

*Examining the Role of Cognitive Function in
Protecting Against Infection:
Evidence from Older Americans During the
COVID-19 Pandemic*

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Title: Examining the Role of Cognitive Function in Protecting Against Infection:
Evidence from Older Americans During the COVID-19 Pandemic

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Abstract

Introduction: Cognitive function is associated with health risk and mortality, but less is known about its associations with infectious diseases and the mechanisms underlying them. We study the relationship between pre-pandemic cognition and COVID-19 infection probability and identify the pathways through which such relationship operates.

Methods: Our longitudinal study followed a large group of adults aged 60-68 in the US right before and after the COVID-19 pandemic began. Participants were first surveyed in November 2019-February 2020 and followed-up in April-May 2020 and July-August 2020.

Results: We find that participants with higher pre-pandemic cognition were substantially less likely to report a COVID-19 infection, even after controlling for baseline demographic and socioeconomic characteristics, and health. This relationship was partly explained by the fact that higher cognition participants had more accurate COVID-risk perceptions and adopted more safety behaviors.

Conclusions: Our findings suggest that societally fostering cognitive function may improve public health through prevention of infectious disease. Cognitive function might also be used to identify vulnerable populations among which effort is needed to increase infection risk awareness and to encourage the adoption of safety health behaviors.

Keywords: Cognition, COVID-19, infection risk.

Introduction

Over four years after the start of the COVID-19 pandemic, the world continues to grapple with rising COVID-19 infections and associated health and economic consequences. Better understanding of individual characteristics that are protective against infection is key for identifying vulnerable populations and developing disease prevention strategies. Cognitive function, which reflects not only innate ability but also experiences over an individual's life course, is one potential protective factor.

Cognitive function predicts many health outcomes, even after controlling for education, economic resources, and avoidance of risky health behaviors (Calvin et al., 2017; Deary, 2010; Deary et al., 2021, 2021; Wraw et al., 2015). This conclusion holds over a wide range of diseases, although the research has tended to focus on chronic rather than infectious diseases (Calvin et al., 2011, 2017; Deary et al., 2021, 2021; Dobson et al., 2017; Gale et al., 2019; Wraw et al., 2015). A small number of studies have extended this research to COVID-19 during the recent pandemic, similarly finding that pre-pandemic cognitive function was negatively associated with COVID-19 hospitalization and mortality (Batty et al., 2020; Batty, Deary, & Gale, 2021). However, these studies lack data on whether individuals were ever infected with COVID-19, focusing instead on risk of serious complications from infection. Moreover, they do not measure COVID-19 specific knowledge and health behaviors, and, consequently, cannot explore their role in explaining the association between cognition and COVID-19 outcomes. Such data are key for understanding *why* cognition protects against COVID-19 outcomes and what lessons can be taken for infectious disease control.

We study whether and why cognitive function protects against infectious disease risk by investigating the inter-relationships between current cognitive resources, protective health

behaviors and knowledge, and COVID-19 infection. We consider multiple pathways through which pre-pandemic cognitive function might operate on subsequent COVID-19 infection (Figure 1). We collected data from a unique panel of Americans in their 60s surveyed just before the COVID-19 pandemic began and through the Summer of 2020. In addition to typical socioeconomic, educational, and health control variables, follow-up surveys included questions on participants' perceptions of COVID-19 risk and self-reported COVID-specific safety behaviors, allowing us to shed new light on potential mechanisms. For robustness, we replicate our results using a nationally representative internet panel.

Methods

Data

We developed and conducted an internet survey of US residents ages 60-68 between November 2019 and February 2020. This age range was chosen because the original research was designed to investigate relationships between Medicare eligibility and emotional and cognitive health. Respondents were drawn from a US national opt-in internet panel run by Dynata Corporation (Dynata, 2021), which has increasingly been used for research purposes including studying COVID-19 (Alsan et al., 2020; Barcellos et al., 2021). The survey was conducted over the internet. Following the pandemic outbreak, we re-contacted participants from our baseline survey and invited them to participate in two follow-up surveys for the purpose of investigating impacts of the COVID-19 pandemic. Follow-up data collection occurred during April-May and July-August of 2020. Survey instruments are available in Appendix D.

The baseline survey included a range of socioeconomic and health information, including basic demographics, economic characteristics (e.g., household income, employment status),

health conditions, and tests of current cognitive function. The follow-up surveys included repeats of baseline questions and added questions about COVID perceptions, behaviors, and infection. We restricted our analyses to respondents with complete data in the original and both follow-up surveys; the final sample included 13,026 respondents (53% of baseline sample, 80% of wave 2 sample).

This survey study was reviewed by the institutional review board of the University of Southern California and was deemed exempt (UP-20-00259). All participants were shown a survey-specific information sheet before opting into the study.

Cognitive Function Measures

We used two performance-based tests of cognitive function taken in our baseline survey, before the COVID-19 pandemic started: word recall and figure identification (figure ID). The word recall test is a measure of memory in which respondents were shown a list of ten words and then asked to recall the list of words by typing them into the computer, once immediately after being shown the list and on a second occasion later in the survey. We summed the number of words correct during immediate and delayed recall to create one recall score. The figure ID test is a measure of perceptual speed that required respondents to match which of 5 figures was identical to a target figure. After two practice trials, respondents repeated this exercise for 20 figures and were scored based on a combination of their accuracy and their time to complete all 20 figures (see Appendix B for details).

Questions about COVID-19 Infections, Knowledge and Behaviors

The primary outcome of interest was whether the respondent reported ever testing positive for COVID by wave 3. We also examined whether the respondent reported ever taking a COVID test or unsuccessfully trying to test. Wave 2 included a question asking the respondent to estimate the current COVID case count in their state of residence, which we used to proxy for a respondents' awareness of local COVID risks. We matched respondents' estimated case count with the actual case count reported by the CDC (Centers for Disease Control and Prevention, 2023) as of the day of interview and calculated the difference, scaled by the state population in the 2020. Waves 2 and 3 included questions asking if the respondent had engaged in a list of COVID-related safety behaviors during the past 7 days, such as mask wearing, avoiding crowded places, or refraining from visiting friends. Since there are multiple behaviors, some of which are more important for safety than others, and which are correlated with each other, we performed a factor analysis to construct a one-dimensional safety index (see Appendix B for details).

Alternative Dataset

Our data were not nationally representative, restricted to ages 60-68, and ended within the first year of the pandemic. To assess the robustness of our estimates to other data contexts, we repeated similar analyses using data from the Understanding America Study (UAS), a nationally representative longitudinal internet panel spanning before and after the COVID-19 pandemic (USC Center for Economic and Social Research, 2024). The UAS included many relevant questions similar to those included in our original surveys, such as baseline socioeconomic characteristics, health, and cognitive function measures. A special COVID-19 tracking survey included questions about COVID-19 perceptions, behaviors, and infection. The UAS COVID-19 tracking surveys were fielded every 2–4 weeks through July 2021, enabling us

to extend the follow-up time horizon. We also used alternative measures of cognitive function: the Woodcock-Johnson number series, verbal analogies, and picture vocabulary tests (Mather & Jaffe, 2016). The limitations of the UAS data were that baseline characteristics and cognitive function were measured at varying times during the years preceding the pandemic, and the sample size was significantly smaller ($n = 5,446-5,558$). Additional details on the UAS data are provided in Appendix C.

Analysis

We first estimated the association between baseline cognition and COVID outcomes using bivariate logistic regressions. For both cognitive function variables, we tested their association with reporting ever testing positive for COVID, ever taking a COVID test, and ever testing positive conditional on taking a test.

We considered multiple pathways through which the cognition-COVID relationship may operate (Figure 1). We estimated intermediate associations using bivariate regressions of 1) COVID perceptions—proxied by respondents' errors in guessing their state's current COVID case count—on baseline socioeconomic and health characteristics; 2) safety behaviors index on socioeconomic, health, and COVID perceptions; and 3) COVID infection on socioeconomic variables, health, perceptions, and safety behaviors.

Finally, we estimated how the cognition-COVID association changed after sequentially adding controls for potential baseline confounders and mediators/moderators using multivariate logistic regressions. We estimated the average marginal effect per standard deviation increase in cognition on the probability of COVID infection. For robustness, we repeated this analysis using nationally-representative UAS data.

Results

Table 1 shows sample summary statistics overall and by cognitive function. For purposes of description, we split respondents into above/below median cognition based on the mean of their (standardized) word recall and figure ID scores. As expected, respondents with higher cognitive function tended to have higher education, higher household incomes and better health. Respondents with higher cognitive function also had more accurate assessments of their local COVID case count and engaged in more safety behaviors.

Table 2 shows the associations between baseline cognitive function and testing positive for COVID. Higher pre-pandemic cognitive resources were associated with large decreased probability of COVID infection; 1 standard deviation increase in figure ID and word recall scores were associated with 27% (OR [95% CI]: 0.733 [0.591, 0.910]) and 28% (OR [95% CI]: 0.723 [0.577, 0.908]) lower odds of infection, respectively. Up to wave 3 (July-August 2020), 13% of the sample reported testing for COVID at least once. There was a negative association between cognition and testing; i.e., those with higher cognition were less likely to ever have tested. However, this does not explain the results in column 1, as even conditioning on ever testing, a 1 SD increase in cognition was associated with 19% (figure ID) and 23% (word recall) lower odds of infection.

Next, we explore whether available survey data on SES, health, COVID perceptions and COVID safety behaviors can explain the large cognition-COVID infection relationship documented in Table 2. We test the hypothesis that the cognition-COVID relationship can be in part explained by those with higher cognition being more aware of COVID risks, adopting more health safety behaviors and, consequently, being less likely to be infected (Figure 1).

As suggested by Table 1, cognition is associated with higher SES, better health, more accurate COVID perceptions and safety behaviors (see Appendix Table A4 for regression coefficients). Figure 2, panel A, shows in turn that baseline SES is significantly associated with respondents' accuracy in reporting their state's current COVID case count at the time of interview. Baseline SES and health were also significant predictors of engaging in COVID-specific protective health behaviors (panel B). As hypothesized, more accurate COVID risk perceptions, measured as being below the median in case count error, was associated with a 0.09 standard deviations higher safety index. Associations with COVID infection exhibited similar patterns with a few exceptions (Figure 2, panel C). Respondents from low-income households and with fair/poor self-rated health had significantly higher odds of infection. As hypothesized, more accurate COVID case count perceptions and more engagement in COVID safety behaviors were both significantly associated with lower odds of infection.

Finally, Figure 3 examines the extent to which the cognition-COVID association measured in Table 2 might be explained by the above confounders and mediators by estimating the association after sequentially adding controls. Without controls, a standard deviation increase in word recall and figure ID scores was associated with 0.723 (95% CI: 0.577, 0.908) and 0.733 (95% CI: 0.591, 0.910) times the odds of infection, respectively. Adding controls for basic demographics (e.g., gender, race, household size), education, employment status, income, and baseline health attenuated the cognition-COVID association by 13%–14%. Adding controls for COVID risk perceptions (case count error) and safety behaviors (index) attenuated the cognition association further, but this model still did not account for the majority of the cognition-COVID relationship. With all controls included, a standard deviation increase in word recall and figure ID scores was associated with .791 (95% CI: 0.634, 0.986) and 0.787 (95% CI: 0.639, 0.969)

times the odds of infection, respectively, which was 20%–25% attenuated compared to the association without controls. In other words, the confounders and mediators included can explain about 1/4 of the initial cognition-COVID relationship.

Figure 3, panel B shows analogous results using UAS data with an expanded age range, alternative cognition measures, and extended time horizon. We again find high baseline cognition was associated with a lower probability of being infected with COVID. Among all adults, odds of infection 20% lower per standard deviation increase in number series, 14% lower for verbal analogies, and 19% lower for picture vocabulary scores. Including controls for socioeconomic covariates attenuated these relationships by 1/4–1/3, but they remained significant; there was little change after subsequently adding controls for baseline health and COVID safety behaviors, though estimates for verbal analogies were on the margins of statistical significance. To make the UAS sample more comparable to our Dynata sample of older respondents, we also estimated associations among respondents ages 50 or older. Estimates were similar to the total adult population.

Discussion

We found that higher cognitive resources measured just before the start of the COVID-19 pandemic were significantly associated with lower risk of subsequent COVID-19 infection. Cognitive function scores were highly correlated with other important baseline characteristics, such as educational attainment, household income, and health, which have been found to predict COVID-19 infection and severity (Theodore et al., 2023). However, the association between cognition and COVID did not appear to be driven by these factors.

These results align with findings from the UK. Batty and colleagues (2020) used data from the UK Biobank to study the relationship between scores on cognitive tests, measured 10–14 years before the pandemic when participants were age 40–69, and hospitalization for COVID-19 during March and April of 2020. They found the odds of COVID hospitalization were 1.98 times higher per standard deviation decrease in their score on a verbal numerical reasoning test, after controlling for a range of pre-pandemic socioeconomic and health covariates. Our analogous odds ratio for the odds of COVID infection (i.e., after reverse coding the cognition measures) with all controls included were 1.25 and 1.27 per standard deviation decrease in recall and figure ID scores, respectively. In a similar study, Batty, Deary, and Gale (2021) found UK Biobank participants with slower reactions times and lower verbal numerical reasoning test scores had higher rates of death from COVID-19 during April–September 2020 (hazard ratio per standard deviation decrease: 1.18 and 1.32, respectively); these associations were partially attenuated after controlling for lifestyle factors. Prior work has also reported a positive association between cognition and COVID-19 vaccination (Acar-Burkay & Cristian, 2022; Batty, Deary, Fawns-Ritchie, et al., 2021; Bussink-Voorend et al., 2022; Elinder et al., 2023). Our study concluded before vaccines became widely available.

