunity is 12 months and the chance of protection is very high, i.e., 99%.

[INSERT FIGURE 1 and TABLE 1 HERE]

We also evaluate demand when individuals are offered two tests instead of one. If the price of two tests is low, as with one test, most individuals choose the tests. As the price increases to $50 or $75, demand drops to 44% and 36%, respectively. This reveals that a minority of people would be willing to pay prices above $75 for testing (see detailed results in the SOM). About 33 percent of individuals say they would use both tests on themselves, while 63 percent say they would pass one on to another person.

Demand for the tests varies strongly by demographic. Figure 2 shows the maximum willingness to pay for an antibody test, averaged across scenarios. As shown in Figure 2 and columns (3)-(4) of Table 1, there is a significant increase in demand in older individuals, consistent with older individuals being at higher risk from death and other complications from COVID-19. Across ethnicities, demand is significantly lower for non-Hispanic blacks, compared to whites, and also to Hispanic individuals, even when controlling for income and other characteristics. On average, non-Hispanic blacks demand the test 11 to 13 percentage points less than whites and are willing to pay $4.10 less than whites ($15.28 compared to $19.38). Bad experiences with past medical issues could be a reason for this low interest (Obermeyer et al. 2019). Yet research suggests that they may be at higher risk from COVID-19, not only for socio-economic, but also for genetic reasons (Cao et al., 2020). An analysis of past pandemics going back almost 1,000 years demonstrates that pandemics typically increase inequality (Wade, 2020). Policy makers should be aware that also in this pandemic inequality may rise.

As income increases, individuals are willing to pay more for the test, as one would expect as the price becomes a less important part of the household's budget. Individuals' work situation does not significantly affect demand. Relative to those who work from home (33% of the sample), those who are essential workers or lost their job due to COVID-19 do not exhibit significantly different demand. Only those who are not employed, such as students or retired individuals, exhibit a weakly lower demand.

[INSERT FIGURE 2 HERE]

A central concern is that individuals overestimate their infection status, misattributing colds, allergies or regular flu to COVID-19. The New York Times stated in May that almost everybody in New York believed they had COVID-19 already (Mandavilli, 2020). In our representative sample of the US, we find that on average, people believe they had been infected already with a likelihood of 25 percent. This is very likely an over-estimate (see SOM for a US-state specific comparison to CDC estimates). Yet few people are certain or almost certain they have had COVID-19. Much more common are beliefs of 0 (19% of the sample), 20 (the median is 18), or 50 percent (see Figure 3).

Beliefs about infection of individuals can be compared with prevalence rates estimated by the Center for Disease Control and Prevention (CDC). We use the data as of May 10, 2020, published by the CDC for each state (see SOM for detailed results by state). The CDC provides an estimated range of percentage of positive cases. This range can be 0-5%, 6-10%, 11-20%, 21-30%, 31-40%. Comparing individual responses across states, we find that in most states (86%), the average believed status of infection is above the CDC estimated range. For example, while the estimated range of positive cases is 6-10% in California, the average belief of participants in California regarding the likelihood that they have had COVID-19 is 25%. In 10% of the states, beliefs coincide with the CDC range, while in 4% of the states, individuals report a belief below that of the CDC estimated range. These results suggest that, while a majority of individuals believe that the chance they have had the virus is low, it may still be above official estimates.

[INSERT FIGURE 3 HERE]

Consistent with standard information economics, we find that willingness to pay for testing is significantly related to individuals' self-reported beliefs about their infection status.

Those who are certain to have had or not have had the virus report the lowest willingness to take the test. The more uncertain individuals are about their infection status, the more they are willing to pay for testing as shown in Figure 3. Thus, patterns are consistent with individuals perceiving the test as providing instrumental information (Schweizer and Szech, 2018). We also elicited individuals' beliefs that others in close proximity had been infected. This belief is highly correlated with own belief (Spearman correlation coefficient = 0.72, p-value<0.001) and does not have an independent effect on demand for the test.

Individuals' willingness to pay for the test is also related to their personal knowledge of people infected with the virus. The number of deaths in the individuals' social circle is related to their demand for the test (column (4) of Table 1). While a relationship can also be found when considering COVID-19 cases instead of deaths, the relationship is generally weaker suggesting that the largest driver of willingness to get tested is deaths, the worst outcome, rather than infections. Not surprisingly, those who have already been tested for COVID-19, approximately 4% of the sample, display a lower demand for the test. At the same time, those individuals who report being worried or very worried about COVID-19 report a higher demand.

Decisions about taking an antibody test may also depend on the understanding of probability values and updating information in a statistically correct way. A concern has been that antibody tests that exhibit low sensitivity, i.e., often showing a positive result for antibodies while the individual does not have any, can mislead people if they cannot account for the error rate of tests (Mandavilli, 2020; Hagmann et al., 2020). We therefore included four questions on statistical knowledge. Two questions were on probability estimates (regarding the chances of particular outcomes of a die roll). Overall, 42% of participants provided a correct answer to both questions, 40% provided a correct answer to 1 question, and 18% did not answer either question correctly. We also added two incentivized questions to measure failures in Bayesian updating (Tversky and Kahnemann, 1974). These questions presented individuals with antibody tests that had an accuracy of either 90% or 95% (i.e., correctly detected antibodies with 90% or 95% chance), and a prevalence of COVID-19 infections of 5% or 20%. Each person saw two randomly drawn scenarios and was incentivized to correctly guess how likely a positive test result indicated the presence of antibodies. A common mistake in such questions is to ignore the "base rate" and report an accuracy equivalent to 90 or 95%. In the sample, 35% of participants exhibit Bayes rate neglect (Tversky and Kahnemann, 1974), while 42% of participants provide an answer that is within 10 percentage points of the correct answer. We aggregate answers to the four

questions on statistical knowledge into an index, adding all correct responses and standardizing it. Statistics knowledge is related to a stronger demand of the test. A one standard deviation increase in statistics knowledge is related to an increase in demand of 1.5 percentage points. This indicates that, despite the fact that some individuals understand the potential limitations of antibody tests very well, they value them (see column (4) of Table 1).

In addition to personal characteristics and beliefs, an individual's perception of how public authorities deal with the pandemic may affect test demand (Briscese et al., 2020; Fetzer et al., 2020). Role models and political preferences may have significant influence (e.g., Allcott et al., 2020). Therefore, individuals rate the performance of Dr. Fauci and of President Trump during the Coronavirus crisis from 0 (extremely bad) to 10 (extremely good). Individuals who report a high degree of approval of Dr. Fauci exhibit a much higher willingness to pay for antibody tests. By contrast, those who like the approach of President Trump to this crisis, exhibit a significantly lower willingness to pay for testing (see Figure 4 Panel A). This result is found for all ethnicities, except for Black respondents, who always display the same (and low) willingness to pay for testing.[2] It is consistent with ongoing research comparing individual perceptions over time (Fetzer et al., 2020) and political preferences (Allcott et al., 2020). It also shows that within the US, perceptions of competence among public authorities and partisan beliefs could significantly influence individual behaviors during the pandemic.[3] Trump-supporters may also protect themselves less from infection. If so, studies based on volunteers may systematically underestimate the status of antibodies within society.

