Racial disparities in knowledge, attitudes and practices related to COVID-19 in the USA

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ABSTRACT

Background Recent reports indicate racial disparities in the rates of infection and mortality from the 2019 novel coronavirus (coronavirus disease 2019 [COVID-19]). The aim of this study was to determine whether disparities exist in the levels of knowledge, attitudes and practices (KAPs) related to COVID-19.

Methods We analyzed data from 1216 adults in the March 2020 Kaiser Family Foundation ‘Coronavirus Poll’, to determine levels of KAPs across different groups. Univariate and multivariate regression analysis was used to identify predictors of KAPs.

Results In contrast to White respondents, Non-White respondents were more likely to have low knowledge (58% versus 30%; P < 0.001) and low attitude scores (52% versus 27%; P < 0.001), but high practice scores (81% versus 59%; P < 0.001). By multivariate regression, White race (odds ratio [OR] 3.06; 95% confidence interval [CI]: 1.70–5.50), higher level of education (OR 1.80; 95% CI: 1.46–2.23) and higher income (OR 2.06; 95% CI: 1.58–2.70) were associated with high knowledge of COVID-19. Race, sex, education, income, health insurance status and political views were all associated with KAPs.

Conclusions Racial and socioeconomic disparity exists in the levels of KAPs related to COVID-19. More work is needed to identify educational tools that tailor to specific racial and socioeconomic groups.

Keywords African-Americans, COVID-19, public health, race, socioeconomic factors

Introduction

Outbreak of the novel coronavirus [2019-nCoV or coronavirus disease 2019 (COVID-19)] has overwhelmed health systems and economies.1,2 Beyond its impact on health and the dynamics of social structure, COVID-19 has had debilitating impact on many families around the world. Mounting evidence suggests African–Americans and Hispanics have increased rates of infection and mortality from COVID-19.3–5 Despite comprising less than a third of the population, African–Americans accounted for >70% of COVID-19-related deaths in Chicago and Louisiana.6,7 In New York where Hispanics make up 29% of the population, 34% of COVID-19-related deaths occurred among Hispanic people.8 These reports underscore the role of underlying social determinants of health, socioeconomic disparities and pervasive racial disparities in health and health outcomes in the USA.

The goal of this study was to assess the knowledge, attitudes and practices (KAPs) related to COVID-19 among a nationally representative sample of the US population. We hypothesize that groups with high knowledge scores will be more likely to have better practices.
Methods

Data source
We analyzed poll data designed and collected by The Kaiser Family Foundation (KFF). The ‘KFF Coronavirus Poll’ was conducted between 11 and 15 March 2020 using a random digit dial telephone survey among 1216 adults (aged 18 years and older) living in the USA (including Alaska and Hawaii). To efficiently obtain an appropriate sample of lower-income and non-White respondents, an oversample of prepaid (pay-as-you-go) telephone numbers was used. According to the KFF Poll, 25% of the cell phone sample consisted of prepaid numbers, and margins of sampling error were generally ±3% points. This dataset closely represents the US population ≥ 18 years after applying sampling weights.

Data analysis
Poll questions were divided into three groups: knowledge, attitudes and practices. Each respondent was assigned a separate score for each group, based on the number of correct or positive answers. Each appropriate answer was assigned 1 point and incorrect responses were assigned zero points. The scores were then dichotomized into low (poor) or high (good) based on their relationship to the respective median score. Groupings were as follows: knowledge (low = 0–14 points; high = 15–18 points); attitude (low = 0–3 points; high = 4–7 points); practice (low = 0 points; high = 1–5 points).

Characteristics of the study population are presented as means ± standard deviation (SD), ranges and frequency where appropriate. Univariate regression analysis was used to evaluate crude associations of KAPs with sociodemographic characteristics by using odds ratios (ORs) and corresponding 95% confidence intervals (CI). An a priori P-value of P < 0.1 was considered significant on univariate analysis and for inclusion into multivariate models. Multivariate logistic regression was used to obtain adjusted ORs; a P < 0.05 was considered significant. Hypothesis tests were all two-sided. Weighted counts are reported, unless otherwise stated. The ‘svy’ suite of commands and Stata 15.1 (StataCorp, College Station, TX) was used for statistical analyses. The Institutional Review Board at Stanford University determined that this research was exempt from full review by the board.