For the present study, in contrast to prior work, we focused on the probability of COVID infection, as opposed to negative health outcomes related to infection, such as hospitalization and mortality. In addition, we investigated the mediating effects of COVID-specific health behaviors. We found cognitive resources were highly related to the extent of respondents' COVID risk awareness (proxied by knowledge of case counts) and engagement in COVID-specific safety behaviors (e.g., mask wearing, social distancing). These factors, in addition to the confounding baseline characteristics described above, explained a considerable portion of the

association. However, a significant relationship between cognition and COVID infection, independent of observed confounders and mediators, remained.

The findings suggest current cognitive function is an important protective resource beyond other types of resources typically considered in health studies, such as income, education, and other measures of socioeconomic status. While some of the relationship was attenuated by our proposed mediators, our findings suggest cognitive function provided protection against infectious disease that was independent of these factors. The broader cognitive epidemiology literature has similarly pointed out the importance of considering cognitive function as a health promoting resource that is only partially explained by these factors (Calvin et al., 2017; Deary et al., 2021; Wraw et al., 2015).

One implication is that societally fostering cognitive function may improve public health through prevention of infectious disease. Early-life interventions such as programs targeting prenatal care, childhood nutrition, or cognitively stimulating environments can promote future cognitive resources (DiGirolamo et al., 2020; Koshy et al., 2024; Whitaker et al., 2023). The cognitive epidemiology literature tends to consider cognitive function as a fixed attribute. Here, we focus on current cognitive function measured as close to the pandemic start as possible. Current cognitive resources reflect cognitive endowment and the accumulated cognitive gains and losses resulting from experiences over the person's lifetime to date. Promoting cognitive health throughout the life-course is therefore important for public health as well.

The chief concern in studies on the relationship between cognitive function and COVID-19 has been on cognitive decrements following a COVID infection (Becker et al., 2021; Douaud et al., 2022; Hampshire et al., 2021; Kapteyn et al., 2024; Liu et al., 2023; Zhao et al., 2022; Zhou et al., 2020). Given the importance of current cognitive resources as a protective factor

against infection, any estimate that neglects pre-infection cognition might misattribute reverse causality to effects of the infection. Results from studies on the cognition impacts of COVID-19 that do account for pre-pandemic cognition are mixed (Del Brutto et al., 2021; Douaud et al., 2022; Kapteyn et al., 2024). While two studies reported adverse effects on some, but not all, cognitive test scores (Del Brutto et al., 2021; Douaud et al., 2022), Kapteyn et al. (2024) found that the association between self-reported COVID-19 infections and lower performance on cognitive tests was no longer significant after accounting for cognitive test scores measured well before the pandemic.

Limitations

As noted, our sample was not nationally representative and was restricted to a certain age group. Our replication of results using nationally representative data from the UAS and extending the age range adds confidence that our results generalize beyond the specific data setting, although the results were stronger for the older than the younger age groups. Some baseline survey participants did not respond to the follow-up surveys, and non-random attrition can affect external validity. It is possible that attrition could be related to COVID-19 hospitalization or death. Given the evidence that pre-pandemic cognitive function is negatively associated with COVID hospitalization and death (Batty, Deary, & Gale, 2021; Batty et al., 2020), we expect potential COVID-related attrition to result in attenuation bias, making our results more conservative. The data for our study came from self-reported survey answers, and misreporting is possible. For example, it could be the case that two respondents with the same self-reported safety behavior but different word recall scores might have actually engaged in differing levels of the behavior if measured directly. We also might miss respondents who were

infected with COVID-19 but did not realize it, or who failed to respond accurately on the survey. Finally, our study estimated observational associations, and we cannot make causal claims. While measuring cognition before the pandemic relieves concerns about reverse causality, we cannot rule out the existence of uncontrolled third factors that drive simultaneously higher pre-pandemic cognition and lower infection risk.

Conclusion

Our findings suggest current cognitive function plays an important role in infectious disease prevention, which goes beyond the association of cognition with traditional measures of socio-economic factors, such as education and income. One potential mechanism for the association between cognition and COVID supported by our results is that higher cognition predicts more accurate risk perceptions and adoption of safety behaviors, which in turn lower rates of infection. However, the tested covariates cannot fully explain the relation between cognition and infection, suggesting current cognitive resources provide additional protections against infectious disease that have yet to be fully explained by the available evidence.

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Exhibits

Figure 1. Hypothesized relationships between current cognitive resources, COVID-19 risk perceptions and protective behaviors, and infection

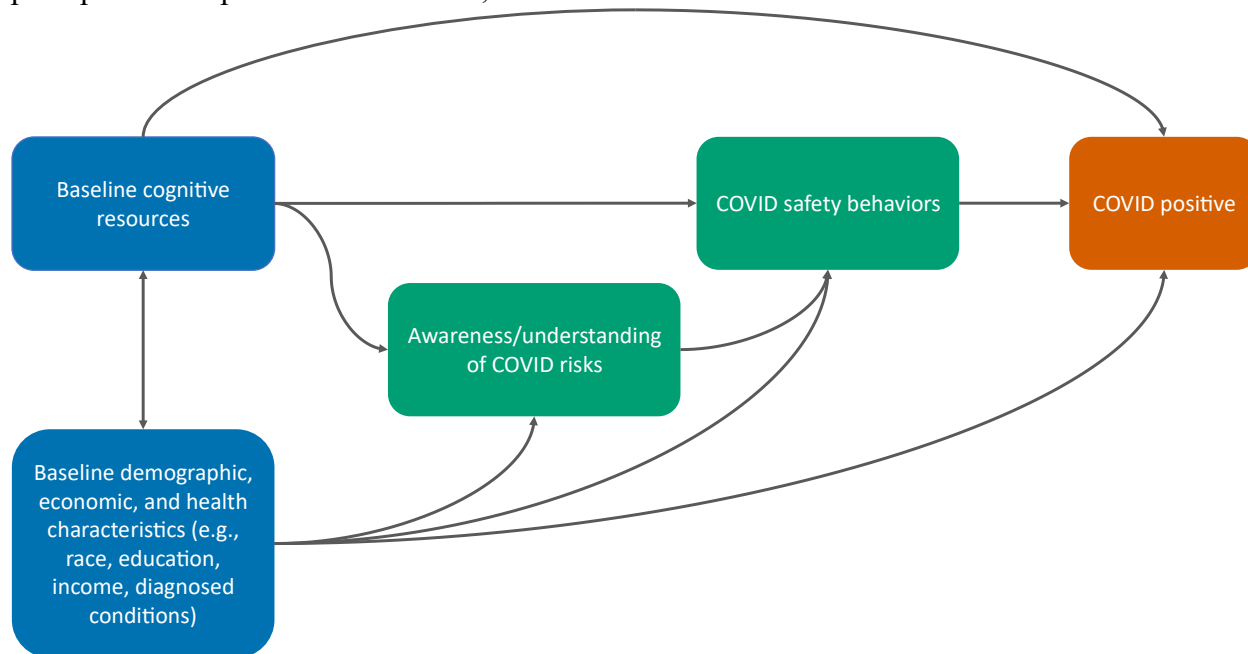


Table 1. Analysis sample summary statistics

	All	By baseline cognitive resources		
		Below median	Above median	<i>p</i>
Baseline variables (wave 1)				
Age (years)	64.8	65.0	64.6	<0.001
Female	0.60	0.56	0.64	<0.001
Race/ethnicity				
NH-white	0.88	0.85	0.91	<0.001
NH-Black	0.03	0.03	0.02	
Hispanic	0.04	0.06	0.02	
NH-other/multiple	0.05	0.05	0.04	
Married	0.66	0.64	0.67	<0.001
Educational attainment				
High school or less	0.15	0.19	0.12	<0.001
Some college, Assoc. degree	0.34	0.36	0.32	
Bach. degree or more	0.51	0.45	0.56	
Employed	0.29	0.27	0.31	<0.001
Household income (\$, thous.)				
<20	0.09	0.11	0.07	<0.001
20-29	0.08	0.08	0.07	
30-39	0.09	0.10	0.09	
40-59	0.17	0.18	0.17	
60-99	0.28	0.27	0.29	
100+	0.29	0.26	0.32	
Any health insurance	0.97	0.97	0.97	0.657
Self-rated health fair/poor	0.15	0.18	0.12	<0.001
Pandemic period variables (waves 2/3)				
Above median case count accuracy	0.50	0.47	0.53	<0.001
Safety index	0.00	-0.08	0.08	<0.001
Respondents	13,026	6,620	6,406	

Notes: This table reports means and proportions of characteristics for the analysis sample. Baseline cognitive resources is the average of respondents' standardized word recall and figure identification scores. *P*-values are from *t*-tests for continuous variables and χ^2 tests for categorical variables, testing for differences between the above- and below-median cognitive resources groups. Age ranges 60–68. Wave 1 data were collected during November 25, 2019 to March 4, 2020, wave 2 during April 7 to May 18, 2020, and wave 3 during July 6 to August 24, 2020.

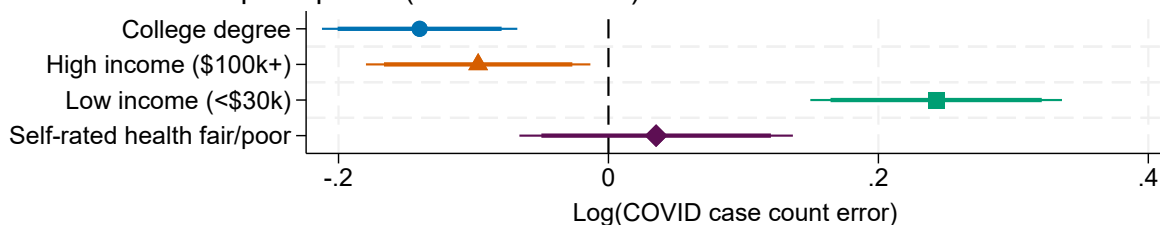
Table 2. Odds ratios for cognition association with COVID-19 outcomes by Summer 2020

	COVID-19 outcome:		
	Ever tested positive	Ever tested	Ever positive if tested
Odds ratios by cognition measure:			
Figure ID			
Per SD increase	0.733*** (0.081)	0.898*** (0.024)	0.810** (0.085)
Word recall			
Per SD increase	0.723*** (0.084)	0.921*** (0.024)	0.772** (0.090)
Outcome mean	0.01	0.13	0.06
Respondents	13,026	13,026	1,748

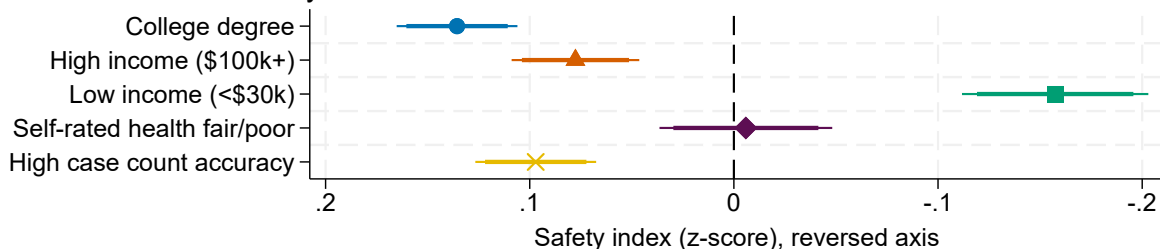
Notes: *** $p < .01$, ** $p < .05$, * $p < .10$. Each table cell shows estimates from separate logistic regressions. Robust standard errors in parentheses. Cognition variables are measured at baseline (November 25, 2019 to March 4, 2020) and standardized as the z-score. Outcomes are binary indicators of ever reporting testing/testing positive in waves 2 (April 7 to May 18, 2020) or 3 (July 6 to August 24, 2020).