[INSERT FIGURE 4 HERE]

The value of the test also ultimately relies on individuals' planned use of the information that they have (or do not have) antibodies. If individuals took the test and it detected antibodies, they indicated that they would engage in indoors and outdoors social activities, visit restaurants and malls, and return to work over 20% of the time. The largest fraction (over 40%), however, indicated that they would not engage in any of these "risky" behaviors. This reveals that, for a substantial fraction of people, knowledge that they had antibodies

[2] Blacks show the lowest support for President Trump in this crisis, giving him a score of 2.37, compared to the average of 3.96 (see Figure 4 Panel B).
[3] Of course, here, we cannot exclude reverse causality in the sense that people who do not like testing approve more of President Trump.

would not be sufficient to lead to riskier, social behaviors.[4] This suggests significant caution among individuals and perhaps assuages the concern that positive antibody test results could be interpreted as "freedom" from social distancing measures by most people.

Conclusion

Our results demonstrate that most people want an antibody test. Four in five US citizens demand a test if prices are close to zero. Yet this demand drops sharply as prices increase. At a cost of $20, demand roughly drops by half. Other hard-hit countries are currently aiming to provide free antibody testing (Nikolskaya and Voronova, 2020). In addition to increasing the supply of such tests (e.g., Kofler and Baylis, 2020), our data indicate that free testing could be a wise choice. It may even make sense to discuss paying people for getting tested, or other measures to bring participation rates closer to 100 percent.

[4] Yet, potentially, having antibodies may ease some individuals' mind in the sense that they may be better protected against a new infection. Further, the likelihood to pass it on to others, should they become infected again, may be lower.

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Demand for COVID-19 Antibody Testing, and Why It Should Be Free

by Marta Serra-Garcia and Nora Szech

Figures and Tables

May 27, 2020

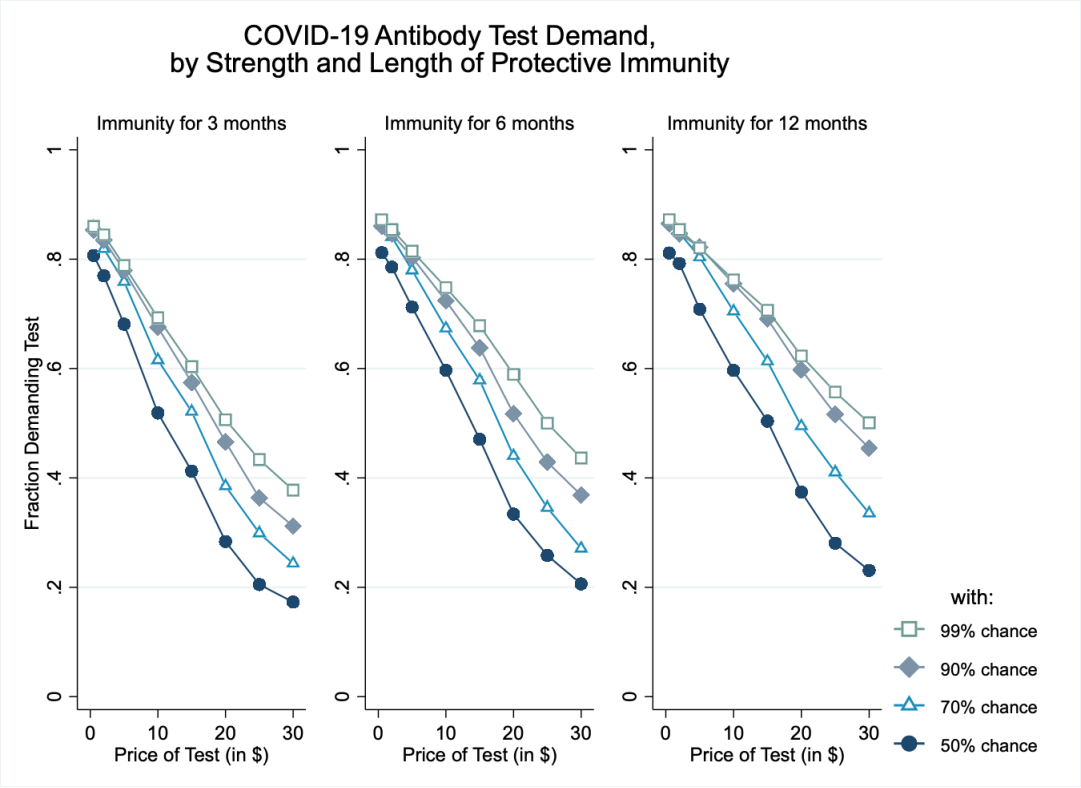


Figure 1. This figure shows the fraction of respondents choosing the COVID-19 antibody tests for each price. Demand is shown for the cases in which protective immunity lasts 3 months (left), 6 months (center), and 12 months (right). In each case, the strength of protective immunity varies between a 99%, 90%, 70% or 50% chance that antibodies offer protection against COVID-19.

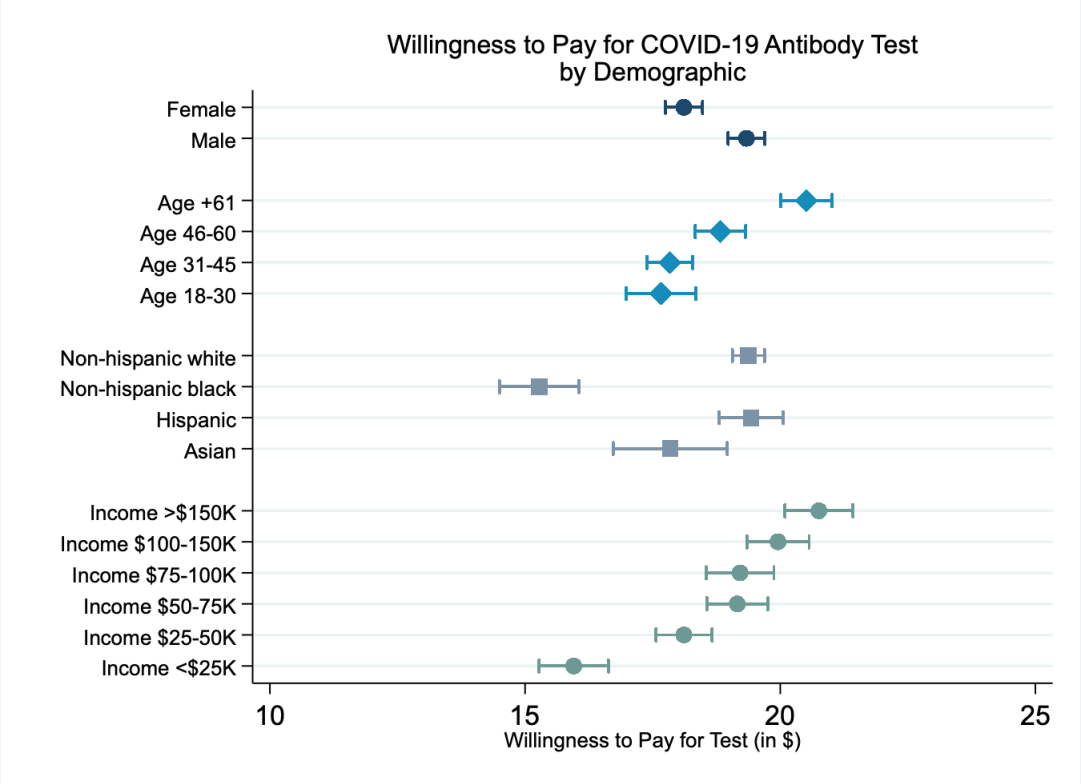


Figure 2. This figure displays the average willingness to pay for COVID-19 antibody tests, by gender, age, ethnicity and household income. The shares of each demographic characteristic are representative of the US population. The horizontal bars around each average represent $\pm$ 1 SE.