Results
Sociodemographic characteristics of the study population are summarized (Table 1). A total of 1402 (48%) respondents were male; 1851 (64%) were White, 338 (12%) were Black, 467 (16%) were Hispanic and 244 (8%) identified as Asian or multiracial. Median (interquartile range) age of respondents was 46 (31–62) years. In total, 850 (29%) had a high school education. In all, 140 (5%) respondents were unemployed and 138 (5%) were current students. Income of 1096 (42%) respondents was <$40 000 a year, and 732 (28%) made >$90 000 per year. A total of 409 (18%) adults (<65 years old) were uninsured, 312 (14%) obtained health insurance coverage through Medicaid or other State-specific insurance marketplace and 141 (6%) were covered under Medicare. Finally, 805 (35%) respondents obtained health insurance through employer-sponsored programs. In total, 1621 survey respondents (56%) reported being in ‘excellent/very good health’. However, 1154 (40%) said either they or someone in their household had a serious health condition (Table 1).

Knowledge of COVID-19
A total of 41% of respondents had low knowledge of COVID-19 (Table 2). Median (IQR) knowledge score among the entire cohort was 15 (13–17). White respondents had a median (IQR) knowledge score of 16 (14–17) compared with 14 (12–15) among Black, 14 (12–16) among Hispanic and 14 (13–16) among Asians/multiracial respondents (P < 0.001). In contrast to 1291 (70%) of White respondents with high knowledge score, only 117 (35%) of Black, 192 (41%) of Hispanic and 119 (48%) of Asian/multiracial respondents had high knowledge score of COVID-19 (P < 0.001) (Table 2). Supplementary Table 1 provides detailed differences in knowledge across the different race groups.

Attitudes toward COVID-19
A total of 37% of respondents had poor attitude toward COVID-19 (Table 2). Mean attitude score among the entire cohort was 4.2 ± 2.0 (range 0–8). White respondents had greater mean attitude scores (4.6 ± 1.9) compared with Black (3.8 ± 1.8), Hispanic (2.9 ± 1.9) or Asians/multiracial respondents (3.8 ± 1.9), (P < 0.001). Although 1345 (73%) of White respondents had high attitude scores, only 193 (57%) of Black, 166 (35%) of Hispanic and 126 (52%) of Asian/multiracial respondents had high attitude score toward COVID-19 (P < 0.001) (Table 2). Supplementary Table 2 provides detailed differences in attitudes across the different race groups.

Practices regarding COVID-19
In total, 33% of the entire study population had poor practices related to COVID-19 (Table 2). Median (IQR) practice score among the entire cohort was 1 (0–3). White respondents
Table 1  Sociodemographic characteristics of study populationa