Figure 2. Associations between potential mediators, confounders, and COVID infection

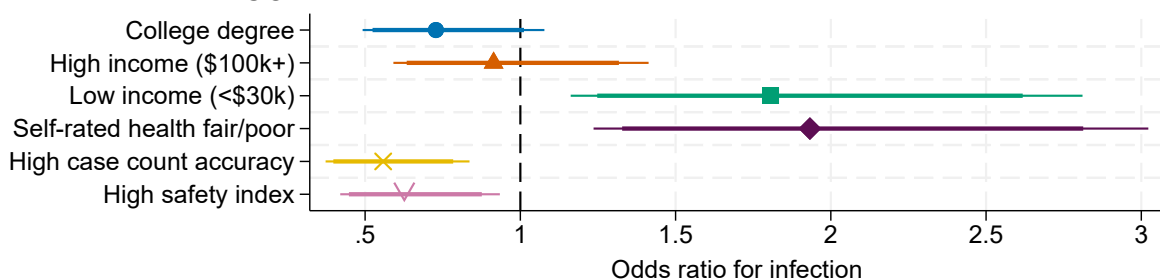
A. Association with perceptions (case count error)



B. Association with safety behaviors



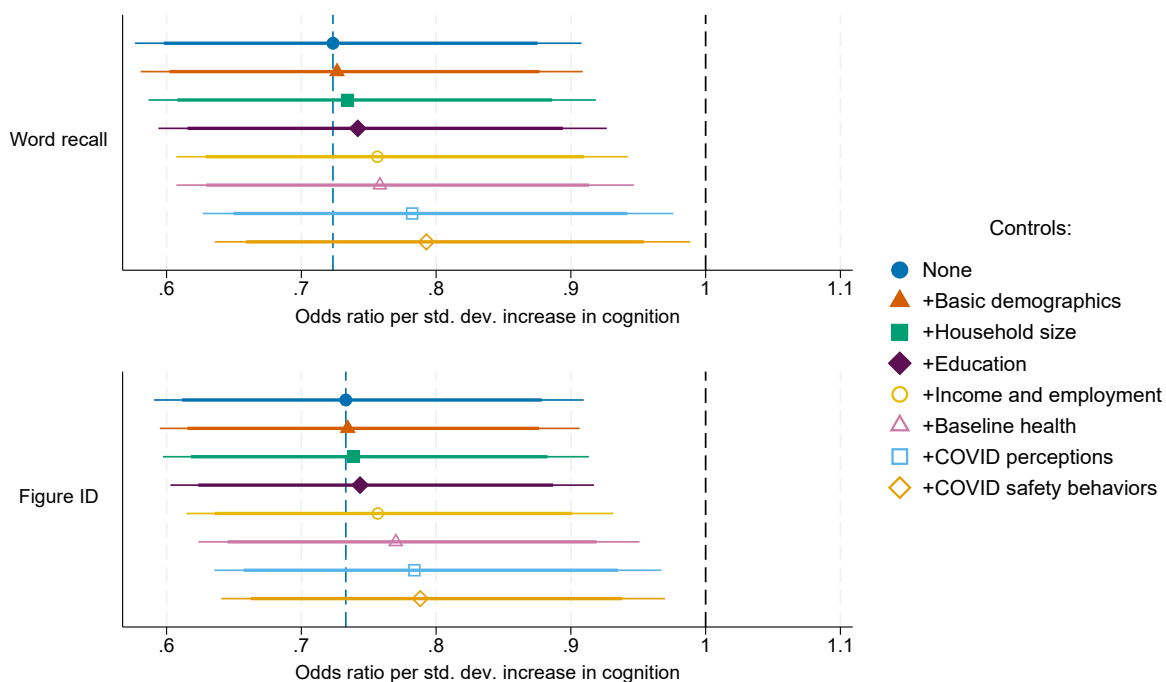
C. Association with COVID infection



Notes: This figure shows point estimates with 95% confidence intervals for the association between the given COVID outcome and each respondent characteristic (i.e., separate regressions for each outcome-characteristic association). Panels A and B show coefficients estimated from linear regressions, and Panel C shows exponentiated coefficients (odds ratios) from logit regressions. Case count guess error (Panel A) is the difference between the respondent's estimated number of their state's COVID cases (scaled by population) and the actual case count at the time of interview. Safety behaviors (Panel B) include wearing a facemask, washing hands several times per day, avoiding gatherings and public spaces, and avoiding restaurants. Safety behaviors index is the first factor from a factor analysis of the safety behaviors, standardized as the z-score.

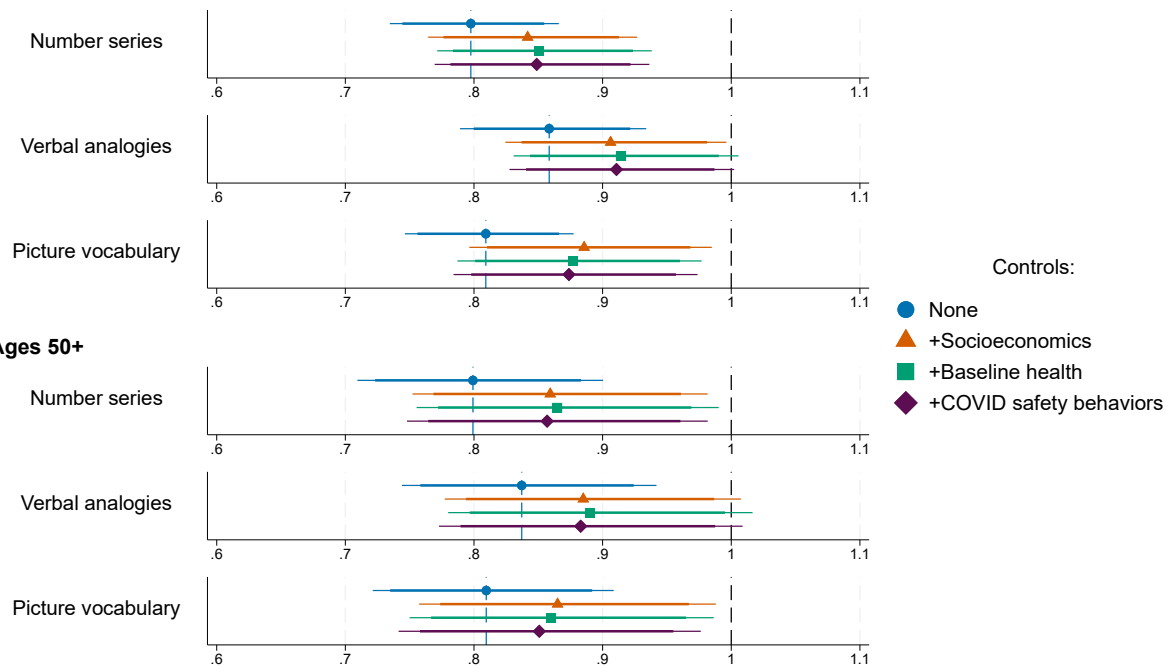
Figure 3. Pre-pandemic cognition associations with COVID infection with controls for potential confounders and mediators

A. Cognition association with COVID infection by Summer 2020 in Dynata data



B. Cognition association with COVID infection by Summer 2021 in UAS data

All adults



Panel A notes: Figure shows odds ratios from logit regressions, with 95% (thin bands) and 90% (thick bands) confidence intervals. Cognition variables are measured at baseline and standardized as the z -score. Basic demographics include age, gender, and race/ethnicity. Household size indicates whether the respondent lives alone, with 1-2 others, or with 2+ others. Education indicates high school or less, some college/Associate's degree, or Bachelor's degree or more. Income is baseline household income in six categories. Employment indicates if the respondent is currently working and if employer allows work from home. Baseline health includes self-rated health and whether the respondent reported ever being told by a doctor they had diabetes, heart disease, asthma, or cancer in the baseline survey. COVID perceptions is the respondent's $\log(\text{COVID case count guess error})$, measured in wave 2. Safety behaviors is the average of the respondent's Safety Index in waves 2 and 3.

Panel B notes: Figure shows odds ratios from logit regressions, with 95% (thin bands) and 90% (thick bands) confidence intervals. Cognition variables are measured at baseline (most recent measurement before March 2020) and standardized as the z -score. Socioeconomics includes age, gender, race/ethnicity, household size, education, household income, and employment. Baseline health includes self-rated health, BMI, smoking status, and number of diagnosed conditions. COVID safety behaviors is the average of the respondent's Safety Index in the leading up to Summer 2021.

Examining the Role of Cognitive Function in Protecting Against Infection: Evidence from Older Americans During the COVID-19 Pandemic

Appendix

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A. Supplemental Tables and Figures

Table A1. Analysis sample summary statistics by baseline cognitive resources

	Word recall		Figure ID	
	Below median	Above median	Below median	Above median
Baseline variables (wave 1)				
Average age (years)	64.3	64.3	64.5	64.0
Female	0.54	0.68	0.60	0.59
Race/ethnicity				
NH-white	0.86	0.91	0.86	0.92
NH-Black	0.03	0.02	0.03	0.02
Hispanic	0.05	0.03	0.05	0.02
NH-other/multiple	0.05	0.04	0.05	0.04
Married	0.65	0.66	0.64	0.69
Educational attainment				
High school or less	0.18	0.12	0.16	0.14
Some college, Assoc. degree	0.36	0.31	0.35	0.32
Bach. degree or more	0.46	0.57	0.49	0.54
Employed	0.34	0.36	0.32	0.39
Household income (\$, thous.)				
<20	0.10	0.07	0.10	0.07
20-29	0.08	0.07	0.08	0.07
30-39	0.09	0.09	0.10	0.08
40-59	0.18	0.17	0.17	0.17
60-99	0.27	0.29	0.28	0.29
100+	0.27	0.32	0.27	0.32
Any health insurance	0.97	0.97	0.97	0.97
Self-rated health fair/poor	0.16	0.12	0.17	0.11
Pandemic period variables (waves 2/3)				
Above median case count accuracy	0.47	0.54	0.49	0.52
Safety index	-0.07	0.10	-0.02	0.03
Respondents	7,843	5,183	8,192	4,834

Notes: This table reports means and proportions of characteristics for the analysis sample by baseline cognitive scores. Age ranges 60–68. Wave 1 data were collected during November 25, 2019, to March 4, 2020, wave 2 during April 7 to May 18, 2020, and wave 3 during July 6 to August 24, 2020.

Table A2. Summary characteristics of completed survey samples with comparison to American Community Survey, Americans aged 60-68 in 2019

	Dynata				ACS
	Complete W1	Complete W2	Complete W3	Complete W2+W3	
Average age (years)	64.1	64.3	64.3	64.3	64.2
Female	0.64	0.61	0.60	0.60	0.53
Race/ethnicity					
NH-white	0.87	0.88	0.88	0.88	0.72
NH-Black	0.03	0.03	0.03	0.03	0.11
Hispanic	0.05	0.04	0.04	0.04	0.10
NH-other/multiple	0.05	0.05	0.05	0.05	0.06
Married	0.62	0.65	0.65	0.66	0.63
Educational attainment					
High school or less	0.17	0.16	0.16	0.15	0.47
Some college, Assoc. degree	0.36	0.34	0.34	0.34	0.23
Bach. degree or more	0.47	0.50	0.50	0.51	0.30
Employed	0.34	0.34	0.34	0.35	0.46
Any health insurance	0.96	0.97	0.97	0.97	0.95
Household income (\$, thous.)					
<20	0.11	0.09	0.09	0.09	0.11
20-29	0.09	0.08	0.08	0.08	0.07
30-39	0.10	0.09	0.09	0.09	0.08
40-59	0.17	0.17	0.17	0.17	0.15
60-99	0.26	0.28	0.28	0.28	0.24
100+	0.26	0.28	0.28	0.29	0.35
Any health insurance	0.96	0.97	0.97	0.97	0.95
Self-rated health fair/poor	0.17	0.15	0.15	0.15	.
Respondents	24,721	16,234	15,320	13,026	461,465

Notes: This table reports means and proportions of characteristics for the sample of respondents with complete data in the given wave. All variables are measured at baseline (W1). Population characteristics from the American Community Survey (ACS) data are estimated for comparison, using sample weights to make estimates representative of the population in 2019.

Table A3. Baseline characteristics associations with completing follow-up surveys

	Probability of completing wave:		
	2	3	2+3
Overall	0.657	0.620	0.527
Relative associations			
Age (per year)	0.012*** (0.001)	0.014*** (0.001)	0.013*** (0.001)
Female	-0.083*** (0.006)	-0.092*** (0.006)	-0.096*** (0.007)
Race/ethnicity (ref: White, NH)			
NH-Black	-0.028 (0.017)	-0.058*** (0.018)	-0.060*** (0.018)
Hispanic	-0.135*** (0.014)	-0.124*** (0.014)	-0.127*** (0.014)
NH-other/multiple	0.006 (0.014)	0.017 (0.015)	0.018 (0.015)
Married	0.085*** (0.006)	0.082*** (0.006)	0.089*** (0.007)
Education (ref: HS or less)			
Some college, Assoc. degree	0.027*** (0.009)	0.030*** (0.009)	0.028*** (0.009)
Bach. degree or more	0.099*** (0.009)	0.097*** (0.009)	0.101*** (0.009)
Employed	0.016** (0.006)	0.019*** (0.007)	0.022*** (0.007)
Household income (\$, thous., ref: <20)			
20-29	0.029** (0.014)	0.018 (0.014)	0.019 (0.014)
30-39	0.087*** (0.014)	0.082*** (0.014)	0.081*** (0.014)
40-59	0.102*** (0.012)	0.117*** (0.012)	0.111*** (0.012)
60-99	0.146*** (0.011)	0.141*** (0.011)	0.144*** (0.011)
100+	0.175*** (0.011)	0.173*** (0.011)	0.174*** (0.011)
Any health insurance	0.100*** (0.017)	0.098*** (0.017)	0.090*** (0.017)

Self-rated health fair/poor	-0.077*** (0.008)	-0.095*** (0.008)	-0.087*** (0.008)
Any health condition	-0.055*** (0.006)	-0.072*** (0.006)	-0.071*** (0.006)
Word recall (per SD increase)	0.021*** (0.003)	0.013*** (0.003)	0.015*** (0.003)
Figure ID (per SD increase)	0.048*** (0.003)	0.043*** (0.003)	0.048*** (0.003)

Notes: Sample includes all respondents with complete baseline surveys. Each cell is estimated from a separate linear regression, measuring the association between the given characteristic and a dummy variable indicating completed survey in the given wave.

