OBSERVATION: BRIEF RESEARCH REPORT

Knowledge and Perceptions of COVID-19 Among the General Public in the United States and the United Kingdom: A Cross-sectional Online Survey

Background: The behavior of the general public will probably have an important bearing on the course of the coronavirus disease 2019 (COVID-19) epidemic. Human behavior is influenced by people's knowledge and perceptions (1).

Objective: To assess knowledge and perceptions about COVID-19 among a convenience sample of the general public in the United States and United Kingdom.

Methods and Findings: This study is a cross-sectional survey conducted on an online platform managed by Prolific Academic Ltd. The platform's pool of participants numbers approximately 80 000 individuals, of whom approximately 43%

Table 1. Sample Characteristics

Characteristic	United States	United Kingdom
Total participants, *n*	2986	2988
Female, *n (%)*	1519 (50.9)	1531 (51.2)
Age, *n (%)*		
18–27 y	655 (21.9)	550 (18.4)
28–37 y	687 (23.0)	557 (18.6)
38–47 y	531 (17.8)	563 (18.8)
48–57 y	493 (16.5)	480 (16.1)
≥58 y	620 (20.8)	838 (28.0)
Education, *n (%)*		
Less than a high school diploma/A-Levels	24 (0.8)	396 (13.3)
High school degree/Completed A-Levels	334 (11.2)	682 (22.8)
Some undergraduate education (no degree)	704 (23.6)	370 (12.4)
Associate degree	322 (10.8)	–*
Bachelor's degree	1068 (35.8)	1030 (34.5)
Master's degree	405 (13.6)	330 (11.0)
Professional degree	63 (2.1)	100 (3.3)
Doctorate	66 (2.2)	80 (2.7)
Total household income, *n (%)*		
<$10 000/<£7 500	165 (5.5)	172 (5.8)
$10 000–$19 000/£7 500–£14 999	222 (7.4)	333 (11.1)
$20 000–$29 000/£15 000–£22 499	342 (11.5)	463 (15.5)
$30 000–$39 000/£22 500–£29 999	325 (10.9)	473 (15.8)
$40 000–$49 000/£30 000–£37 499	280 (9.4)	358 (12.0)
$50 000–$59 000/£37 500–£44 999	304 (10.2)	312 (10.4)
$60 000–$69 000/£45 000–£52 499	230 (7.7)	242 (8.1)
$70 000–$79 000/£52 500–£59 999	242 (8.1)	156 (5.2)
$80 000–$89 000/£60 000–£67 499	138 (4.6)	121 (4.0)
$90 000–$99 000/£67 500–£74 999	154 (5.2)	98 (3.3)
$100 000–$149 000/£75 000–£99 999	401 (13.4)	168 (5.6)
≥$150,000/≥£100,000	183 (6.1)	92 (3.1)
Race or ethnicity, *n (%)*		
White	2269 (76.0)	2540 (85.0)
Black or African American	392 (13.1)	110 (3.7)
Asian or Asian Indian	191 (6.4)	227 (7.6)
Mixed	74 (2.5)	62 (2.1)
Other	60 (2.0)	49 (1.6)
Current student	516 (17.3)	409 (13.7)
Chinese descent, *n (%)*		
Born in China	11 (0.4)	15 (0.5)
Parents or grandparents born in China	57 (1.9)	27 (0.9)
Works as a healthcare provider, *n (%)*		
Nurse	33 (1.1)	44 (1.5)
Physician	5 (0.2)	15 (0.5)
Pharmacist	10 (0.3)	6 (0.2)
Other	102 (3.4)	118 (3.9)

* Associate degrees are not awarded in the United Kingdom.