| Variables                                      | White N (%) | Black N (%) | Hispanic N (%) | Asian/Multiracial N (%) | Total, N (%) | P-value |
|------------------------------------------------|-------------|-------------|----------------|-------------------------|--------------|---------|
| Sex                                            |             |             |                |                         |              |         |
| Male                                           | 877 (63%)   | 153 (11%)   | 246 (18%)      | 124 (9%)                | 1402 (48%)   | 0.568   |
| Female                                         | 974 (65%)   | 185 (12%)   | 221 (16%)      | 120 (8%)                | 1500 (52%)   |         |
| Age (n, %)                                     |             |             |                |                         |              |         |
| 18–29                                          | 344 (54%)   | 57 (9%)     | 157 (25%)      | 79 (12%)                | 637 (22%)    | <0.001  |
| 30–49                                          | 567 (38%)   | 132 (14%)   | 191 (20%)      | 84 (9%)                 | 974 (34%)    |         |
| 50–64                                          | 483 (69%)   | 66 (9%)     | 93 (13%)       | 58 (8%)                 | 700 (24%)    |         |
| > 65                                           | 460 (77%)   | 84 (14%)    | 28 (5%)        | 24 (4%)                 | 595 (20%)    |         |
| Marital status: are you currently married, living with a partner, widowed, divorced, separated or have you never been married? |             |             |                |                         |              |         |
| Married/living together                         | 1152 (69%)  | 148 (9%)    | 240 (14%)      | 123 (7%)                | 1662 (57%)   | <0.001  |
| Single/widowed/divorced                         | 696 (56%)   | 188 (15%)   | 226 (18%)      | 122 (10%)               | 1232 (43%)   |         |
| Last year—that is, in 2019—what was your total family income from all sources before taxes? |             |             |                |                         |              |         |
| <$40 K                                         | 575 (53%)   | 169 (15%)   | 245 (22%)      | 106 (10%)               | 1096 (42%)   | <0.001  |
| $40 K–$89 K                                    | 535 (69%)   | 74 (9%)     | 113 (15%)      | 54 (7%)                 | 776 (30%)    |         |
| $90K+                                          | 545 (75%)   | 66 (9%)     | 68 (9%)        | 52 (7%)                 | 732 (28%)    |         |
| Are you self-employed or do you work for someone else? |             |             |                |                         |              |         |
| Self-employed                                  | 193 (67%)   | 15 (5%)     | 58 (20%)       | 24 (8%)                 | 289 (17%)    | 0.288   |
| Work for someone else                          | 906 (63%)   | 167 (12%)   | 273 (19%)      | 102 (7%)                | 1448 (83%)   |         |
| What is the highest level of school you have completed or the highest degree you have received? |             |             |                |                         |              |         |
| Less than high school                          | 83 (31%)    | 51 (19%)    | 112 (42%)      | 21 (8%)                 | 266 (9%)     | <0.001  |
| High school graduate                           | 549 (65%)   | 106 (12%)   | 151 (18%)      | 44 (5%)                 | 850 (29%)    |         |
| Some college                                   | 590 (66%)   | 110 (12%)   | 124 (14%)      | 76 (8%)                 | 900 (31%)    |         |
| College+                                       | 630 (71%)   | 71 (8%)     | 82 (9%)        | 100 (11%)               | 882 (30%)    |         |
| Do you or anyone in your household have a serious health condition? |             |             |                |                         |              |         |
| Yes                                            | 721 (62%)   | 163 (14%)   | 170 (15%)      | 101 (9%)                | 1154 (40%)   | 0.223   |
| No                                             | 1126 (65%)  | 175 (10%)   | 299 (17%)      | 144 (8%)                | 1744 (60%)   |         |
| Are you the parent or guardian of any child under the age of 18 living in your household? |             |             |                |                         |              |         |
| Yes                                            | 514 (58%)   | 102 (12%)   | 174 (20%)      | 93 (10%)                | 883 (30%)    | 0.054   |
| No                                             | 1340 (66%)  | 236 (12%)   | 295 (15%)      | 152 (8%)                | 2022 (70%)   |         |
| Would you say your views in most political matters are liberal, moderate, or conservative? |             |             |                |                         |              |         |
| Liberal                                        | 339 (56%)   | 70 (12%)    | 112 (18%)      | 85 (14%)                | 606 (23%)    | 0.001   |
| Moderate                                       | 717 (68%)   | 107 (10%)   | 146 (14%)      | 87 (8%)                 | 1057 (40%)   |         |
| Conservative                                   | 886 (69%)   | 104 (10%)   | 167 (17%)      | 41 (4%)                 | 997 (37%)    |         |
| In general, would you say your health is excellent, very good, good, only fair or poor? |             |             |                |                         |              |         |
| Excellent/very good                            | 1094 (67%)  | 159 (10%)   | 228 (14%)      | 140 (9%)                | 1621 (56%)   | 0.081   |
| Good                                           | 507 (60%)   | 112 (13%)   | 153 (18%)      | 79 (9%)                 | 850 (29%)    |         |
| Only fair/Poor                                 | 250 (58%)   | 66 (15%)    | 89 (21%)       | 26 (6%)                 | 431 (15%)    |         |
| Which of the following is your MAIN source of health insurance coverage? |             |             |                |                         |              |         |
| Employer                                       | 542 (67%)   | 82 (10%)    | 120 (15%)      | 61 (6%)                 | 805 (35%)    | <0.001  |
| Spouse’s employer                              | 189 (76%)   | 26 (10%)    | 11 (5%)        | 23 (9%)                 | 250 (11%)    |         |
| Self-purchased plan                            | 102 (69%)   | 19 (12%)    | 16 (11%)       | 12 (8%)                 | 148 (6%)     |         |
| Medicare                                       | 81 (58%)    | 17 (12%)    | 26 (18%)       | 16 (11%)                | 141 (6%)     |         |
| Medicaid/state-specific                        | 162 (52%)   | 54 (17%)    | 57 (18%)       | 40 (13%)                | 312 (14%)    |         |
| Somewhere else                                 | 55 (53%)    | 13 (13%)    | 16 (15%)       | 19 (18%)                | 103 (4%)     |         |
| Plan through parents                           | 84 (68%)    | 16 (13%)    | 15 (12%)       | 8 (7%)                  | 123 (5%)     |         |
| Uninsured and <65                              | 172 (42%)   | 28 (7%)     | 177 (43%)      | 32 (8%)                 | 409 (18%)    |         |
| State expanding Medicaid                       |              |             |                |                         |              |         |
| Yes                                            | 1263 (64%)  | 223 (11%)   | 292 (15%)      | 205 (10%)               | 1983 (68%)   | 0.008   |
| No/ Maybe                                      | 591 (64%)   | 115 (12%)   | 177 (19%)      | 40 (4%)                 | 923 (32%)    |         |

aNumbers do not always add up to total weighted count because of missing responses.