Table A4. Respondent characteristics associations with cognition measures

	Cognition measure (z-score)			
	Figure ID		Word recall	
	Bivariate	Multivariate	Bivariate	Multivariate
Age (per year)	-0.035*** (0.002)	-0.045*** (0.003)	0.008*** (0.002)	0.000 (0.003)
Female	-0.064*** (0.013)	-0.020 (0.018)	0.305*** (0.013)	0.366*** (0.018)
Race/ethnicity (ref: White, NH)				
NH-Black	-0.296*** (0.037)	-0.266*** (0.050)	-0.305*** (0.038)	-0.276*** (0.053)
Hispanic	-0.677*** (0.028)	-0.605*** (0.044)	-0.420*** (0.030)	-0.358*** (0.046)
NH-other/multiple	-0.113*** (0.031)	-0.114*** (0.041)	-0.218*** (0.032)	-0.205*** (0.042)
Married	0.186*** (0.013)	0.036* (0.020)	0.067*** (0.013)	-0.033 (0.020)
Education (ref: HS or less)				
Some college, Assoc. degree	0.128*** (0.019)	0.084*** (0.026)	0.204*** (0.019)	0.162*** (0.027)
Bach. degree or more	0.247*** (0.018)	0.128*** (0.026)	0.413*** (0.018)	0.349*** (0.027)
Employed	0.181*** (0.014)	0.045** (0.019)	0.050*** (0.014)	-0.013 (0.019)
Household income (\$, thous., ref: <20)				
20-29	0.119*** (0.029)	0.079* (0.043)	0.168*** (0.029)	0.074* (0.043)
30-39	0.211*** (0.029)	0.079* (0.041)	0.255*** (0.028)	0.141*** (0.042)
40-59	0.300*** (0.025)	0.107*** (0.037)	0.300*** (0.025)	0.154*** (0.037)
60-99	0.382*** (0.023)	0.134*** (0.037)	0.363*** (0.023)	0.186*** (0.037)
100+	0.487*** (0.024)	0.171*** (0.039)	0.414*** (0.023)	0.195*** (0.039)
Any health insurance	0.040	-0.035	0.199***	-0.048

	(0.034)	(0.049)	(0.036)	(0.054)
Self-rated health fair/poor	-0.310*** (0.017)	-0.190*** (0.025)	-0.198*** (0.017)	-0.076*** (0.025)
Any health condition	-0.171*** (0.013)	-0.075*** (0.018)	-0.044*** (0.013)	0.005 (0.018)
Log(case count error)	-0.023*** (0.004)	-0.017*** (0.004)	-0.036*** (0.004)	-0.031*** (0.004)
Safety index (z-score)	0.028*** (0.011)	0.032*** (0.011)	0.169*** (0.011)	0.124*** (0.011)

Notes: Table shows coefficients from linear regressions of the cognition measure (z-score) on characteristics. Each cell in the bivariate columns are from separate, bivariate regressions of the cognition measure and the given characteristic. Cells in the multivariate columns are from regressions of the cognition measure on all characteristics together in one regression.

B. Description of key variables

Cognitive Ability Measures

We used two measures of current cognitive ability in our original survey data: word recall and figure identification tests. Here, we describe these two measures and their construction in more detail. In our repeated analysis using Understanding America Study data, we used alternative cognition measures, which we describe in Appendix C.

The word recall test measured respondents' memory. Respondents were shown a list of 10 words, and then were asked to recall the list of words. The *immediate* recall score was the number of words the respondent was able to recall. Then, later on in the questionnaire, respondents were asked again to recall the 10 words they were shown earlier. The number of words respondents were able to recall on this second attempt was their *delayed* recall score. Word recall tests have been used in other surveys including the Health and Retirement Study and the Understanding America Study.^{1,2} To construct a single score, we summed the immediate and delayed recall scores. Respondents' overall word recall scores therefore ranged 0–20.

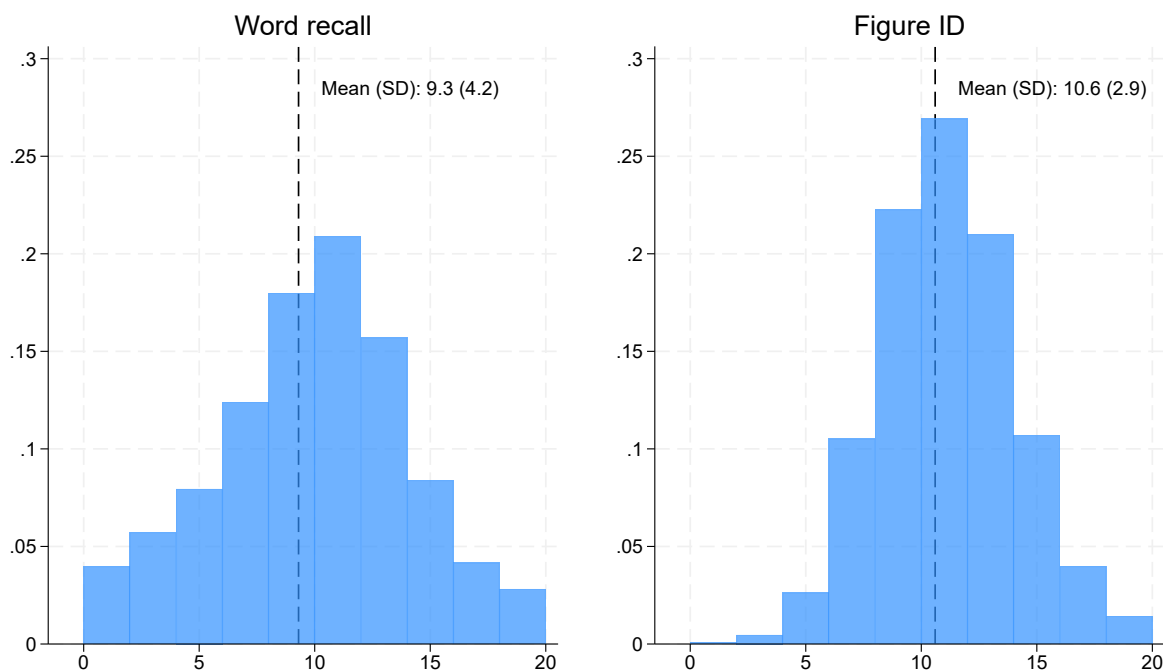
The figure identification test measured respondents' perceptual speed. Respondents were shown a target figure and tasked with identifying which of five candidate figures was identical to the target. After practice trials, respondents repeated this exercise for 20 figures, and they were asked to respond as quickly as they could while still trying to be accurate. The test is based on the work of Thurstone³ on primary mental abilities, and a paper-and-pencil version has long been part of the Dureman and Sälde battery.⁴ A similar online test was implemented by the Understanding America Study.^{2,5} The test was scored based on both accuracy and speed, and we excluded respondents taking longer than 1000 seconds to complete the test. Based on the total number of correctly identified figures and total time (in seconds) to complete the test, we estimated the number correct within a 45 second threshold. Specifically, we calculated the score as

$$Score = 45 \left(\frac{\text{total correct}}{\text{total time}} \right)$$

and top-coded at 20.

Figure B1 shows the distribution of each cognition measure for our analysis sample. For the analyses, we normalized these scores to have mean 0 and standard deviation 1.

Figure B1. Distribution of cognition test scores



COVID safety behaviors

The follow-up surveys contained questions asking about respondents' participation in a range of COVID-related safety behaviors. Table B1 shows the included safety behaviors and the proportion of respondents in our analysis sample reporting they engaged in the given behavior during the past 7 days for each wave.

Table B1. Rates of COVID-related safety behaviors, past 7 days

	Wave	
	W2	W3
Wore a face mask	0.69	0.91
Washed hands several times/day	0.90	0.84
Avoided public spaces/crowds	0.84	0.72
Avoided eating at restaurants	0.78	0.65
Avoided contact with people who could be high risk	0.58	0.50
Self-isolated at home	0.77	0.45
Done nothing different	0.02	0.04
Respondents	13,026	13,026

To reduce the dimensionality of these behavior variables we performed a factor analysis and constructed a one-dimensional safety behavior index.^{6,7} We estimated principle component factor models with the variables in table B1. Since COVID-related safety recommendations were still

evolving early in the pandemic, particularly for mask-wearing, and risk contexts changed, we estimated separate models for each wave. Table B2 shows the factor loadings for each variable in each wave, for factors with eigenvalues greater than 1 (factor 1 in wave 2, and factors 1 and 2 in wave 3).

Table B2. Factor loadings

	W2	W3	
	Factor 1	Factor 1	Factor 2
Wore a face mask	0.4188	0.6886	-0.5127
Washed hands several times/day	0.6561	0.6811	-0.2596
Avoided public spaces/crowds	0.7032	0.7089	0.2758
Avoided eating at restaurants	0.6584	0.6626	0.3491
Avoided contact with people who could be high risk	0.5409	0.5614	0.3913
Self-isolated at home	0.5406	0.4932	0.4987
Done nothing different	0.6700	0.7102	-0.5106

Table B3 shows the coefficients for each safety behavior in calculating the factor 1 score, which we use for our safety index.

Table B3. Scoring coefficients from factor analysis

	W2	W3
Wore a face mask	0.1631	0.2340
Washed hands several times/day	0.2555	0.2315
Avoided public spaces/crowds	0.2739	0.2409
Avoided eating at restaurants	0.2564	0.2252
Avoided contact with people who could be high risk	0.2107	0.1908
Self-isolated at home	0.2105	0.1676
Done nothing different (reverse coded)	0.2609	0.2414

We normalized the factor score within each wave to have mean 0 and standard deviation 1, and we used the average of respondents' normalized scores as the safety index used in our analyses.

Table B4. Mean and standard deviation of safety behaviors factor scores and index

	Mean	Standard deviation
	Factor score, W2	-0.1871
Factor score, W3	0.0714	0.9454
Safety index, W2	0.0000	1.0000
Safety index, W3	0.0000	1.0000
Safety index, avg. W2 and W3	-0.0003	0.8627

C. Understanding America Study Data

To assess the robustness of our main results to alternative data contexts, we repeat similar analyses using data from the Understanding America Study (UAS). The UAS is a nationally representative panel survey of adults conducted by the Center for Economic and Social Research at the University of Southern California.⁸ The UAS is an internet panel and respondents answer survey questions on a computer, tablet, or phone. Respondents are randomly selected using address (postal code) based sampling. The UAS began in 2014 and regularly elicits demographic information through core surveys. Starting in 2015, UAS began fielding surveys replicating those used in the Health and Retirement Study (HRS), which includes a wealth of socioeconomic and health information. UAS panel members complete the HRS surveys biennially, completing portions of the full survey on a rolling basis over the two years. Through the HRS surveys and others, the UAS includes multiple measures of cognition (described in detail below). During March 2020–July 2023, the UAS fielded surveys specifically about the COVID-19 pandemic (described in detail below). Questions on a wide variety of other topics have also been included in the UAS less regularly or as one-off surveys. The UAS analyses used the following datasets: UAS Comprehensive File,⁹ UAS Cognitive Comprehensive File,¹⁰ and UAS Understanding Coronavirus in America National Sample Longitudinal File.¹¹

Cognitive Ability Measures

To measure cognitive ability, we used the Woodcock Johnson Tests of Cognitive Abilities.¹² The UAS began including three Woodcock Johnson tests in June 2016: number series, verbal analogies, and picture vocabulary. The number series test was designed to measure respondents' quantitative reasoning, and the verbal analogies and picture vocabulary tests were designed to measure lexical knowledge.² Each test was included in a different UAS survey and were fielded every two years. We used respondents' most recently taken test before March 2020.

The UAS has included additional tests of cognition, including the word recall and figure ID tests we included in our original surveys. However, we chose to use the Woodcock Johnson tests because these were consistently measured since the beginning of the UAS, whereas others, including word recall and figure ID, were not included in the surveys until late 2020 or 2021, after the initial outbreak of COVID-19. Using the Woodcock Johnson tests, we are able to measure multiple dimensions of cognitive ability before the pandemic. A drawback compared to our original surveys is that respondents completed the cognition tests at varying points in time over years preceding the pandemic, whereas the respondents in our surveys completed cognition tests at a consistent time point (within 3 months) immediately before the pandemic.

COVID-19 Variables

In March 2020, the UAS began a series of high frequency surveys, the Understanding Coronavirus in America surveys, to longitudinally gather information on attitudes and behaviors related to the Novel Coronavirus pandemic. COVID tracking surveys were fielded bi-weekly

through February 2021, and monthly through July 2021. Four additional stand-alone surveys were subsequently fielded periodically through July 2023. The COVID surveys included questions about respondents' COVID-19 experiences (e.g., testing, infection, diagnosis), attitudes, and engagement in safety behaviors. Many of these questions were similar or identical to the questions we included in our original surveys. There was not a variable regarding accuracy of COVID-19 risk perceptions that was similar to our case count error variable used in the main analysis.

To measure COVID-19 infection, we used self-reported information from questions about whether the respondent had ever tested positive or been diagnosed by a health professional. After the first survey, these questions asked whether the respondent had been infected since the last time they completed a survey. We carried forward any affirmative response to the questions in any wave to create a binary variable indicating the respondent was ever infected (up to the last weekly/monthly wave in July 2021).