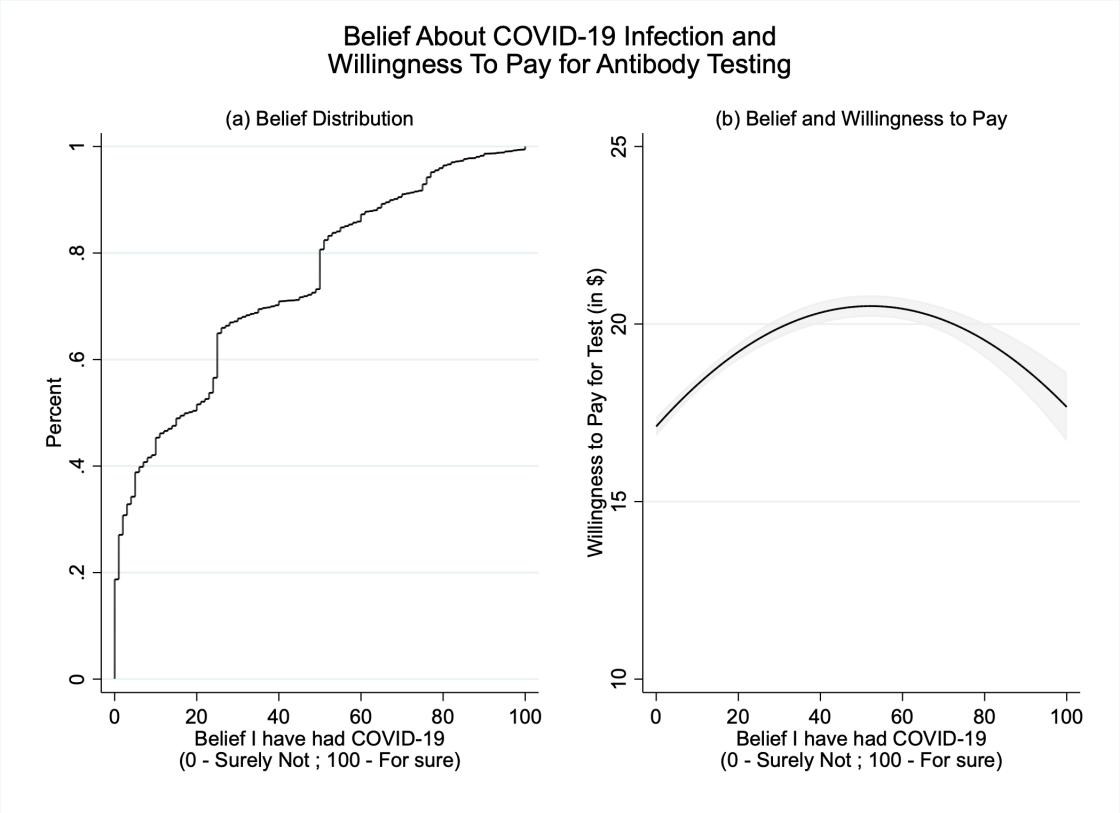
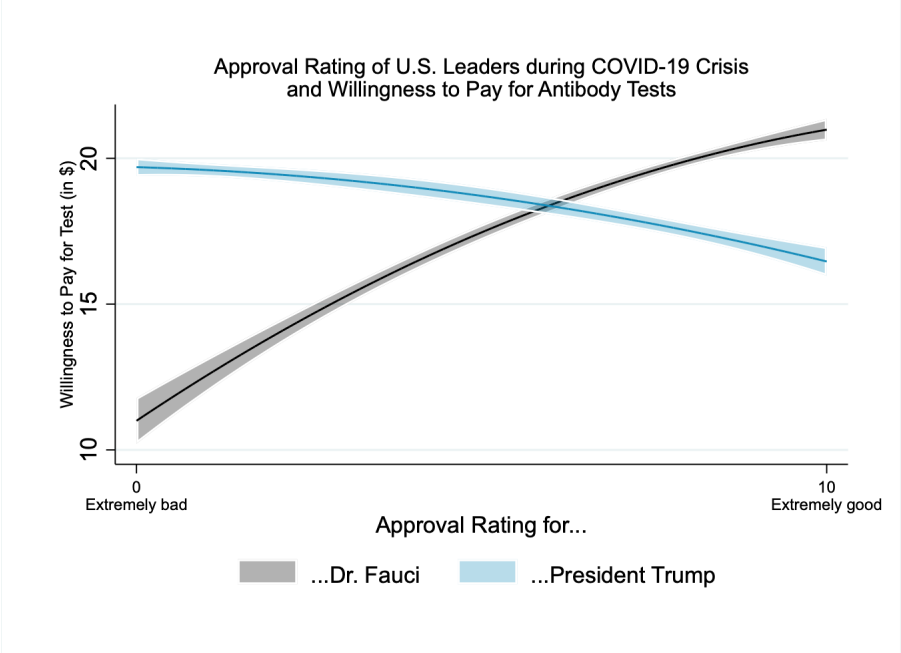


Figure 3. This figure exhibits the distribution of beliefs about COVID-19 infection status, as of May 6-18 of 2020 (left panel), and the relationship between their belief and individuals' willingness to pay for COVID-19 antibody tests (right panel). The black line is a polynomial fitted regression for the individual's average willingness to pay, across all scenarios, as a function of the individual's belief about COVID-19 status with 95% confidence interval (shaded grey area).