had lower median (IQR) practice scores [1 (0–2)] compared with Black [2 (10–3)], Hispanic [2 (1–3)] or Asians/multiracial respondents [2 (1–3), (P < 0.001). Paradoxically to the knowledge and attitude assessments, only 1097 (59%) of White respondents had high practice scores, compared with 258 (76%) of Black, 387 (82%) of Hispanic and 204 (84%) of Asian/multiracial respondents who had high practice scores toward COVID-19 (P < 0.001) (Table 2). Supplementary Table 3 provides detailed differences in practices across the different race groups.
Table 2  Knowledge, attitude and practice scores by race

| Variables                      | White N = 1854 | Black N = 338 | Hispanic N = 469 | Asian/Multiracial N = 245 | Total N = 2906 | P-value |
|-------------------------------|----------------|---------------|------------------|---------------------------|----------------|---------|
| Knowledge score (median, IQR) | 16 (14–17)     | 14 (12–15)    | 14 (12–16)       | 14 (13–16)               | 15 (13–17)     | <0.001  |
| Attitude score (mean, SD)     | 4.6 (1.9)      | 3.8 (1.8)     | 2.9 (1.9)        | 3.8 (1.9)                | 4.2 (2.0)      | <0.001  |
| Practice score (median, IQR)  | 1 (0–2)        | 2 (1–3)       | 2 (1–3)          | 2 (1–3)                  | 1 (0–3)        | <0.001  |
| Knowledge of COVID-19          |                |               |                  |                           |                |         |
| Low knowledge                 | 563 (47%)      | 221 (19%)     | 277 (23%)        | 126 (11%)                | 1187 (41%)     |         |
| High knowledge                | 1291 (75%)     | 117 (7%)      | 192 (11%)        | 119 (7%)                 | 1719 (59%)     | <0.001  |
| Attitudes toward COVID-19      |                |               |                  |                           |                |         |
| Poor attitude                 | 510 (47%)      | 145 (14%)     | 303 (28%)        | 119 (11%)                | 1076 (37%)     | <0.001  |
| Good attitude                 | 1345 (73%)     | 193 (14%)     | 166 (9%)         | 127 (6%)                 | 1829 (63%)     |         |
| Practices to reduce risk of COVID-19 |          |               |                  |                           |                |         |
| Poor practices                | 757 (79%)      | 80 (8%)       | 82 (9%)          | 40 (4%)                  | 959 (33%)      | <0.001  |
| Good practices                | 1097 (56%)     | 258 (13%)     | 387 (20%)        | 204 (11%)                | 1947 (67%)     |         |

Univariate and multivariate analyses of high knowledge score

On univariate analysis, Black, Hispanic and Asian/multiracial respondents were less likely than White respondents to have a high knowledge score (77, 70 and 59%, respectively; \( P < 0.001 \)) (Table 3). In contrast to respondents with less than high school education, increasing levels of education resulted in corresponding higher likelihood of having a high knowledge score (OR 2.43 for high school graduates, 5.12 for respondents with some college degree and 10.80 for respondents with a college degree or higher, \( P < 0.001 \)). Similarly, compared to respondents with an annual income < $40,000, those with higher income had higher odds of having a high attitude score (OR 1.74 and OR 2.17 for income \( \geq \$40,000 \) and \( \geq \$90,000 \), respectively; \( P < 0.001 \)). Compared to those with an employer-sponsored health insurance, uninsured respondents and those with Medicaid/other state-specific insurance were over 60% less likely to have high attitude scores (\( P < 0.001 \)).

In multivariate analysis, Black respondents, Hispanic and Asian/multiracial participants were less likely to have high attitude scores (57, 75 and 52%, respectively, \( P < 0.018 \)). Uninsured and patients with Medicaid health insurance were less likely to have high attitude scores (54 and 51%, respectively, \( P < 0.026 \)). Higher level of education and ‘moderate’ or ‘conservative’ political views remained positively associated with high attitude scores (Table 4).