We used questions about 17 safety behaviors that were consistently included in the weekly/monthly tracking surveys after the first wave. The questions asked whether the respondent had engaged in the following behaviors in the past 7 days: worn facemask; washed hands; shared items like towels or utensils with other people; avoided public spaces; avoided restaurants; avoided contact with high-risk people; remained in residence except for essential activities; had visitors at your residence; had close contact (within 6ft) with people who lived with you; had close contact with people not living with you; gone to a friend, neighbor, or relative's residence; attended a gathering with more than 10 people; gone out to a bar, club, or other place where people gather; traveled by airplane; traveled by public transit; gone to the grocery store or pharmacy; attended a religious service. We performed a factor analysis as described in Appendix B to create a one-dimensional safety index from these 17 safety behaviors. We used the average of the safety index values from each wave the respondent completed.

Analysis Sample

To construct our sample for analysis, we identified respondents with completed cognition tests before the first UAS COVID survey wave in March 2020. We used the most recently taken tests before this date. Since the tests were asked in different UAS waves, resulting in a differing number of respondents with pre-pandemic cognition depending on the measure, we constructed samples for each of the three cognition measures. We included respondents with a follow-up observation in Summer (April 14 to July 20) of 2021, using the most recent survey the respondent completed among the last three waves of the COVID high frequency tracking to maximize sample size; the majority had data in the June 9 to July 20 wave. Finally, to control for baseline confounders, we used health and economic data from the HRS surveys waves, using the most recently completed survey before March 2020. Table C1 shows summary statistics for the UAS sample.

Table C1. Summary statistics for UAS analysis sample

	Cognition measure sample		
	Number series	Verbal analogies	Picture vocabulary
Age (years)	49.0	49.0	49.0
Female	0.52	0.51	0.51
Race/ethnicity			
NH-white	0.63	0.63	0.63
NH-Black	0.12	0.12	0.12
Hispanic	0.18	0.17	0.17
Asian	0.04	0.04	0.04
Other/mult.	0.04	0.04	0.04
Education			
HS or less	0.41	0.41	0.41
Some coll./Assoc.	0.28	0.28	0.27
BA or more	0.32	0.32	0.32
Labor force status			
Working	0.60	0.60	0.60
Retired, disabled	0.27	0.28	0.28
Unemployed, other	0.13	0.12	0.12
Household income (\$, thous.)			
<30	0.23	0.23	0.23
30-59	0.22	0.22	0.22
60-99	0.23	0.23	0.23
100+	0.32	0.32	0.32
Current smoker	0.14	0.14	0.14
BMI	29.3	29.4	29.4
Self-report health fair/poor	0.17	0.17	0.17
Number of chronic conditions			
None	0.41	0.41	0.41
1	0.28	0.28	0.28
2+	0.31	0.31	0.31
N	5,558	5,446	5,489

D. Survey Instruments

Wave 1

Survey Instrument

Notes to programmer are given in brackets [.]

INTRO: Thanks for participating in our study! This survey asks you about your health and how you feel about your life.

Some of the questions ask you about your past, about what happened and how you felt. Some ask about the recent past like yesterday and others about a more distant past like the past 12 months.

To help you, the time period for each question is shown in bold.

Q1.

What is your date of birth? [drop down menu for each]

DD MM YYYY

[If age at time of interview is not between 60 and 68, please thank respondent and terminate survey]

Q2.

Please imagine a ladder with steps numbered from zero at the bottom to ten at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?

10 Best possible

09

08

07

06

05

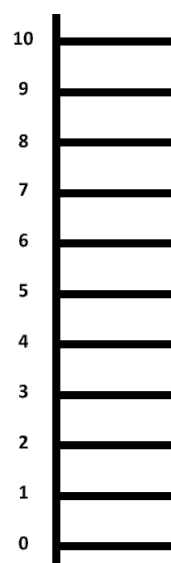
04

03

02

01

00 Worst possible



Q3.

In general, how satisfied are you with your life?

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied

Q4.

[Please show one question per screen, randomize the order in which the questions are presented]

Did you experience the following feelings during A LOT OF THE DAY **yesterday**? Yesterday, did you experience _____?

Q4.1. Enjoyment

Q4.2. Physical Pain

Q4.3. Worry

Q4.4. Sadness

Q4.5. Stress

Q4.6. Anger

Q4.7. Happiness

Response scale:

1 Yes

2 No

Q5.

Q9.1. Did you worry about money **yesterday**?

1 Yes

2 No

Q6.

In general, would you say your health is:

1. Excellent
2. Very Good
3. Good
4. Fair
5. Poor

Q7.

In general, would you say your *mental health* is:

1. Excellent
2. Very Good
3. Good
4. Fair
5. Poor

Q8.

The following to questions ask about how you have been feeling in the **past 2 weeks**.

Over the last 2 weeks, how often have you been bothered by any of the following problems?

Little interest or pleasure in doing things

1. Nearly every day
2. More than half the days

3. Several days
4. Not at all

Q9.

Which of the following words is similar to **love**?

1. Wall
2. Line
3. Cynical
4. Like
5. Keyboard

INTRO 2: Now we will ask you some questions about your medical care use

Q10.

In the next month, are you confident you will have access to quality medical care?

- 1 Yes
- 2 No

Q11.

In the next month, are you confident that if you had a high medical bill you or your health insurance plan (if any) would be able to pay for it? Think about a medical bill due to a major surgery, for example.

- 1 Yes
- 2 No

Q12.

Is there a particular doctor's office, clinic, health center, or other place that you **usually** go if you are sick or need advice about your health?

1. Yes
2. There is NO place
3. There is MORE THAN ONE place

[If Q12 = 2 then skip to Q14]

Q13.

What kind of place do you go to **most often** - a clinic, a doctor's office, an emergency room, or some other place?

1. Clinic or health center
2. Doctor's office or HMO
3. Hospital emergency room
4. Hospital outpatient department
5. Some other place

6. No one place most often

Q14.

In the last 12 months, were you delayed in getting medical care, tests, or treatments that you or a doctor believed necessary?

1 Yes

2 No

[If yes]

Which of these best describes the main reason you were delayed in getting medical care, tests, or treatments that you or a doctor believed necessary?

1. Couldn't afford care
2. Insurance company wouldn't approve, cover, or pay for care
3. Doctor refused to accept my insurance plan
4. Problems getting to doctor's office
5. Couldn't get time off work
6. Didn't know where to go to get care
7. Was refused services
8. Didn't have time or took too long
9. Other _____

Q15.

In the last 12 months, have you seen or talked to any of the following health care providers about your own health?

...A mental health professional such as a psychiatrist, psychologist, psychiatric nurse, or clinical social worker.

1 Yes

2 No

...A medical doctor or nurse practitioner in general practice, family medicine, or internal medicine who treats a variety of illnesses?

1 Yes

2 No

...A medical specialist (other than a psychiatrist) such as a cardiologist, gastroenterologist or

orthopedist?

1 Yes

2 No

Q16.

Are you **currently** taking any medication prescribed by a doctor or other health professional?

1 Yes

2 No

[If YES, ask Q17]

Q17.

Are you **currently** taking any prescribed medication to manage anxiety, depression, or another emotional problem?

1 Yes

2 No

Q18.

Do you have health insurance coverage?

1 Yes

2 No

Which of the following best describes your current health insurance or health coverage plan?

Please check all that apply.

1. Insurance through my or my spouse's/partner's employer/union
2. Retiree Insurance through my or my spouse's/partner's former employer/union
3. Private insurance purchased directly from an insurance company or through a state or federal exchange marketplace
4. Medicare
5. Medicaid, Medical Assistance or any kind of government assistance plan for those with low incomes or a disability
6. Tricare or other military health care
7. VA, including CHAMPVA or VA Care
8. Other program: _____
9. No coverage

Q19.

Has a doctor or other health professional **ever** told you that you had (check all that apply)

1. diabetes
2. heart disease
3. arthritis
4. asthma
5. cancer
6. memory problems
7. other _____

Q20.

Which of the following word belongs to the same category as **red**?

2. Fast
3. Right
4. Orange
5. Important
6. Whole

Q21. Word recall task

Next, we'll display a total of 10 words, one at a time, and ask you to recall as many as you can. We have purposely made the list long so that it will be difficult for anyone to recall all the words. Most people recall just a few. Please pay careful attention as the words are displayed because they will not be repeated. After all of the words have been displayed, we will ask you to type as many of the words as you can recall, in any order.

Please select "Next" when you are ready to begin

WORD LIST:

HOTEL

RIVER

TREE

SKIN

GOLD

MARKET

PAPER

CHILD

KING

BOOK

Now please type the words you can recall in the box below, separating each word with a space.

When you no longer recall any new word, please hit next.

INTRO 3: The next part of this survey will ask some general questions about you

Q22.

What is your gender?

7. Female
8. Male

Q23.

What is your race? Check all that apply.

1. White
2. Black or African American
3. American Indian or Alaska Native
4. Asian
5. Other: SPECIFY _____

Are you Hispanic, Latino, or of Spanish origin?

1. Yes
2. No

Q24.

In which state are you currently residing?

1 Alaska (AK)

...

52 Puerto Rico

[drop down menu]

Q25.

Are you now married, widowed, divorced, separated or never married?

1. Married (Spouse lives with me)
2. Married (Spouse lives elsewhere)
3. Separated
4. Divorced
5. Widowed
6. Never Married

Q26.

What is the highest level of school that you have completed or the highest degree you have received?

- 1 Less than 1st grade
- 2 1st, 2nd, 3rd or 4th grade
- 3 5th or 6th grade
- 4 7th or 8th grade
- 5 9th grade
- 6 10th grade
- 7 11th grade
- 8 12th grade - no diploma
- 9 High school graduate - high school diploma or the equivalent (for example GED)
- 10 Some college but no degree

- 11 Associate degree in college - Occupational/vocational program
- 12 Associate degree in college - - Academic program
- 13 Bachelor's degree (For example: BA, AB, BS)
- 14 Master's degree (For example: MA, MS, MEng, MEd, MSW, MBA)
- 15 Professional School Degree (For example: MD,DDS,DVM,LLB,JD)
- 16 Doctorate degree (For example: PhD, EdD)

Q27.

What is your labor force status? Please choose all that apply.

- 1 Currently working
- 2 On sick or other leave
- 3 Unemployed - on layoff
- 4 Unemployed – looking for work
- 5 Retired
- 6 Disabled
- 7 Other

Q28.

How many children do you have (please include all children deceased or alive)

- 1. 1
- 2. 2
- 3. 3
- 4. 4
- 5. 5 or more
- 6. I never had any children

Q29. Delayed Word recall task

A little while ago, we displayed a list of words and you typed the ones you could remember. Please type any of the words that you still remember now, separating each word with a space.

Q30.

Which category represents the total combined income of all members of your family (living in your house) during the past 12 months? This includes money from jobs, net income from business, farm or rent, pensions, dividends, interest, Social Security payments and any other monetary income received by members of your family who are 15 years of age or older.

- 1 Less than \$5,000
- 2 5,000 to 7,499
- 3 7,500 to 9,999
- 4 10,000 to 12,499

- 5 12,500 to 14,999
- 6 15,000 to 19,999
- 7 20,000 to 24,999
- 8 25,000 to 29,999
- 9 30,000 to 34,999
- 10 35,000 to 39,999
- 11 40,000 to 49,999
- 12 50,000 to 59,999
- 13 60,000 to 74,999
- 14 75,000 to 99,999
- 15 100,000 to 149,999
- 16 150,000 or more

[if younger than 65 ask Q31]

Q31.

When you turn 65 and are eligible for Medicare do you expect ...

Better access to medical care (doctors, hospitals, prescription drugs)

Yes

No

Paying less out-of-pocket for medical care

Yes

No

Protection against very high medical bills

Yes

No

[if older than 65 ask Q32]

Q32.

If you have Medicare, has it met your expectations in terms of ...

Better access to medical care (doctors, hospitals, prescription drugs)

Yes

No

Don't have Medicare [then skip next two questions]

Paying less out-of-pocket for medical care

Yes

No

Protection against very high medical bills

Yes

No

[If marked Medicare in question 19, then go to Q33. If not, then skip to Q36]

Q33.

People who qualify for Medicare can obtain their medical coverage for things like doctor or hospital care in different ways. Which of the following describes your Medicare coverage?

- a. Traditional Medicare
- b. Private Medicare Advantage Plan
- c. Don't know

[If Q33= private medicare advantage plan then skip to Q35]

Q34.

Medicare supplemental or Medigap policies are designed to cover the costs of doctor visits or hospital care that are not covered by Medicare. Are you covered by a supplemental Medigap policy you bought on your own or through a previous or current employer (of yours or your spouses)?

Yes

No

Don't know

Q35.

Do you have prescription drug coverage through Medicare Part D? People get this type of coverage either through a Medicare health plan, such as a Medicare HMO, that covers prescription drugs, or through a separate Medicare prescription drug plan.

Yes

No

Don't know

Q36.

Have you ever received in the mail a "Welcome to Medicare" letter? The "Welcome to Medicare" letter explains Medicare benefits, coverage choices, and how to enroll on Medicare.

- 1. Yes
- 2. No

Q37.

Have you ever received any other information, either through the mail or electronically, about Medicare benefits?

- 1. Yes
- 2. No

[If yes]

Q38.

Was the information from:

1. The Center for Medicare and Medicaid Services (CMS)
2. Your or your spouse's employer
3. A Medicare Advantage plan or private health insurance company
4. other _____

INTRO: The next questions ask about your life **when you were 55 years old.**

Q39.

When you were 55, were you married, widowed, divorced, separated or never married?

1. Married (Spouse lives with me)
2. Married (Spouse lives elsewhere)
3. Separated
4. Divorced
5. Widowed
6. Never Married

Q40.