Panel A



Panel B

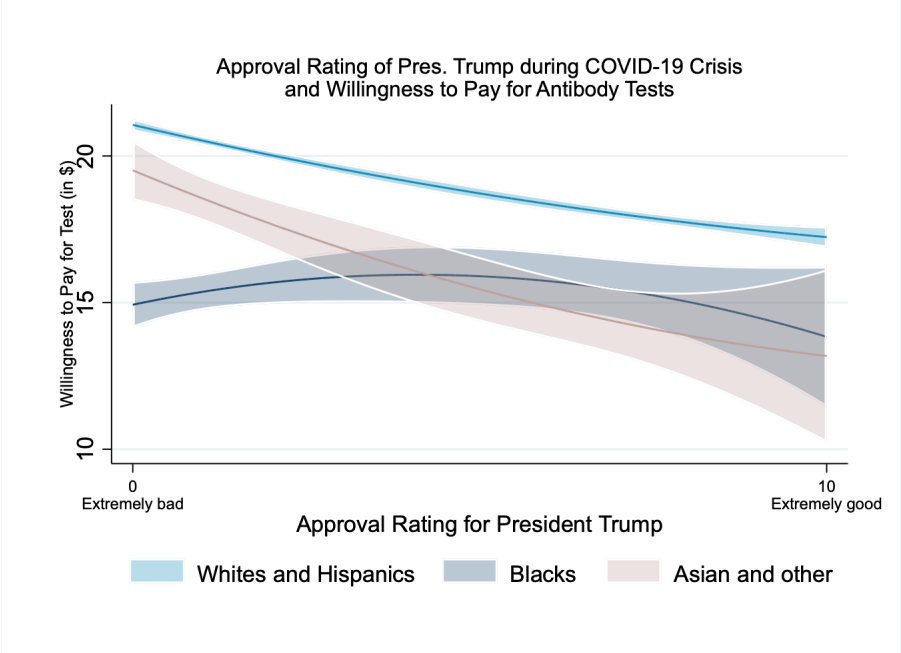


Figure 4. Panel A shows the results of polynomial fitted regressions for the individual's average willingness to pay for antibody tests, across all scenarios, as a function of the individual's approval of President Trump's (in blue) and Dr. Fauci's (in black) performance during the COVID-19 crisis. Panel B displays the results of polynomial fitted regressions for the individual's average willingness to pay for antibody tests, across all scenarios, for different ethnicities as a function of the individual's approval of President Trump's performance during the COVID-19 crisis. The shaded areas in each case indicate 95% confidence intervals.

Table 1: Willingness to Get COVID-19 Antibody Test

	Antibody Test Demand							
	(1)		(2)		(3)		(4)	
Price of Test	-0.019***	(0.000)	-0.032***	(0.001)	-0.032***	(0.001)	-0.032***	(0.001)
Months of immunity	0.008***	(0.001)	0.002***	(0.001)	0.002***	(0.001)	0.002***	(0.001)
Chance of immunity (0-100)	0.003***	(0.000)	0.001***	(0.000)	0.001***	(0.000)	0.001***	(0.000)
Price X Months of immunity			0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)
Price X Chance of immunity			0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)
Age					0.003***	(0.001)	0.002***	(0.001)
Female					0.010	(0.016)	0.006	(0.015)
Race: hispanic					0.016	(0.020)	0.005	(0.020)
Race: non-hispanic black					-0.115***	(0.024)	-0.131***	(0.024)
Race: asian or other					-0.052**	(0.027)	-0.081***	(0.026)
College-level education or higher					0.022	(0.016)	0.011	(0.015)
Household income>75k in 2019					0.033**	(0.015)	0.030**	(0.015)
Essential worker					-0.023	(0.021)	-0.010	(0.020)
Lost job due to COVID-19					-0.013	(0.025)	-0.003	(0.024)
Not employed (e.g., student, retired)					-0.040**	(0.019)	-0.030*	(0.018)
Other work situation					0.008	(0.029)	0.008	(0.028)
Chance I have had COVID19 already (0-100)							0.001***	(0.000)
Tested for COVID19							-0.085**	(0.034)
Worried about becoming infected with COVID19							0.051***	(0.014)
Nr. of friends died from COVID19							0.020***	(0.007)
Predicted Deaths from COVID19 (Standardized)							-0.014*	(0.007)
Statistical Sophistication Score (Standardized)							0.014**	(0.007)
Approval score for Pres. Trump during COVID19 crisis							-0.010***	(0.002)
Approval score for Dr. Fauci during COVID19 crisis							0.022***	(0.003)
Constant	0.550***	(0.013)	0.732***	(0.016)	0.606***	(0.034)	0.474***	(0.038)
Observations	126016		126016		126016		126016	
Individuals	1984		1984		1984		1984	
R^2	0.172		0.176		0.193		0.225	

Notes: This table shows linear probability models on the decision to demand the antibody test (0/1), as a function of test price, length and chance of protective immunity, in addition to other individual characteristics and beliefs (columns 3-4).

Robust standard errors, clustered at the individual level, reported in parentheses. ***,**,* indicates significance at the 1%, 5% and 10% levels, respectively.

Supplementary Online Materials

Contents

A Methods: Additional Details

The study was designed to recruit approximately 2,000 respondents, whose gender, age, ethnicity and income is representative of the US population, based on the US Census (2015 ACS PUMs: https://www.census.gov/programs-surveys/acs/data/pums.html). The study was conducted completely online. Respondents provided their informed consent, and answered four questions regarding their gender, age, ethnicity and income for quota representation purposes. A captcha verification question was included initially to ensure human respondents were taking the survey. The instructions were presented in simple language (see Online Appendix D), and a question to check reading and understanding was included at the end. Only respondents who answered this question correctly completed the remainder of the study.

The study was launched in collaboration with market research company, Qualtrics Panel. Recruitment of participants, distribution of antibody tests and monetary payments is implemented by our partner. To ensure data quality, our partner excluded respondents who completed the study in less than a third of the average time taken to complete the survey, and those who provided gibberish answers to the open-ended questions at the end of the study.

The design of the experimenter was pre-registered in AsPredicted.org, as shown in Online Appendix C. The questions presented to respondents are presented in Online Appendix D.

B Additional Results

B.1 Descriptive Statistics of the Sample

Table B.1: Sociodemographic Characteristics of the Sample

	(1) mean
Female	0.51
Age	47.33
Race: non-hispanic white	0.61
Race: non-hispanic black	0.13
Race: hispanic	0.18
Race: asian or other	0.08
Household income>75k in 2019	0.42
High school or less	0.28
College-level education or higher	0.67
Lives in city	0.31
Lives in suburban area	0.51
Lives in rural area	0.18
Democrat	0.39
Republican	0.27
Independent	0.34
Essential worker	0.18
Working from home	0.29
Lost job due to COVID-19	0.12
Not employed (e.g., student, retired)	0.33
Other work situation	0.08
Observations	1984

Table B.2: Beliefs and Experiences during COVID-19 Crisis

	(1) All mean
Tested for COVID19	0.04
Chance I have had COVID19 already (0-100)	25.44
Chance close others have had COVID19 already (0-100)	25.55
COVID19 Dangerous due to underlying conditions	0.24
Worried about becoming infected with COVID19	0.36
Nr. of friends infected with COVID19	0.79
Nr. of friends died from COVID19	0.18
Predicted Deaths from COVID19 within 1 month	118802.73
Approval score for President Trump during COVID19 crisis	3.96
Approval score for Dr. Fauci during COVID19 crisis	6.80
Observations	1984

B.2 Demand and Willingness to Pay

Table B.3: Antibody Test Demand, by Price, Length and Strength of Immunity

	(1) All mean	(2) P=0.50 mean	(3) P=2 mean	(4) P=5 mean	(5) P=10 mean	(6) P=15 mean	(7) P=20 mean	(8) P=25 mean	(9) P=30 mean
3 month - 50%	0.48	0.81	0.77	0.68	0.52	0.41	0.28	0.21	0.17
6 month - 50%	0.52	0.81	0.79	0.71	0.60	0.47	0.33	0.26	0.21
12 month - 50%	0.54	0.81	0.79	0.71	0.60	0.50	0.37	0.28	0.23
3 month - 70%	0.56	0.86	0.82	0.76	0.62	0.52	0.39	0.30	0.24
6 month - 70%	0.60	0.86	0.84	0.78	0.67	0.58	0.44	0.35	0.27
12 month - 70%	0.63	0.87	0.85	0.80	0.70	0.61	0.49	0.41	0.34
3 month - 90%	0.61	0.85	0.83	0.78	0.68	0.57	0.47	0.36	0.31
6 month - 90%	0.65	0.86	0.85	0.80	0.72	0.64	0.52	0.43	0.37
12 month - 90%	0.69	0.86	0.85	0.82	0.75	0.69	0.60	0.52	0.45
3 month - 99%	0.64	0.86	0.84	0.79	0.69	0.60	0.51	0.43	0.38
6 month - 99%	0.69	0.87	0.85	0.81	0.75	0.68	0.59	0.50	0.44
12 month - 99%	0.71	0.87	0.85	0.82	0.76	0.71	0.62	0.56	0.50
Observations	15872	1984	1984	1984	1984	1984	1984	1984	1984