Univariate and multivariate analyses of high practice score

On univariate analysis, Black, Hispanic and Asian/multiracial respondents were 2 to 3.5 times more likely than White respondents to have a high practice score (\( P < 0.001 \)) (Table 5). Respondents’ education level was not significantly associated with practice score on either univariate or multivariate regression.

After multivariate regression, Black, Hispanic and Asian/multiracial respondents were more likely (OR 2.97, 3.50 and...
### Table 3  Odd ratios of higher knowledge score

| Variables                     | Crude OR (95% CI) | Adjusted OR (95% CI)<sup>a</sup> |
|------------------------------|-------------------|----------------------------------|
| **Race/ethnicity**           |                   |                                  |
| White                        | Referent          | Referent                         |
| Black                        | 0.23 (0.15–0.35)  | 0.33 (0.18–0.60)                 |
| Hispanic                     | 0.30 (0.21–0.43)  | 0.46 (0.28–0.74)                 |
| Asian, multiracial           | 0.41 (0.26–0.66)  | 0.55 (0.26–1.13)                 |
| **Sex**                      |                   |                                  |
| Male                         | Referent          | Referent                         |
| Female                       | 1.26 (0.98–1.60)  | 1.24 (0.84–1.82)                 |
| **Age (year)**               |                   |                                  |
| <30                          | Referent          | Referent                         |
| 30–49                        | 1.09 (0.78–1.53)  | 1.0 (0.61–1.61)                  |
| 50–64                        | 1.48 (1.01–2.15)  | 1.39 (0.81–2.39)                 |
| ≥65                          | 1.04 (0.72–1.49)  |                                  |
| **Marital status**           |                   |                                  |
| Married/living together      | Referent          | Referent                         |
| Single/widowed/divorced      | 0.55 (0.43–0.71)  | 0.97 (0.64–1.47)                 |
| **Education level**          |                   |                                  |
| Less than high school        | Referent          | Referent                         |
| High school graduate         | 2.43 (1.40–4.24)  | 1.59 (0.77–3.28)                 |
| Some college                 | 5.12 (2.96–8.90)  | 2.75 (1.34–5.62)                 |
| College+                     | 10.80 (6.20–18.80)| 5.14 (2.36–11.18)                |
| **Income**                   |                   |                                  |
| <$40 000                     | Referent          | Referent                         |
| $40 000–$89 000              | 3.07 (2.22–4.25)  | 2.34 (1.41–3.90)                 |
| ≥$90 000                     | 6.45 (4.48–9.29)  | 3.42 (1.91–6.12)                 |
| **Insurance coverage**       |                   |                                  |
| Employer-sponsored           | Referent          | Referent                         |
| Medicare                     | 0.33 (0.18–0.62)  | 0.77 (0.35–1.71)                 |
| Medicaid/State-specific insurance | 0.25 (0.16–0.41) | 0.63 (0.32–1.23)                 |
| Uninsured, <65 years         | 0.33 (0.21–0.50)  | 0.68 (0.38–1.22)                 |
| **Political views**          |                   |                                  |
| Liberal                      | Referent          | Referent                         |
| Moderate                     | 0.77 (0.54–1.10)  | 0.55 (0.33–0.91)                 |
| Conservative                 | 0.50 (0.35–0.71)  | 0.36 (0.21–0.62)                 |

<sup>a</sup>Adjusted for race, sex, age, marital status, education level, income, insurance coverage and political views.

3.09, respectively; *P* < 0.001) to have high practice scores. Female respondents were at least 85% more likely to have high practice scores compared to males in both models (*P* < 0.001) (Table 5).

**Correlation between knowledge and practice scores**

Having high knowledge score was not associated with high practice scores; for every 1-unit increase in knowledge score, practice score increased by 0.02 points (*P* = 0.3) (Supplementary Table 4). However, on subpopulation analysis; for every 1-unit increase in knowledge score for a Black respondent, practice score increased by 0.11 points (95% CI: 0.02–0.21, *P* = 0.023). For White respondents, practice score increased by 0.09 points (95% CI: 0.05–0.14, *P* < 0.001) for every 1-unit increase in knowledge score. Education level added a positive effect; practice scores for Black respondents with at least a college degree increased by 0.23 points for every 1-unit increase in knowledge score (95% CI: 0.12–0.34, *P* < 0.001) compared with 0.12 points for every 1-unit increase in knowledge score in White respondents (95% CI 0.04–0.20, *P* = 0.002) (Supplementary Table 4).
Table 4  Odd ratios of higher attitude score with sociodemographic characteristics