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Table 2. Summary of Survey Findings

Survey Question	Response*	United States†	United Kingdom†
Cause, current state, and future development of the COVID-19 epidemic			
"Do you think it is likely that the new coronavirus is a bioweapon developed by a government or terrorist organization?"	Slightly likely, moderately likely, or extremely likely	23.9% (22.4%–25.5%)	18.4% (17.1%–19.9%)
"What do you think is the number of people living in the [US/UK] who are infected with the new coronavirus?"	Continuous variable	100 (20–500)	40 (13–200)
"How many people in the [US/UK] do you think will die from the new coronavirus by the end of 2020?"	≤500	61.0% (59.3%–62.8%)	71.7% (70.1%–73.3%)
Case-fatality rate and high-risk groups			
"What percent of people who get infected with the new coronavirus die from this infection?"	Continuous variable	5.0% (2.0%–15.0%)	3.0% (2.0%–10.0%)
"When they have been infected, what age groups are most likely to die from the illness caused by the new coronavirus?"	Children	53.8% (52.1%–55.6%)	39.1% (37.4%–40.9%)
	Older adults	96.3% (95.6%–96.9%)	98.3% (97.7%–98.7%)
"Are those with other health problems more likely to die from an infection with the new coronavirus disease than those without any other health problems?"	Yes	96.3% (95.6%–97.0%)	97.5% (96.9%–98.0%)
Symptoms of COVID-19 and recommended healthcare-seeking behavior			
"What are common signs or symptoms of an infection with the new coronavirus?"	Cough, fever, and shortness of breath	79.8% (78.3%–81.2%)	84.6% (83.3%–85.9%)
	At least one of the following: nosebleeds, rash, constipation, and frequent urination	25.5% (24.0%–27.1%)	18.7% (17.4%–20.2%)
"If you have a fever or cough and recently visited China, or spent time with someone who did, what would be the best course of action?"	Would either delay care-seeking by 2–3 days, attend the emergency department unannounced, or take a taxi or public transport to their primary care provider	35.8% (34.1%–37.6%)	21.0% (19.5%–22.5%)
Preventing a COVID-19 infection			
"Which of the following actions help prevent catching an infection with the new coronavirus?"	All of the following: washing your hands; avoid close contact with people who are sick; and avoid touching your eyes, nose, and mouth with unwashed hands	92.6% (91.6%–93.4%)	86.0% (84.7%–87.2%)
	At least one of the following: using a hand dryer, regularly rinsing your nose with saline, taking antibiotics, and gargling mouthwash	43.5% (41.7%–45.2%)	36.0% (34.3%–37.8%)
"Consistently wearing a face mask is highly effective in protecting you from getting infected with the new coronavirus"‡	True	37.8% (36.1%–39.6%)	29.7% (28.1%–31.4%)
"What is the main way in which people are currently getting infected with the new coronavirus?"	Droplets of saliva that land in the mouths or noses of people who are nearby when an infected person sneezes or coughs	74.8% (73.2%–76.4%)	81.2% (79.8%–82.6%)
"At this point in the coronavirus epidemic, do you think your government should implement the following measures to prevent spreading of the virus?"	Suspend all air travel	25.3% (23.7%–26.8%)	21.2% (19.7%–22.7%)
Perceptions of the risk posed by community members of East Asian ethnicity			
"What percent of people of East-Asian ethnicity living in the [US/UK] do you think are currently infected with the new coronavirus?"	Continuous variable	0.5% (0.0001–2.0)	0.5% (0.0–1.0)
"Suppose that you see an adult of East-Asian ethnicity in your neighborhood who wears a face mask. What do you think is the probability (in percent from 0% to 100%) that he or she is infected with the new coronavirus?"	Continuous variable	1.0% (0.0–5.7)	1.0% (0.0–5.0)

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Table 2–Continued

Survey Question	Response*	United States†	United Kingdom†
"Do you think it would be prudent for you to not eat at Chinese restaurants for the next few weeks to reduce the risk of getting infected with the new coronavirus?"	Yes	25.6% (24.1%–27.2%)	29.6% (28.0%–31.3%)
"If you were an Uber driver today, would you try to reject ride requests from people with East-Asian-sounding names (or a profile photo of East-Asian ethnicity) to reduce your risk of getting infected with the new coronavirus?"	Sometimes, often, or always	29.7% (28.1%–31.3%)	40.8% (39.0%–42.5%)
"Does receiving a letter or package from China put you at risk of getting infected with the new coronavirus?"	Yes	29.0% (27.4%–30.7%)	24.4% (22.9%–26.0%)