Table B.4: Antibody Test Willingness to Pay, by Length and Strength of Immunity

	(1) 50% immunity mean	(2) 70% immunity mean	(3) 90% immunity mean	(4) 99% immunity mean
3-month immunity	14.39	17.14	18.62	19.61
6-month immunity	15.82	18.41	20.03	21.24
12-month immunity	16.32	19.53	21.50	21.94

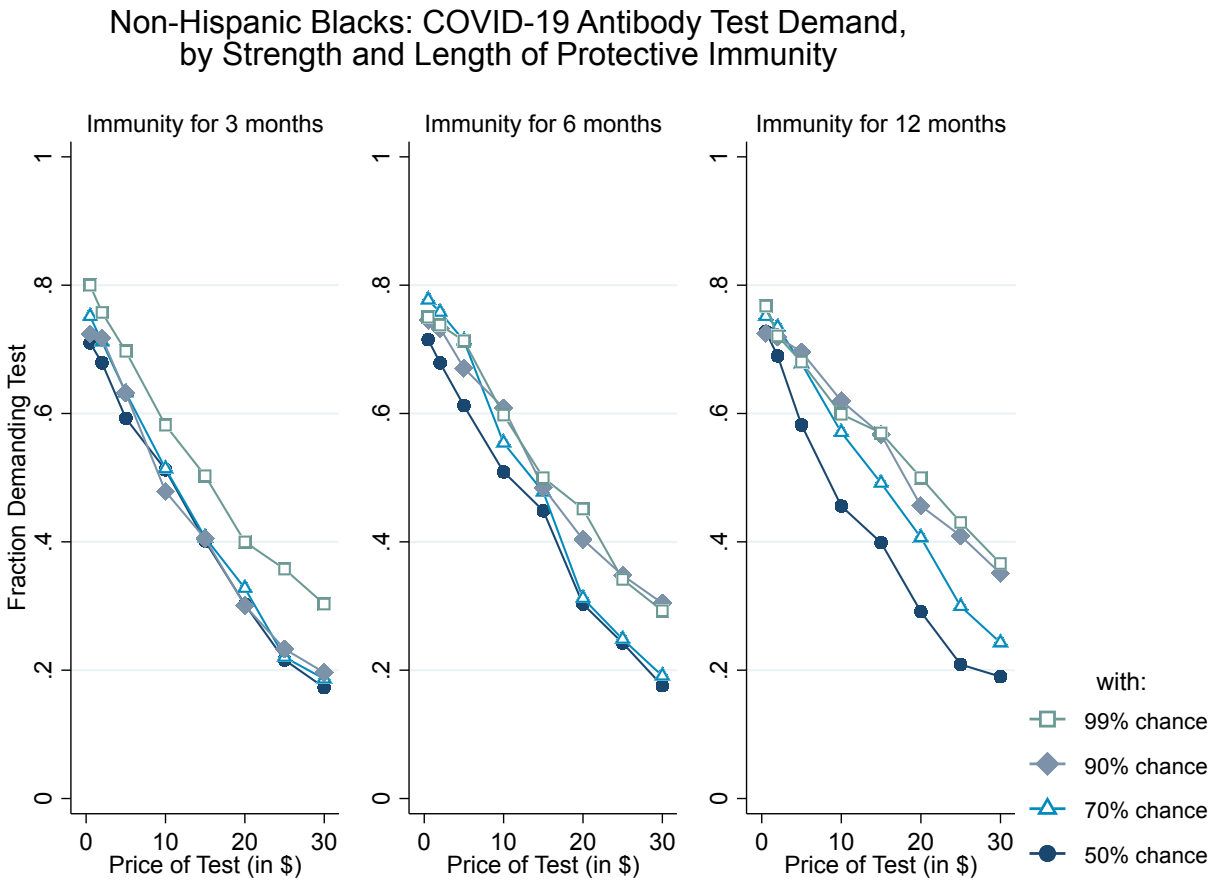


Figure B.1: This figure exhibits the fraction of non-Hispanic blacks choosing the COVID-19 antibody tests, for each price. Demand is shown for the cases in which protective immunity lasts 3 months (left), 6 months (center), and 12 months (right). In each case, the strength of protective immunity varies between a 99%, 90%, 70% or 50% chance that antibodies offer protection against COVID-19.

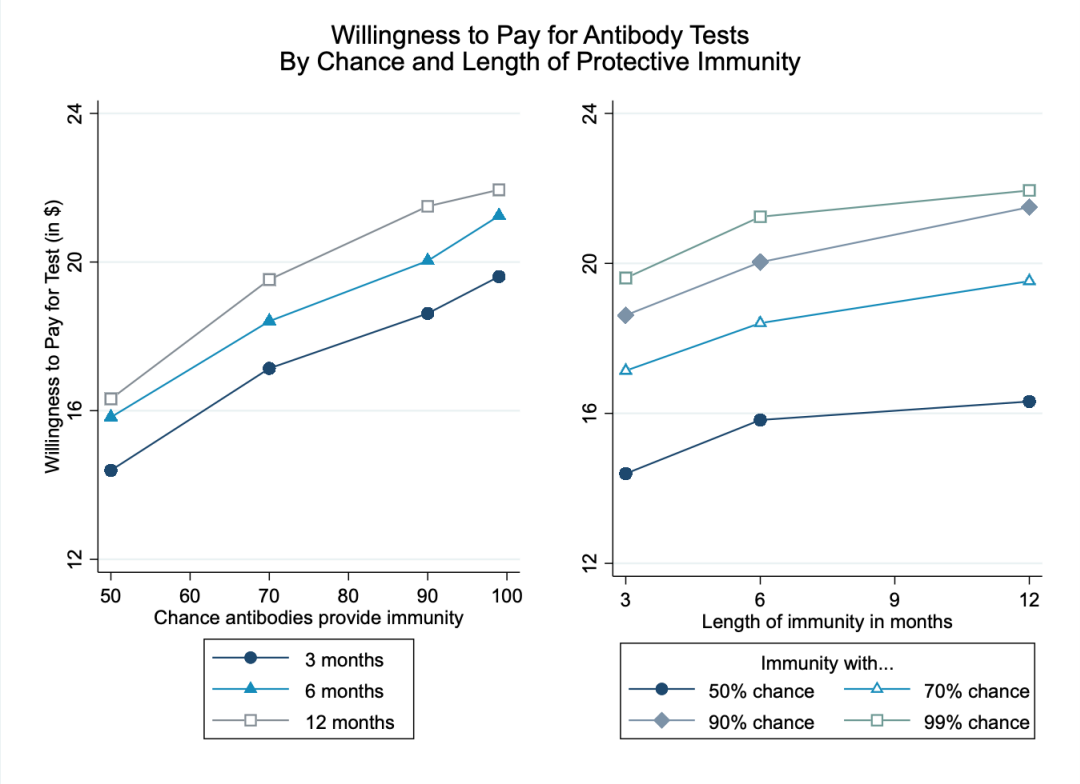


Figure B.2: This figure presents the average willingness to pay for antibody tests, by chance of immunity (left panel) and length of immunity (right panel).