When you were 55, what was your labor force status? Please choose all that apply.

- 1 Working
- 2 On sick or other leave
- 3 Unemployed - on layoff
- 4 Unemployed – looking for work
- 5 Retired
- 6 Disabled
- 7 Other

Q41.

When you were 55, how many of your children lived at home with you?

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5 or more
7. I never had any children

Q42.

When you were 55, did you have health insurance coverage?

- 1 Yes
- 2 No

When you were 55, which of the following best described your health insurance or health coverage plan?

Please check all that apply.

1. Insurance through my or my spouse's/partner's employer/union
2. Retiree Insurance through my or my spouse's/partner's former employer/union
3. Private insurance purchased directly from an insurance company or through a state or federal exchange marketplace
4. Medicare
5. Medicaid, Medical Assistance or any kind of government assistance plan for those with low incomes or a disability
6. Tricare or other military health care
7. VA, including CHAMPVA or VA Care
8. Other program: _____
9. No coverage

Q43.

By age 55, had you been told by a doctor or other health professional that you had hypertension, also called high blood pressure?

- 1 Yes
- 2 No

Q44.

By age 55, had you been told by a doctor or other health professional that you had: Coronary heart disease?

- 1 Yes
- 2 No

Diabetes or sugar diabetes? Do not include diabetes during pregnancy.

- 1 Yes
- 2 No

Cancer or a malignancy of any kind?

- 1 Yes
- 2 No

Some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?

- 1 Yes
- 2 No

Depression?

- 1 Yes
- 2 No

Q45. Figure Identification Task

INTRO: The last few questions ask you about who lives with you and your income according to your latest tax forms.

Q46.

Do you live with a spouse?

1. Yes
2. No

[If no to Q46 then go to Q48]

Q47.

Do you and your spouse file your taxes jointly?

1. Yes
2. No

Q48.

Did you receive any supplemental security income last year?

1. Yes
2. No

Q49.

Did you receive any social security income last year?

1. Yes
2. No

Q50.

Did you receive any disability benefits last year?

1. Yes
2. No

Q51.

What is your best estimate of the amount you reported as Adjusted Gross Income (AGI) on your US 1040 tax form last year? Your Adjusted Gross Income is approximately your earnings from wages, tips plus any taxable interest or dividends, taxable refunds or credits, alimony received, taxable pension or annuities, unemployment compensation, taxable social security benefits. Please estimate your AGI to the nearest \$1,000.

Less than \$6,000

\$6,000-6,999

\$7,000-7,999

\$8,000-8,999

\$9,000-9,999

\$10,000-10,999

\$11,000-11,999

\$12,000-12,999

\$13,000-13,999

\$14,000-14,999
\$15,000-15,999
\$16,000-16,999
\$17,000-17,999
\$18,000-18,999
\$19,000-19,999
\$20,000-20,999
\$21,000-21,999
\$22,000-22,999
\$23,000-23,999
\$24,000-24,999
\$25,000-25,999
\$26,000-26,999
\$27,000-27,999
\$28,000-28,999
\$29,000-29,999
\$30,000-30,999
\$31,000-31,999
\$32,000-32,999
\$33,000-33,999
\$34,000-34,999
\$35,000-35,999
\$36,000-36,999
\$37,000-37,999
\$38,000-38,999
\$39,000-40,000
More than \$40,000
Don't know

Q52.

How many children (ages 18 and below) did you claim as dependents on your Form 1040 last year?

Drop menu 0 to 9 and more than 10

Don't know.

[If don't know to Q52 ask]

How many children (ages 18 and below) currently live with you?

Drop menu 0 to 9 and more than 10

[Final Screen showing scores in word recall and figure ID]

*Wave 2***Survey Instrument**

Notes to programmer are given in brackets [.] Questions in blue were asked in our baseline survey and should not be changed.

SCREEN 1:

INTRO: Welcome to this survey!

This survey asks you about your health and how you feel about your life.

Please remember that, in addition to the compensation you typically receive for answering a survey, you are eligible to receive a \$10 dollars reward if you complete this survey.

Next, we will show you an information sheet about our study. Once you click next, you will be taken to the survey.

Thank you for your participation! We greatly value your input and hope that you will find this survey interesting.

[SCREEN 2: DIFFERENT SCREEN SHOW INFO SHEET IN SCROLL BOX]

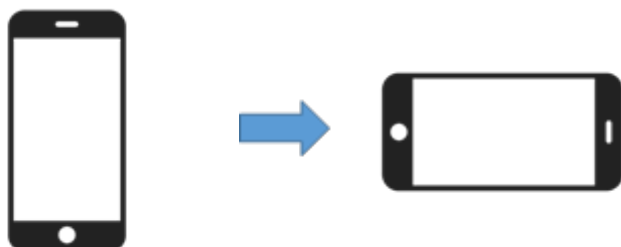
SCREEN 3:

You might recognize some of the questions below from a previous survey you answered.

Some of the questions in this survey ask you about your past, about what happened and how you felt. Some ask about the recent past like yesterday and others about a more distant past like the past 2 weeks.

To help you, the time period for each question is shown in bold.

If you are taking this survey on a smartphone we recommend holding the screen horizontally (landscape mode)

**Q0.**

What is your date of birth? [drop down menu for each]

DD MM YYYY

[PLEASE LET RESPONDENTS CONTINUE NO MATTER WHAT THE AGE IS]

Q1.

Please imagine a ladder with steps numbered from zero at the bottom to ten at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?

10 Best possible

09

08

07

06

05

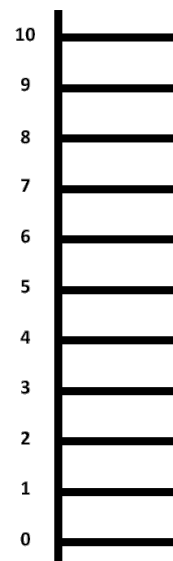
04

03

02

01

00 Worst possible



Q2.

In general, how satisfied are you with your life?

6. Very satisfied
7. Somewhat satisfied
8. Neither satisfied nor dissatisfied
9. Somewhat dissatisfied
10. Very dissatisfied

Q3.

[Please show one question per screen, keep the same order in which the questions were presented in the baseline]

Did you experience the following feelings during A LOT OF THE DAY **yesterday**? Yesterday, did you experience _____?

Q3.1. Enjoyment

Q3.2. Physical Pain

Q3.3. Worry

Q3.4. Sadness

Q3.5. Stress

Q3.6. Anger

Q3.7. Happiness

Response scale:

1 Yes

2 No

Q4.

Did you worry about money **yesterday**?

1 Yes

2 No

Q5.

In general, would you say your health is:

6. Excellent
7. Very Good
8. Good
9. Fair
10. Poor

Q6.

In general, would you say your *mental health* is:

6. Excellent
7. Very Good
8. Good
9. Fair
10. Poor

Q7.

The following two questions ask about how you have been feeling in the **past 2 weeks**.

Over the last 2 weeks, how often have you been bothered by any of the following problems?

Little interest or pleasure in doing things

5. Nearly every day
6. More than half the days
7. Several days
8. Not at all

Feeling down, depressed, or hopeless

1. Nearly every day
2. More than half the days
3. Several days
4. Not at all

INTRO 2: Now we will ask you some questions about your medical care use

Q8.

In the next month, are you confident you will have access to quality medical care?

1 Yes

2 No

Q9.

In the next month, are you confident that if you had a high medical bill you or your health insurance plan (if any) would be able to pay for it? Think about a medical bill due to a major surgery, for example.

- 1 Yes
- 2 No

Q9a. During the past 12 months, have you had any problems paying bills?

- 1. Yes
- 2. No

[If yes, ask Q9b and c

Q9b. During the past 12 months, have you had any problems paying *medical* bills?

- 1. Yes
- 2. No

Q9c. Because of problems paying bills during the past 12 month, have you been contacted by a collection agency?

- 1. Yes
- 2. No

Q10.

Are you **currently** taking any medication prescribed by a doctor or other health professional?

- 1 Yes
- 2 No

[If YES, ask Q11]

Q11.

Are you **currently** taking any prescribed medication to manage anxiety, depression, or another emotional problem?

- 1 Yes
- 2 No

Q12.

Do you have health insurance coverage?

- 1 Yes
- 2 No

Which of the following best describes your current health insurance or health coverage plan?

Please check all that apply.

1. Insurance through my or my spouse's/partner's employer/union
2. Retiree Insurance through my or my spouse's/partner's former employer/union
3. Private insurance purchased directly from an insurance company or through a state or federal exchange marketplace
4. Medicare
5. Medicaid, Medical Assistance or any kind of government assistance plan for those with low incomes or a disability
6. Tricare or other military health care
7. VA, including CHAMPVA or VA Care
8. Other program: _____
9. No coverage

Q13.

[Randomize the order in which answers 1-7 are presented]

Has a doctor or other health professional **ever** told you that you had (check all that apply)

7. diabetes
8. heart disease
9. arthritis
10. respiratory or lung disease such as asthma or COPD
11. cancer
12. memory problems
13. depression or anxiety
14. other _____
15. Never been told I have any of these conditions

Q14. Word recall task

Next, we'll display a total of 10 words, one at a time, and ask you to recall as many as you can. We have purposely made the list long so that it will be difficult for anyone to recall all the words. Most people recall just a few. Please pay careful attention as the words are displayed because they will not be repeated. After all of the words have been displayed, we will ask you to type as many of the words as you can recall, in any order.

Please select "Next" when you are ready to begin

WORD LIST:

SKY

OCEAN

FLAG

DOLLAR

WIFE

MACHINE

HOME

EARTH

COLLEGE

BUTTER

Now please type the words you can recall in the box below, separating each word with a space.
When you no longer recall any new word, please hit next.

INTRO 3: The next part of this survey will ask some general questions about you

Q15.

In which state are you currently residing?

1 Alaska (AK)

...

52 Puerto Rico

[drop down menu]

Q15a. What is the ZIP code of your current residence?

[text box with the relevant number of boxes (5?) – please add error message if they don't fill all the boxes]

Q15b. Have you moved since **November 2019**?

1 Yes

2 No

If Yes ask q15c

Q15c. What is the ZIP code of the residence were you were living in **November 2019**?

[text box with the relevant number of boxes (5?) – please add error message if they don't fill all the boxes]

Q16.

Which of the following best describes the place where you live now...

1. a large city
2. a suburb near a large city
3. a small city or town
4. a rural area

Q17.

What is your labor force status? Please choose all that apply.

1 Currently working

2 On sick or other leave

3 Unemployed - on layoff

4 Unemployed – looking for work

5 Retired

6 Disabled

7 Other

If Q17 == 1 or 2, ask Q17a-f

Q17a.

Do you have the kind of job where working from home is an option, if required?

1. Yes
2. No
3. Unsure

Q17b. Have you changed employers since **November 2019**?

- 1 Yes
- 2 No

[If no, ask questions Q17c and d. If Yes, ask questions Q17 e and f]

Q17c.

Are you employed by government, by a private company, a nonprofit organization, or self-employed or working in a family business?

- 1 Government
- 2 Private for profit company
- 3 Non profit organization including tax exempt and charitable organizations
- 4 Self employed
- 5 Working in family business

Q17d.

Counting all locations where your employer (or you if self-employed) operate, what is the total number of persons who work for your employer/you?

- 1 I am self-employed and I do not employ anyone
- 2 1-10
- 3 10-49
- 4 50-99
- 5 100-499
- 6 500-999
- 7 1,000+

Q17e.

Think about your employer in November 2019. Were you employed by government, by a private company, a nonprofit organization, or self-employed or working in a family business?

- 1 Government
- 2 Private for profit company
- 3 Non profit organization including tax exempt and charitable organizations
- 4 Self employed
- 5 Working in family business

Q17f.

Think about your employer in November 2019. Counting all locations where your employer (or you if self-employed) operated, what was the total number of persons who worked for your employer/you?

- 1 I was self-employed and I did not employ anyone
- 2 1-10
- 3 10-49
- 4 50-99
- 5 100-499
- 6 500-999
- 7 1,000+

Q18.

How many people live at home with you?

- 16. I live alone
- 17. 1
- 18. 2
- 19. 3
- 20. 4
- 21. 5
- 22. 6 or more

Q18a.

In November 2019, how many people lived at home with you?

- 23. I lived alone
- 24. 1
- 25. 2
- 26. 3
- 27. 4
- 28. 5
- 29. 6 or more

Q19.

How do you see yourself: are you a person who is generally willing to take risks or do you try to avoid taking risks?

[The question should be followed by a clickable horizontal boxes with the numbers 0 through 10 in them. To the left of 0 should be the text “completely unwilling to take risks”, and to the right of 10 should be the text, “very willing to take risks”.]

Q20.

How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?

[The question should be followed by a clickable horizontal boxes with the numbers 0 through 10 in them. To the left of 0 should be the text “completely unwilling to do so”, and to the right of 10 should be the text, “very willing to do so”.]

Q21.

How well does the following statement describe you as a person?

“I tend to postpone things even though it would be better to get them done right away.”

[The question should be followed by a clickable horizontal boxes with the numbers 0 through 10 in them. To the left of 0 should be the text “does not describe me at all”, and to the right of 10 should be the text, “describes me perfectly”.]

Q22.

You will find below a series of statements which describe how people may react to the uncertainties of life. Please use the scale below to describe to what extent each item is characteristic of you. Please circle a number (1 to 5) that describes you best.