COVID-19 = coronavirus disease 2019.
* This column shows how I grouped response options to summarize categorical variables into a dichotomous measure. Percentages under the headings "United States" and "United Kingdom" refer to the percentage of participants who selected the response option or logical grouping of response options shown in this column.
† For dichotomous outcomes, data are expressed as percentage (95% CI). For continuous outcomes, data are expressed as median (interquartile range).
‡ This question was followed by the following text: "For the purpose of this question, 'highly effective' is defined as reducing your risk of getting infected by >95% and a 'face mask' is a common medical mask."

reside in the United Kingdom and 33% in the United States (2). For this study, Prolific selected a convenience sample of 3000 participants residing in the United States and 3000 participants residing in the United Kingdom who were chosen to have approximately the same distribution of age, sex, and ethnicity (and each combination thereof) as the U.S. and U.K. general population (by using numbers from the last census in each country). Specifically, Prolific established population strata (**Table 1**) with a predetermined number of open slots into which eligible participants in the online pool could enroll on a first-come, first-served basis.

Participants, who had to have indicated that they were fluent in English, received US$1.50 for completing the survey. They completed the online questionnaire between 23 February and 2 March 2020. The questionnaire (**Supplement**, available at Annals.org) consisted of 22 questions on knowledge and perceptions of COVID-19, including specific questions about "myths" or falsehoods listed on the World Health Organization's "myth busters" Web site (3).

To summarize the survey findings, I dichotomized categorical variables and computed the median and interquartile range for continuous variables. For binomial proportions, I used a score interval (Wilson score interval without continuity correction [4]) to construct a 95% CI. No sampling weights were used given that this was not a probabilistic sample.

In total, 2986 and 2988 adults residing in the United States and United Kingdom, respectively, completed the questionnaire. Participants' sociodemographic characteristics are shown in **Table 1**. Although participants generally had good knowledge of the main mode of disease transmission and common symptoms, the survey identified several important misconceptions on how to prevent acquisition of COVID-19, including beliefs in falsehoods that have circulated on social media (**Table 2**). A substantial proportion of participants also expressed an intent to discriminate against individuals of East Asian ethnicity for fear of acquiring COVID-19. A more detailed analysis and visualization of all survey responses are available (5).

Discussion: The findings of this study could be used to set priorities in information campaigns on COVID-19 by public health authorities and the media. Such information provision could, for instance, emphasize the comparatively low case-fatality rate, the recommended care-seeking behavior, the low risk posed by individuals of East Asian ethnicity living in the United States and United Kingdom, and that children appear to be at a lower risk for a fatal disease course than adults. In addition, to ensure that individuals focus their attention on those prevention measures that are most effective, this study suggests that it will be important to inform the public about the comparative effectiveness of common surgical masks versus frequent and thorough handwashing and avoiding close contact with people who are sick.

This study has several limitations. First and foremost, given that participants had to have both chosen to register with Prolific and to take the survey at the time it was published, this convenience sample of adults is unlikely to be representative of the general U.S. and U.K. population. The generalizability of the findings is, therefore, limited. Second, it is possible that some participants may have randomly selected responses to spend the least amount of time to earn the $1.50 reward. I believe this is unlikely to be an important source of bias because only 2 participants (who were excluded from the analysis) completed the survey in under 2 minutes (while it was physically possible to complete it in well under 90 seconds), there was no bimodal distribution in the time taken to complete the survey, and $1.50 is a relatively small monetary incentive. Third, it is possible that participants looked up the answers to some of the questions online before answering. Participants were asked at the end of the survey (while being reassured that their payment is not influenced by their response) for which, if any, questions they searched for an answer online. These responses were set to missing in the analysis.

In conclusion, the general public in the United States and United Kingdom appears to have important misconceptions about COVID-19. Correcting these misconceptions should be targeted in information campaigns organized by government agencies, information provision by clinicians to their patients, and media coverage.

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Reproducible Research Statement: *Study protocol:* Available from Dr. Geldsetzer (e-mail, pgeldsetzer@stanford.edu). *Statistical code and data set:* Available from https://purl.stanford.edu/zx357dw0759.

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