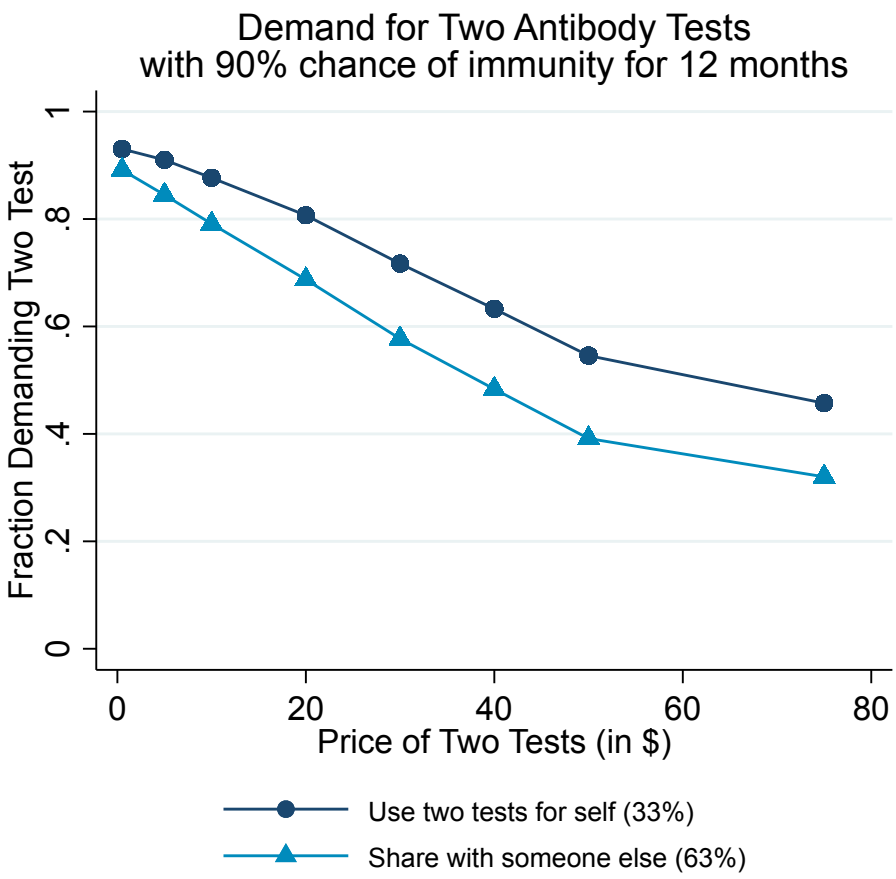


Figure B.3: This figure displays the fraction of subjects who demand the 2 antibody tests, over each available monetary payment, separated by those who indicated they would share the 2 tests with someone else or use them for themselves.

B.3 Willingness to Pay by State and CDC Statistics

Table B.5: Willingness to Pay and Beliefs by US State

	CDC Data (May 12, 2020)			Study Data		
	Total Cases	Total Death	Percent Category	Belief I had COVID19	Willingness to pay (in $)	N
Alabama	10413	424	11-20%,	20.65	18.31	26
Alaska	381	10	0-5%	52.50	25.94	2
Arizona	11380	542	11-20%,	23.24	21.28	54
Arkansas	4043	94	6-10%	26.08	17.93	13
California	67939	2770	6-10%	24.93	17.92	245
Colorado	19735	986	11-20%,	37.77	19.19	43
Connecticut	33765	3008	21-30%	34.17	22.96	18
Delaware	6741	237	21-30%	25.17	21.08	6
District of Columbia	6389	328	21-30%	17.33	22.78	3
Florida	40982	1735	6-10%	21.06	18.53	177
Georgia	33995	1442	11-20%,	23.79	15.84	77
Hawaii	582	17	0-5%	20.33	11.17	3
Idaho	2260	70	0-5%	28.25	10.97	4
Illinois	79007	3459	21-30%	30.80	18.53	96
Indiana	24627	1540	21-30%	24.62	21.81	24
Iowa	12373	271	21-30%	30.10	18.12	10
Kansas	7116	158	11-20%	31.75	19.60	12
Kentucky	6677	311	6-10%	18.52	15.37	21
Louisiana	31881	2308	11-20%,	23.44	18.33	25
Maine	1462	65	6-10%	14.62	18.11	8
Maryland	34061	1756	21-30%	22.38	21.29	37
Massachusetts	78462	5108	11-20%,	24.00	19.51	39
Michigan	47552	4584	11-20%,	26.33	18.09	45
Minnesota	11799	591	6-10%	26.09	19.36	32
Mississippi	9908	457	6-10%	16.70	14.08	10
Missouri	9918	488	6-10%	23.32	17.40	37
Montana	459	16	0-5%	50.00	7.50	1
Nebraska	8572	100	21-30%	22.50	16.87	14
Nevada	6163	317	11-20%,	27.62	22.16	26
New Hampshire	3160	133	6-10%	20.80	21.14	10
New Jersey	139945	9310	31-40%	22.14	20.99	65
New Mexico	5069	208	6-10%	22.75	20.67	16
New York	336017	27184	21-30%	31.60	19.33	157
North Carolina	15045	550	11-20%,	24.59	15.48	71
North Dakota	1518	36	0-5%	33.00	20.00	1
Ohio	24777	1357	6-10%	27.33	19.08	72
Oklahoma	4439	269	0-5%	29.73	14.28	22
Oregon	3286	130	0-5%	28.61	20.44	18
Pennsylvania	57154	3731	11-20%,	26.16	19.83	99
Rhode Island	11450	430	11-20%,	25.17	15.88	6
South Carolina	7792	346	11-20%,	33.62	15.75	21
South Dakota	3614	34	11-20%,	15.00	25.62	3
Tennessee	15622	251	6-10%	22.30	19.20	33
Texas	39869	1100	6-10%	21.41	18.41	149
Utah	6395	72	0-5%	29.67	15.33	12
Vermont	926	53	0-5%	16.00	13.33	3
Virginia	25800	891	11-20%,	23.20	21.04	45
Washington	17122	945	6-10%	28.10	19.26	31
West Virginia	1369	57	0-5%	15.00	25.21	6
Wisconsin	10418	409	6-10%	24.20	19.01	35
Wyoming	669	7	0-5%	66.67	11.19	3

Notes: Percent category is the percent range of positive cases provided by the CDC under https://www.cdc.gov/covid-data-tracker/index.html.