	Not at all characteristic of me	A little characteristic of me	Somewhat characteristic of me	Very characteristic of me	Entirely characteristic of me
1. Unforeseen events upset me greatly.	1	2	3	4	5
2. It frustrates me not having all the information I need.	1	2	3	4	5
3. Uncertainty keeps me from living a full life.	1	2	3	4	5
4. One should always look ahead so as to avoid surprises.	1	2	3	4	5

5. A small unforeseen event can spoil everything, even with the best of planning.	1	2	3	4	5
6. When it's time to act, uncertainty paralyzes me.	1	2	3	4	5
7. When I am uncertain I can't function very well.	1	2	3	4	5
8. I always want to know what the future has in store for me.	1	2	3	4	5
9. I can't stand being taken by surprise.	1	2	3	4	5
10. The smallest doubt can stop me from acting.	1	2	3	4	5
11. I should be able to organize everything in advance.	1	2	3	4	5
12. I must get away from all uncertain situations.	1	2	3	4	5

Q23. Big 5 personality

Instead of asking them to write a number, let's say:

Here are a number of personality traits that may or may not apply to you. Please indicate the extent to which you agree or disagree with each statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

I see myself as:

1. _____ Extraverted, enthusiastic.
 2. _____ Critical, quarrelsome.
 3. _____ Dependable, self-disciplined.
 4. _____ Anxious, easily upset.
 5. _____ Open to new experiences, complex.
 6. _____ Reserved, quiet.
 7. _____ Sympathetic, warm.
 8. _____ Disorganized, careless.
 9. _____ Calm, emotionally stable.
 10. _____ Conventional, uncreative.
-

Q24.

Below we would like to ask your opinion about how likely an event might be. When we ask a question we'd like for you to give us a number from 0 to 100, where "0" means that you think there is absolutely no chance, and "100" means that you think the event is absolutely sure to happen. For example, no one can ever be sure about tomorrow's weather, but if you think that rain is very unlikely tomorrow, you might say that there is a 10 percent chance of rain. If you think there is a very good chance that it will rain tomorrow, you might say that there is an 80 percent chance of rain

On a scale of 0 to 100 percent, what is the chance that you will be doing any work for pay **by this time next year**? If you're not sure, please give your best guess.

[Include ruler]

RANGE 0 100

Please enter a number between 0% and 100%

Q25. Do you have any money in a retirement or tax deferred savings account through either a current or past employer or union?

1. Yes
2. No
3. Unsure

[If yes]

Q25a.

Some retirement plans base benefits on a formula involving age, years of service and salary, often called a defined benefit plan. Some plans base benefits on how much money has accumulated in a person's retirement account, often called a defined contribution plan. Other plans use both ways of setting benefits.

Think about the plan where you have the largest amount of money saved for retirement. What type of plan is it?

1. DEFINED BENEFIT(FORMULA)
2. DEFINED CONTRIBUTION (ACCOUNT)
3. BOTH TYPES

Unsure

Q26.

In the last month, did you provide care for or look after an adult or child who cannot care for themselves?

YES

NO

Q26a.

Who was it that you provided care for or looked after? USE RELATIONSHIP CODES FOR Q1.
[drop down]

Q26b.

In November 2019, were you already providing care for this person?

1 Yes

2 No

Q27.

Do any of your close family members or friends live in a nursing home or assisted living facility?

1. Yes
2. No

Q28. Delayed Word recall task

A little while ago, we displayed a list of words and you typed the ones you could remember. Please type any of the words that you still remember now, separating each word with a space.

Q29.

Which of the following words belongs to the same category as **bicycle**?

1. Little
2. Window
3. Motorcycle
4. Rain
5. Tender

Q30. Figure Identification Task

Q31. [4 questions on the same screen]

Please respond to each question or statement by marking one box per row.

In the past 7 days...

My sleep quality was

1. Very poor
2. Poor
3. Fair
4. Good
5. Very good

In the past 7 days...

My sleep was refreshing...

I had a problem with my sleep...

I had difficulty falling asleep...

1. Not at all
2. A little bit
3. Somewhat
4. Quite a bit
5. Very much

Q32. [3 questions on the same screen]

Think about how you have been feeling in the **past 7 days**.

1. In the **past 7 days**, how often did you feel that you lack companionship?
2. In the **past 7 days**, how often did you feel left out?

3. In the **past 7 days**, how often did you feel isolated from others?

Answers for each are:

1. Hardly Ever
2. Some of the Time
3. Often

Q33.

The following two questions ask about how you have been feeling in the **past 2 weeks**.

Over the last 2 weeks, how often have you been bothered by any of the following problems?

Feeling nervous, anxious or on edge

1. Nearly every day
2. More than half the days
3. Several days
4. Not at all

Not being able to stop or control worrying

1. Nearly every day
2. More than half the days
3. Several days
4. Not at all

INTRO: In the last questions, we will ask you what you are thinking and feeling about the coronavirus (COVID-19)

Q34.

Have you heard of the coronavirus (COVID-19)?

1. Yes
2. No
3. Unsure

[if No or Unsure then show]

The coronavirus or COVID-19 is a new disease with flu-like symptoms that is spreading across the world.

Q35.

Do you think the coronavirus is a real threat or blown out of proportion?

1. A real threat
2. Blown out of proportion
3. Unsure

Q36.

Have you been tested for the coronavirus (COVID-19)?

1. Yes, I tested positive
2. Yes, I tested negative
3. No, I have not been tested

[If Q36 “yes, I tested positive” skip Q37]

Q37a.

Do you think you’ve been infected with the coronavirus (COVID-19)?

1. Yes
2. No
3. Unsure

[If Q37 “No” skip Q37b]

Q37b.

Did you try to get tested for the coronavirus (COVID-19)?

1. Yes but I was unable to get tested
2. Yes but I’m still waiting for the results
3. No
4. Unsure

Q38a.

Do you personally know anyone who has been diagnosed with the coronavirus (COVID-19)?

1. Yes
2. No
3. Unsure

If Q38a = YES, then ask Q38b.

Q38b.

Do any of your close relatives or friends have been diagnosed with the coronavirus (COVID-19)?

1. Yes
2. No
3. Unsure

Q39. How many people in your state of residence are currently infected with the coronavirus (COVID-19)? If you’re not sure, please give your best guess. Please enter numbers only.

_____ (open ended)

Q40. In the last month, were you delayed in getting medical care, tests, or treatments that you or a doctor believed necessary?

1. Yes
2. No

[If yes]

Q40a.

[Order of answers is randomized, other always at the bottom]

Which of these best describes the main reason you were delayed in getting medical care, tests, or treatments that you or a doctor believed necessary?

1. Couldn't afford care
2. Insurance company wouldn't approve, cover, or pay for care
3. Doctor refused to accept my insurance plan
4. Problems getting to doctor's office
5. Worried that would get infected with COVID-19 at doctor's office
6. Couldn't get time off work
7. Didn't know where to go to get care
8. Was refused services
9. Didn't have time or took too long
10. Doctor's office was closed
11. Other _____

Q41a. If you needed help, how many people do you feel you could call who would help you?

1. 1
2. 2
3. 5
4. 4
5. 5 or more
6. I have no one I could call.

Q41b.

Have you lost your job or a significant part of your income because of the coronavirus (COVID-19)?

1. Yes, I lost my job
2. Yes, I did not lose my job but I lost a significant part of my income
3. No

Next we would like to ask your opinion about how likely you think various events might be. When we ask a question we'd like for you to give us a number from 0 to 100, where "0" means that you think there is absolutely no chance, and "100" means that you think the event is absolutely sure to happen. For example, no one can ever be sure about tomorrow's weather, but if you think that rain is very unlikely tomorrow, you might say that there is a 10 percent chance of rain. If you think

there is a very good chance that it will rain tomorrow, you might say that there is an 80 percent chance of rain.

Q42.

On a scale of 0 to 100 percent, what is the chance that you will get the coronavirus (COVID-19) in the **next three months**? If you're not sure, please give your best guess.

RANGE 0 100

Please enter a number between 0% and 100%

Q43.

If you do get the coronavirus (COVID-19), what is the percent chance you will die from it? If you're not sure, please give your best guess.

RANGE 0 100

Please enter a number between 0% and 100%

Q44.

On a scale of 0 to 100 percent, what is the chance that someone you know will get the coronavirus (COVID-19) in the **next three months**? If you're not sure, please give us your best guess.

RANGE 0 100

Please enter a number between 0% and 100%

Q45.

If someone the same age as you gets the coronavirus (COVID-19), what is the percent chance they will die from it? If you're not sure, please give us your best guess.

RANGE 0 100

Please enter a number between 0% and 100%

[Ask if Q46 currently working Q17= 1 or 2 (currently working or on leave)]

Q46.

The coronavirus (COVID-19) may cause economic challenges for some people regardless of whether they are actually infected.

What is the percent chance that you will lose your job because of the coronavirus (COVID-19) within the **next three months**?

RANGE 0 100

Please enter a number between 0% and 100%

Q47.

The coronavirus (COVID-19) may cause economic challenges for some people regardless of whether they are actually infected.

What is the percent chance you will run out of money because of the coronavirus (COVID-19) in the **next three months**?

RANGE 0 100

Please enter a number between 0% and 100%

Q48.

[Order of answers is randomized, I've done nothing different always in the bottom]

Which of the following have you done in the **past 7 days** to keep yourself safe from the coronavirus (COVID-19) in addition to what you normally do?

Only consider actions that you took or decisions that you made personally. Mark all that apply.

1. Worn a face mask
2. Washed hands with soap or used hand sanitizer several times per day
3. Canceled or postponed air travel
4. Canceled or postponed work or school activities
5. Canceled or postponed personal or social activities
6. Visited a doctor
7. Canceled a doctor's appointment
8. Stockpiled food or water
9. Avoided contact with people who could be high-risk
10. Avoided public spaces, gatherings, or crowds
11. Avoided eating at restaurants
12. Worked or studied at home
13. Self-isolated at home
14. Avoided interacting with own children or/and grandchildren
15. I've done nothing differently

[If they mark self-isolated at home, ask Q49a]

Q48a. How long have you been self-isolating at home because of the coronavirus (COVID-19)?

_____ [open ended, allow numbers only] days/weeks [drop down menu]

In the past 7 days, did the coronavirus (COVID-19) keep you from

	Yes	No
Q49. visiting in person with friends and family not living with you		
Q51. attending religious services		
Q53. participating in clubs, classes, or other organized activities		
Q55. exercising (i.e. walking, working out, running, biking, swimming, playing a sport, etc.)?		
Q57. getting your usual help with household chores or other daily activities (e.g. cleaning, cooking, laundry, child or elderly care)?		

Would you say the following activities are very important, somewhat important, or not so important to you?

	Very Important	Somewhat Important	Not Important
Q50. visiting in person with friends and family not living with you			
Q52. attending religious services			
Q54. participating in clubs, classes, or other organized activities			
Q56. exercising (i.e. walking, working out, running, biking, swimming, playing a sport, etc.)?			
Q58. getting your usual help with household chores or other daily activities (e.g. cleaning, cooking, laundry, child or elderly care)?			

Q59.

[Order of answers 1-7 is randomized]

Have you changed your plans with respect to any of the below because of the coronavirus (COVID-19)? Please mark all that apply.

1. Travel
2. Work
3. Retirement
4. Health treatments and procedures
5. Residential move
6. Real estate or vehicle purchase or sale
7. Big ticket purchase or sale
8. Other _____
9. I have not changed any of my plans

Q60.

Please tell us what your primary source of information about the coronavirus (COVID-19) is.

Please be specific about the sources. For example, if your primary source of information is TV, please tell us which channel; if it is a newspaper, please tell us which newspaper; if internet or social media, please tell us which site.

_____ [open ended]

Q60b.

Regarding the answer to the prior question, how many minutes or hours a day do you spend with that media outlet?

_____ Hours _____ Minutes

[Final Screen showing scores in word recall and figure ID]

Thank you for participating in our survey! You answered all questions so your \$10 dollar reward will be credited to your account.

We will be monitoring people's feelings and opinions in the coming months and we might contact you again for another interview. Your answers are very important to us. We appreciate your cooperation!

*Wave 3***Survey Instrument**

Notes to programmer are given in brackets [.] Questions in blue were asked in our baseline survey and should not be changed.

SCREEN 1:

INTRO: Welcome to this survey!

This survey asks you about your health and how you feel about your life.

Next, we will show you an information sheet about our study. Once you click next, you will be taken to the survey.

Thank you for your participation! We greatly value your input and hope that you will find this survey interesting.

[SCREEN 2: DIFFERENT SCREEN SHOW INFO SHEET IN SCROLL BOX]

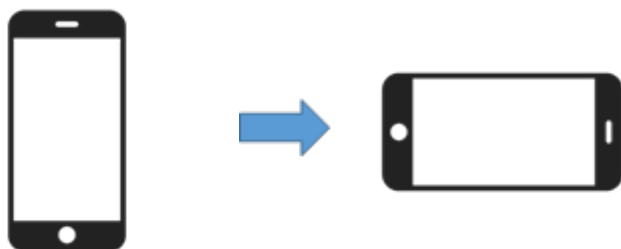
SCREEN 3:

You might recognize some of the questions below from a previous survey you answered.

Some of the questions in this survey ask you about your past, about what happened and how you felt. Some ask about the recent past like yesterday and others about a more distant past like the past 2 weeks.

To help you, the time period for each question is shown in bold.