B.4 Self-reported Planned Behavior after Testing

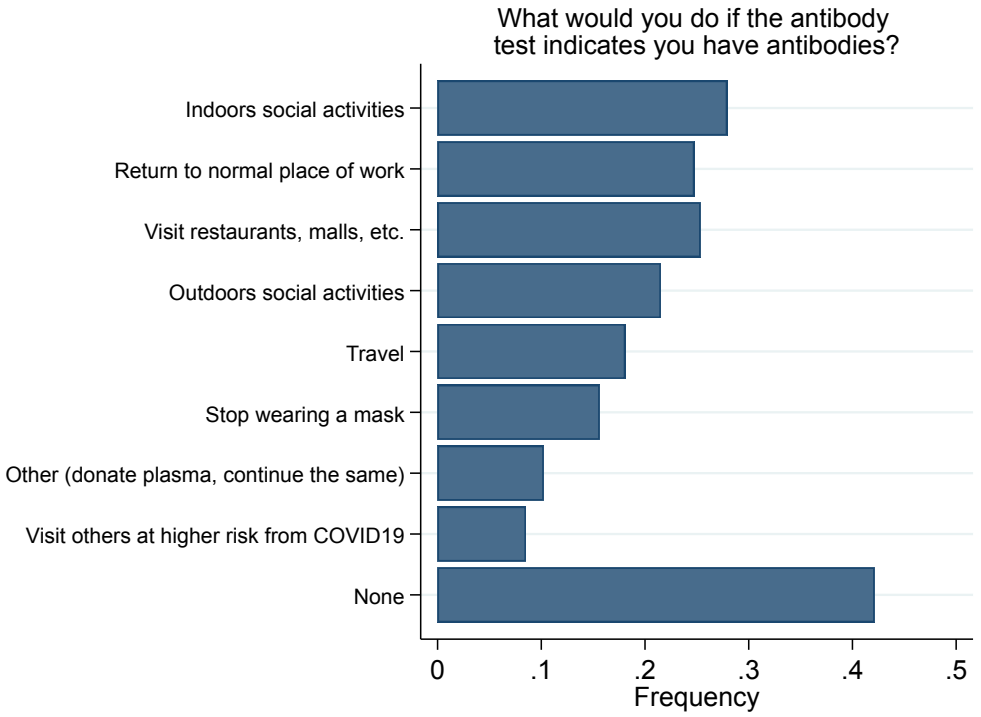


Figure B.4: This figure shows the frequency with which each option was chosen when subjects were asked "Suppose you took a Coronavirus antibody test, and the result came back positive, indicating antibodies. Which of the following behaviors do you think you would engage in immediately after?" Individuals were asked to "assume all these options are possible and legal, but restrictions imposed have not been fully lifted yet."

C Pre-registration

As Predicted:"*Willingness to get tested for Coronavirus Antibodies*" (#40547)

Created: 05/06/2020 09:18 AM (PT)

Author(s)
Marta Serra-Garcia (University of California, San Diego) - mserragarcia@ucsd.edu
Nora Szech (Karlsruhe Institute of Technology) - nora.szech@kit.edu

1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
We study willingness to get tested for Coronavirus (COVID-19) antibodies, depending on how likely and for how long a positive test result indicates a protective effect for Coronavirus. We measure willingness to pay (WTP) for antibody tests, across 12 different scenarios of protection offered by antibodies. We hypothesize that
a) People react to even moderate price changes. Demand for the test may be much higher if testing is almost free than if it costs $15, or even $30 (meaning people have to give up a gift voucher from Amazon of that value to get the test).
b) Demand for the test is higher if a positive test result leads to a higher protection rate, especially at higher prices.
c) Demand for the test is higher if a positive test result leads to a longer protection, especially at higher prices.

3) Describe the key dependent variable(s) specifying how they will be measured.
People decide between the test kit (at-home) versus Amazon vouchers ranging up to $30. Subjects know that, with some probability, one of their decisions will materialize (subject to test availability).

4) How many and which conditions will participants be assigned to?
We work with the strategy method. Subjects decide for eight different testing scenarios (randomly chosen out of 12 scenarios), and for different dollar values of the Amazon vouchers in each scenario.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
Elicit demand and compare WTP for different testing scenarios.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
We exclude subjects who fail a basic attention check.

7) How many observations will be collected or what will determine sample size?
No need to justify decision, but be precise about exactly how the number will be determined.
We plan to collect ca. 2000 observations from a representative sample in the US.

8) Anything else you would like to pre-register?
(e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
We aim to test whether WTP will vary across subjects depending on their educational background, income, own beliefs about whether they have had Coronavirus, cases of Coronavirus among friends or family, higher degree of being scared of Corona, gender, and prevalence of Coronavirus cases in the state in which they live. We plan to test whether subjects with a better statistical understanding react more strongly to differences in protection levels. We will also examine whether the individual's political position and evaluation of politician's management of the crises is related to their WTP.
We will run analysis including and excluding subjects who exhibit inconsistencies in the law of demand (i.e. in willingness to get tested in response to price increases).

D Survey Instructions and Questions

This study

This study relates to Coronavirus (COVID-19). Currently, so-called antibody-tests for Coronavirus are being developed and are expected to become accessible in the US. These tests aim to detect whether you had Coronavirus in the past. They cannot detect whether you currently have the disease. But they can inform you whether your body was in contact with the virus before and built up antibodies to defend it.

People who have these antibodies may be much better protected against Coronavirus now. It is likely they have a lower risk of getting infected from Coronavirus again. Think of it like a vaccine.

Many patients who have had Coronavirus may not have felt sick. The disease goes without any symptoms in many patients. Others die from it. So even if you did not experience any sickness, cold or fever in the last months, you may have had Coronavirus already.

In the following, we will ask you to decide, for different dollar amounts, whether you would like to get an antibody test for Coronavirus. It is still unclear how good or how long the vaccine-effect of the antibodies could last. This also varies with existing vaccines for other diseases, for example the flu vaccine. In some years, it only offers protection from the flu in 40% of cases. Also, the antibody-tests may not be always perfect. Scientists are still conducting research to find out.

Therefore, we will present you with 8 different scenarios. Across scenarios, a positive test result means you are protected from getting Coronavirus in 50%, in 70%, in 90% or 99% of the cases. That is, antibodies provide immunity with 50%, 70%, 90% or 99% chance. This protection lasts for 3, 6 or 12 months. You will make decisions in 8 randomly chosen scenarios, out of 12 possible ones.

In all scenarios, you decide between the respective antibody test and an amazon gift card. The value of the gift card varies from $0.50 to $30. You decide for each value whether you prefer the test or the gift card.

While you make your decisions, we are searching and monitoring the release of at-home tests for Coronavirus antibodies in the US. This test can be done at home, by yourself, in private. It is not yet clear what scenario the test will fit best. Therefore, please decide carefully for each scenario!

Approximately one out of every 25 participants will be randomly chosen by the computer, to have the test delivered at home by Qualtrics, the company running this survey, in collaboration with UCSD and KIT. Your decisions are not hypothetical, they can have real consequences.

If you are randomly chosen by the computer, it will choose the scenario that fits best for the test that becomes available. For this test scenario, the computer will pick one of your decisions randomly. If you chose the test, you will get the test delivered by regular mail. If you chose the amazon gift card, you will get the amazon gift card. (In the unlikely event no test becomes available in upcoming weeks, you will get $15 as a thank you no matter what you decided for any testing scenario.)