If you are taking this survey on a smartphone we recommend holding the screen horizontally (landscape mode)

**Q0.**

What is your date of birth? [text box for each]

DD MM YYYY

[PLEASE LET RESPONDENTS CONTINUE NO MATTER WHAT THE AGE IS]

Q1.

Please imagine a ladder with steps numbered from zero at the bottom to ten at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?

10 Best possible

09

08

07

06

05

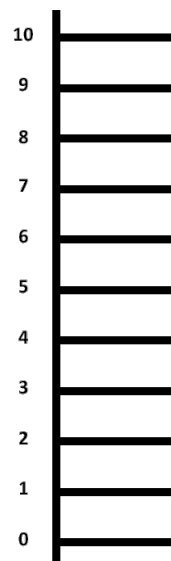
04

03

02

01

00 Worst possible



Q2.

In general, how satisfied are you with your life?

11. Very satisfied
12. Somewhat satisfied
13. Neither satisfied nor dissatisfied
14. Somewhat dissatisfied
15. Very dissatisfied

Q3.

[Please show one question per screen, keep the same order in which the questions were presented in the baseline]

Did you experience the following feelings during A LOT OF THE DAY **yesterday**? Yesterday, did you experience _____?

Q3.1. Enjoyment

Q3.2. Physical Pain

Q3.3. Worry

Q3.4. Sadness

Q3.5. Stress

Q3.6. Anger

Q3.7. Happiness

Response scale:

1 Yes

2 No

Q4.

Did you worry about money **yesterday**?

1 Yes

2 No

Q5.

In general, would you say your health is:

11. Excellent
12. Very Good
13. Good
14. Fair
15. Poor

Q6.

In general, would you say your *mental health* is:

11. Excellent
12. Very Good
13. Good
14. Fair
15. Poor

Q7.

The following two questions ask about how you have been feeling in the **past 2 weeks**.

Over the last 2 weeks, how often have you been bothered by any of the following problems?

Little interest or pleasure in doing things

9. Nearly every day
10. More than half the days
11. Several days
12. Not at all

Feeling down, depressed, or hopeless

5. Nearly every day
6. More than half the days
7. Several days
8. Not at all

INTRO 2: Now we will ask you some questions about your medical care use

Q8.

In the next month, are you confident you will have access to quality medical care?

1 Yes

2 No

Q9.

In the next month, are you confident that if you had a high medical bill you or your health insurance plan (if any) would be able to pay for it? Think about a medical bill due to a major surgery, for example.

- 1 Yes
- 2 No

Q9a. During the past 12 months, have you had any problems paying bills?

- 3. Yes
- 4. No

[If yes, ask Q9b and c

Q9b. During the past 12 months, have you had any problems paying *medical* bills?

- 3. Yes
- 4. No

Q9c. Because of problems paying bills during the past 12 month, have you been contacted by a collection agency?

- 3. Yes
- 4. No

Q10.

Are you **currently** taking any medication prescribed by a doctor or other health professional?

- 1 Yes
- 2 No

[If YES, ask Q11]

Q11.

Are you **currently** taking any prescribed medication to manage anxiety, depression, or another emotional problem?

- 1 Yes
- 2 No

Q12.

Do you have health insurance coverage?

- 1 Yes
- 2 No

Which of the following best describes your current health insurance or health coverage plan?

Please check all that apply.

1. Insurance through my or my spouse's/partner's employer/union
2. Retiree Insurance through my or my spouse's/partner's former employer/union
3. Private insurance purchased directly from an insurance company or through a state or federal exchange marketplace
4. Medicare
5. Medicaid, Medical Assistance or any kind of government assistance plan for those with low incomes or a disability
6. Tricare or other military health care
7. VA, including CHAMPVA or VA Care
8. Other program: _____
9. No coverage

INTRO 3: The next part of this survey will ask some general questions about you

Q13.

What is your labor force status? Please choose all that apply.

- 1 Currently working
- 2 On sick or other leave
- 3 Unemployed - on layoff
- 4 Unemployed – looking for work
- 5 Retired
- 6 Disabled
- 7 Other

Q13a.

In which state are you currently residing?

- 1 Alaska (AK)

...

[drop down menu]

Q13b. What is the county [parish for LA, municipality for PR] of your current residence?

[text box or drop down menu?]

Q13c. Have you moved since **April 2020**?

- 1 Yes
- 2 No

If Yes ask q13d

Q13d. What is the state and county [parish for LA, municipality for PR] of the residence were you were living in **April 2020**?

[2 text boxes, 1 for state and 1 for county]

Q14.

In the last month, did you provide care for or look after an adult or child who cannot care for themselves?

YES

NO

Q15.

Which of the following words belongs to the same category as **banana**?

6. Famous
7. Keyboard
8. Inexpensive
9. Foreign
10. Cherry

Q16. [4 questions on the same screen]

Please respond to each question or statement by marking one box per row.

In the past 7 days...

My sleep quality was

1. Very poor
2. Poor
3. Fair
4. Good
5. Very good

In the past 7 days...

My sleep was refreshing...

I had a problem with my sleep...

I had difficulty falling asleep...

6. Not at all
7. A little bit
8. Somewhat
9. Quite a bit
10. Very much

Q17. [3 questions on the same screen]

Think about how you have been feeling in the **past 7 days**.

1. In the **past 7 days**, how often did you feel that you lack companionship?
2. In the **past 7 days**, how often did you feel left out?
3. In the **past 7 days**, how often did you feel isolated from others?

Answers for each are:

1. Hardly Ever
2. Some of the Time
3. Often

Q18.

The following two questions ask about how you have been feeling in the **past 2 weeks**.

Over the last 2 weeks, how often have you been bothered by any of the following problems?

Feeling nervous, anxious or on edge

5. Nearly every day
6. More than half the days
7. Several days
8. Not at all

Not being able to stop or control worrying

5. Nearly every day
6. More than half the days
7. Several days
8. Not at all

Q19.

Which category represents the total combined income of all members of your family (living in your house) **during the past 12 months**? This includes money from jobs, net income from business, farm or rent, pensions, dividends, interest, Social Security payments and any other monetary income received by members of your family who are 15 years of age or older.

- 1 Less than \$5,000
- 2 5,000 to 7,499
- 3 7,500 to 9,999
- 4 10,000 to 12,499
- 5 12,500 to 14,999
- 6 15,000 to 19,999
- 7 20,000 to 24,999
- 8 25,000 to 29,999
- 9 30,000 to 34,999
- 10 35,000 to 39,999
- 11 40,000 to 49,999
- 12 50,000 to 59,999
- 13 60,000 to 74,999
- 14 75,000 to 99,999
- 15 100,000 to 149,999

16 150,000 or more

INTRO: In the next questions, we will ask you what you are thinking and feeling about the coronavirus (COVID-19)

Q20.

Have you been tested for the coronavirus (COVID-19)?

4. Yes, I tested positive
5. Yes, I tested negative
6. No, I have not been tested

[If Q20 “yes, I tested positive” skip Q21]

Q21.

Do you think you’ve been infected with the coronavirus (COVID-19)?

4. Yes
5. No
6. Unsure

[If Q21 “No” skip Q22]

Q22.

Did you try to get tested for the coronavirus (COVID-19)?

5. Yes but I was unable to get tested
6. Yes but I’m still waiting for the results
7. No
8. Unsure

Q23.

Do you personally know anyone who has been diagnosed with the coronavirus (COVID-19)?

4. Yes
5. No
6. Unsure

If Q23 = YES, then ask Q23b.

Q23b.

Do any of your close relatives or friends have been diagnosed with the coronavirus (COVID-19)?

4. Yes
5. No
6. Unsure

Q24. In the last month, were you delayed in getting medical care, tests, or treatments that you or a doctor believed necessary?

1. Yes
2. No

[If yes]

Q24a.

[Order of answers is randomized, other always at the bottom]

Which of these best describes the main reason you were delayed in getting medical care, tests, or treatments that you or a doctor believed necessary?

1. Couldn't afford care
2. Insurance company wouldn't approve, cover, or pay for care
3. Doctor refused to accept my insurance plan
4. Problems getting to doctor's office
5. Worried that would get infected with COVID-19 at doctor's office
6. Couldn't get time off work
7. Didn't know where to go to get care
8. Was refused services
9. Didn't have time or took too long
10. Doctor's office was closed
11. Other _____

Q25.

Have you lost your job or a significant part of your income because of the coronavirus (COVID-19)?

4. Yes, I lost my job
5. Yes, I did not lose my job but I lost a significant part of my income
6. No

Next we would like to ask your opinion about how likely you think various events might be. When we ask a question we'd like for you to give us a number from 0 to 100, where "0" means that you think there is absolutely no chance, and "100" means that you think the event is absolutely sure to happen. For example, no one can ever be sure about tomorrow's weather, but if you think that rain is very unlikely tomorrow, you might say that there is a 10 percent chance of rain. If you think there is a very good chance that it will rain tomorrow, you might say that there is an 80 percent chance of rain.

Q26.

On a scale of 0 to 100 percent, what is the chance that you will get the coronavirus (COVID-19) in the **next three months**? If you're not sure, please give your best guess.

RANGE 0 100

Please enter a number between 0% and 100%

Q26a.

If you do get the coronavirus (COVID-19), what is the percent chance you will die from it? If you're not sure, please give your best guess.

RANGE 0 100

Please enter a number between 0% and 100%

Q27.

On a scale of 0 to 100 percent, what is the chance that someone you know will get the coronavirus (COVID-19) in the **next three months**? If you're not sure, please give us your best guess.

RANGE 0 100

Please enter a number between 0% and 100%

Q27a.

If someone the same age as you gets the coronavirus (COVID-19), what is the percent chance they will die from it? If you're not sure, please give us your best guess.

RANGE 0 100

Please enter a number between 0% and 100%

[Ask if Q28 currently working Q13= 1 or 2 (currently working or on leave)]

Q28.

The coronavirus (COVID-19) may cause economic challenges for some people regardless of whether they are actually infected.

What is the percent chance that you will lose your job because of the coronavirus (COVID-19) within the **next three months**?

RANGE 0 100

Please enter a number between 0% and 100%

Q29.

The coronavirus (COVID-19) may cause economic challenges for some people regardless of whether they are actually infected.

What is the percent chance you will run out of money because of the coronavirus (COVID-19) in the **next three months**?

RANGE 0 100

Please enter a number between 0% and 100%

Q30. The coronavirus stimulus bill that was passed last March is known as the CARES ACT. Have you received your CARES ACT economic assistance payment from the IRS yet, are you waiting for it, or do you not qualify?

1. Received it
2. Waiting for it
3. Do not qualify

Q31. Have you received any State or Federal unemployment compensation between **since March 2020**?

1. Yes
2. No

Q32.

[Order of answers is randomized, I've done nothing different always in the bottom]

Which of the following have you done in the **past 7 days** to keep yourself safe from the coronavirus (COVID-19) in addition to what you normally do?

Only consider actions that you took or decisions that you made personally. Mark all that apply.

16. Worn a face mask
17. Washed hands with soap or used hand sanitizer several times per day
18. Canceled or postponed air travel
19. Canceled or postponed work or school activities
20. Canceled or postponed personal or social activities
21. Visited a doctor
22. Canceled a doctor's appointment
23. Stockpiled food or water
24. Avoided contact with people who could be high-risk
25. Avoided public spaces, gatherings, or crowds
26. Avoided eating at restaurants
27. Worked or studied at home
28. Self-isolated at home
29. Avoided interacting with own children or/and grandchildren
30. I've done nothing differently

[If they mark self-isolated at home, ask Q49a]

Q32a. How long have you been self-isolating at home because of the coronavirus (COVID-19)?
 _____ [open ended, allow numbers only] days/weeks [drop down menu]

Q33.

[Order of answers 1-7 is randomized]

Have you changed your plans with respect to any of the below because of the coronavirus (COVID-19)? Please mark all that apply.

10. Travel
11. Work
12. Retirement

- 13. Health treatments and procedures
- 14. Residential move
- 15. Real estate or vehicle purchase or sale
- 16. Big ticket purchase or sale
- 17. Other _____
- 18. I have not changed any of my plans

Q34.

Has your county of residence started re-opening the economy (e.g. allowing more business to operate, opening leisure options such as beaches, trails and parks, etc)

- 1. Yes
- 2. No
- 3. Not sure

Q35.

What do you think of the pace in which your county of residence officials are re-opening the economy?

- 1. They are moving too fast
- 2. They are moving too slow
- 3. They are moving at the right speed

INTRO: In the last part of this survey, we will ask you questions related to current events

Q36. From what you know or have read and heard, how do you feel about the Black Lives Matter movement?

- 1. Strongly support
- 2. Somewhat support
- 3. Somewhat oppose
- 4. Strongly oppose
- 5. No answer

Q37. Have you ever done any of the following, or not? [randomize order]

- a. Contacted a public official to express your opinion on issues related to race or racial equality
- b. Contributed money to a group or organization that focuses on race or racial equality
- c. Attended a protest or rally that focused on issues related to race or racial equality
- d. Had conversations with family or friends about issues related to race or racial equality
- e. Posted or shared content on social networking sites related to race or racial equality

- 1. Yes in the last 3 months
- 2. Yes but not in the last 3 months

3. No

Thank you for participating in our survey!

We will be monitoring people's feelings and opinions in the coming months and we might contact you again for another interview. Your answers are very important to us. We appreciate your cooperation!

Appendix References

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