Checking Understanding

We would like to check that you have read the instructions carefully. Please carefully answer the question below. If you fail to select the correct answer, you will be disqualified from participating in this study.

What kinds of decisions will you be making in this study?

I will make decisions regarding Coronavirus antibody testing kits. There will be 12 scenarios, in which I make decisions, and one will be randomly picked and implemented for all participants in this study.

I will make decisions regarding Coronavirus antibody testing kits. There will be 8 scenarios, and none of the decisions I make will be implemented.

I will make decisions regarding Coronavirus antibody testing kits. There will be 8 scenarios, and approximately 1 out of 25 participants will be randomly selected and one of his/her decisions will be implemented.

Decision-Making Scenario (1 out of 8 shown)

Scenario 1

In each row, please choose between the two options:

- Option A: Coronavirus antibody test (at-home kit)
- Option B: Amazon gift card.

In this scenario, if you choose the Coronavirus antibody test kit: A positive test result (indicating antibodies) means you are **protected from Coronavirus for 6 months with 99 percent chance**.

Option A	OR	Option B
Coronavirus antibody test	O O	$0.50 Amazon gift card
Coronavirus antibody test	O O	$2 Amazon gift card
Coronavirus antibody test	O O	$5 Amazon gift card
Coronavirus antibody test	O O	$10 Amazon gift card
Coronavirus antibody test	O O	$15 Amazon gift card
Coronavirus antibody test	O O	$20 Amazon gift card
Coronavirus antibody test	O O	$25 Amazon gift card
Coronavirus antibody test	O O	$30 Amazon gift card

We will now present you with 2 questions about Coronavirus tests. We will randomly pick one of your answers and, if you are randomly picked by the computer and your answer is correct, you will receive an additional bonus of $1 as an Amazon gift card.

Question (1 out of 2 shown)

Suppose a Coronavirus antibody test is developed that is able to identify antibodies **correctly 90% of the time**, but the test is incorrect 10% of the time.
Suppose the fraction of **people who have antibodies** in the US population **is 20%.**

If the test is positive (indicating antibodies), what do you think the chance is that the person tested indeed has antibodies?

Not at all	Unlikely	Neither likely nor unlikely	Likely	For sure
0	25	50	75	100

Please consider this additional scenario, we would like you to ask you about. Here, we would like you to choose between two tests or an Amazon gift card. If you do one of these tests and the test result is positive (indicating antibodies), it means you will stay protected from Coronavirus for 12 months with 90 percent chance. If you take both tests and both turn out positive, it means you stay protected from Coronavirus for 12 months with 99 percent chance.

In each row, choose between the two options:

- Option A: **2** Coronavirus antibody tests (at-home kit)
- Option B: Amazon gift card.

Option A	OR	Option B
2 Coronavirus antibody tests	○ ○	$0.50 Amazon gift card
2 Coronavirus antibody tests	○ ○	$5 Amazon gift card
2 Coronavirus antibody tests	○ ○	$10 Amazon gift card
2 Coronavirus antibody tests	○ ○	$20 Amazon gift card
2 Coronavirus antibody tests	○ ○	$30 Amazon gift card
2 Coronavirus antibody tests	○ ○	$40 Amazon gift card
2 Coronavirus antibody tests	○ ○	$50 Amazon gift card
2 Coronavirus antibody tests	○ ○	$75 Amazon gift card

If you had two of these tests, what would you do?

- Use both tests
- Give one test to another person
- Other. Please specify

According to the CDC on May 6, 2020, there were:

- 68,279 deaths due to Coronavirus

How many deaths do you estimate there will be in exactly 1 month from today, due to Coronavirus in the US?
If your answer is within 10% of the correct answer, and you are randomly selected by the computer, you will receive an additional bonus of $1 as an Amazon gift card.

70000 116000 162000 208000 254000 300000

Suppose **you took a Coronavirus antibody test**, and the result came back **positive**, indicating antibodies.

Which of the following behaviors do you think you would engage in immediately after? Select all that apply. If none does, please select None. Assume all these options are possible and legal, but restrictions imposed have not been fully lifted yet.

- [ ] Return to normal place of work (e.g, office, store, etc)
- [ ] Visit restaurants, cafes, shopping malls or cinemas
- [ ] Engage in outdoors social activities (e.g., team sports, parties, etc.)
- [ ] Engage in indoors social activities (e.g., invite or visit friends and relatives)
- [ ] Stop wearing a mask
- [ ] Visit others who are at-risk of serious consequences from Coronavirus (e.g., the elderly)
- [ ] Travel
- [ ] Other, please specify:
- [ ] None

Do you think you have had Coronavirus already? Please select how likely you think it is you had Coronavirus.

Not at all	Unlikely	Neither likely nor unlikey	Likely	For sure
0	25	50	75	100

Have you been tested for Coronavirus or for antibodies against Coronavirus?

- Yes
- No

How worried are you about getting infected with Coronavirus?

- A great deal
- A lot
- A moderate amount
- A little
- Not at all

Do you have severe underlying conditions (heart disease, lung disease or diabetes) that make Coronavirus particularly dangerous for you?

- Yes
- No

Do you think other members of your household (or people with whom you have been in close contact) have had Coronavirus already? Please select how likely you think it is someone physically close to you had Coronavirus.

Not at all	Unlikely	Neither likely nor unlikey	Likely	For sure
0	25	50	75	100

How many people in your family, friends and acquaintances circle have been infected by Coronavirus, that you know of?

How many people in your family, friends and acquaintances circle have died from Coronavirus, that you know of?

2 Quick Quiz Questions

1. Suppose you roll a **6-sided die**. What is the chance that you do not roll a 6? That is, that you roll a 1, 2, 3, 4 or 5?

- 3/4
- 5/6
- 1/2
- None of the above

---

2. Suppose you roll **two 6-sided dice**. What is the chance that you do roll two 6? That is, both dice come up 6?

- 2/6
- 1/6
- 1/36
- None of the above

What is your current employment situation?

- I am an essential worker and I am currently working outside of my home
- I am not an essential worker and I am currently working outside of my home
- I am currently working from home
- I have been put on furlough or lost my job due to the Coronavirus shutdown
- I am not currently working (e.g., retired, student, etc.)
- Other. Please specify

What is your highest educational degree?

- Elementary and middle school
- High school
- Bachelor's (undergraduate) degree
- Master's (graduate) degree
- PhD, MD, JL, etc.
- Associate's degree
- Other, please specify
- None of the above

On a scale from 0 to 10, how would you rate President Trump's performance during the Coronavirus crisis?

Extremely bad 0 1 | Somewhat bad 2 3 | Neither good nor bad 4 5 6 | Somewhat good 7 8 | Extremely good 9 10

On a scale from 0 to 10, how would you rate Dr. Fauci's performance during the Coronavirus crisis?

Extremely bad 0 1 | Somewhat bad 2 3 | Neither good nor bad 4 5 6 | Somewhat good 7 8 | Extremely good 9 10

How do you position yourself politically?

- Democrat
- Republican
- Independent

What state in the US do you live in?

Which county in the state do you live in?

What kind of area do you live in?

- Urban
- Suburban
- Rural

Please describe in 1-2 sentences how you decided between the Coronavirus antibody test and the Amazon gift card.

Please leave any additional comments on this study below. Thanks!