| Variables                  | Crude OR (95% CI) | Adjusted OR (95% CI) |
|----------------------------|-------------------|----------------------|
| Race/Ethnicity             |                   |                      |
| White                      | Referent          | Referent             |
| Black                      | 0.50 (0.33–0.76)  | 0.43 (0.24–0.77)     |
| Hispanic                   | 0.21 (0.15–0.30)  | 0.25 (0.16–0.40)     |
| Asian, multiracial         | 0.40 (0.25–0.65)  | 0.48 (0.27–0.88)     |
| Sex                        |                   |                      |
| Male                       | Referent          | Referent             |
| Female                     | 0.67 (0.52–0.87)  | 0.80 (0.56–1.15)     |
| Age (year)                 |                   |                      |
| <30                        | Referent          | Referent             |
| 30–49                      | 1.29 (0.92–1.83)  | 1.62 (1.03–2.54)     |
| 50–64                      | 1.32 (0.92–1.93)  | 1.38 (0.83–2.31)     |
| ≥65                        | 1.98 (1.34–2.93)  |                      |
| Marital status             |                   |                      |
| Married/living together    | Referent          | Referent             |
| Single/widowed/divorced    | 0.95 (0.74–1.23)  | 1.47 (0.98–2.22)     |
| Education level            |                   |                      |
| Less than high school      | Referent          | Referent             |
| High school graduate       | 2.80 (1.67–4.69)  | 1.95 (1.02–3.73)     |
| Some college               | 3.26 (1.96–5.41)  | 2.11 (1.11–4.04)     |
| College+                   | 3.42 (2.08–5.65)  | 1.99 (1.01–3.93)     |
| Income                     |                   |                      |
| <$40 000                   | Referent          | Referent             |
| $40 000–$89 000            | 1.74 (1.26–2.41)  | 1.44 (0.90–2.31)     |
| ≥$90 000                   | 2.17 (1.55–3.03)  | 1.41 (0.82–2.43)     |
| Insurance coverage         |                   |                      |
| Employer-sponsored         | Referent          | Referent             |
| Medicare                   | 1.05 (0.53–2.06)  | 0.95 (0.39–2.36)     |
| Medicaid/State-specific insurance | 0.37 (0.23–0.60) | 0.49 (0.27–0.92) |
| Uninsured, <65 years       | 0.32 (0.21–0.48)  | 0.46 (0.27–0.80)     |
| Political views            |                   |                      |
| Liberal                    | Referent          | Referent             |
| Moderate                   | 1.74 (1.24–2.44)  | 1.71 (1.09–2.68)     |
| Conservative               | 2.41 (1.69–3.43)  | 2.41 (1.50–3.87)     |

*Adjusted for race, sex, age, marital status, education level, income, insurance coverage and political views.

Discussion

Main finding of this study

In light of recent reports suggesting significant disparity in the rates of infection and mortality from COVID-19, the goal of this study was to compare differences in KAPs related to COVID-19 by race. To our knowledge, this is the first study to evaluate racial differences in KAPs related to COVID-19 in the USA. We found significant racial disparities in the level of KAPs regarding COVID-19. Despite having lower average knowledge scores and reporting more negative experiences related to COVID-19, people of minority racial/ethnic backgrounds were more likely to report engaging in better practices to reduce their risk of spread and infection with COVID-19.

What is already known on this topic

Many changes have been made on state and federal levels to curb the spread of COVID-19: social distancing recommendations, shelter-in-place orders and orders for mandatory mask use in public. Although these directives may reduce spread of disease, having high knowledge and positive attitudes affect how people relate to disease because
Table 5 ORs of higher practice scores with sociodemographic characteristics

| Variables                        | Crude OR (95% CI) | Adjusted OR (95% CI) |
|----------------------------------|-------------------|----------------------|
| **Race/ethnicity**               |                   |                      |
| White                            | Referent          | Referent             |
| Black                            | 2.23 (1.40–3.58)  | 2.97 (1.54–5.75)     |
| Hispanic                         | 3.24 (2.12–4.96)  | 3.50 (2.07–5.89)     |
| Asian, multiracial               | 3.51 (1.92–6.41)  | 3.09 (1.45–6.57)     |
| **Sex**                          |                   |                      |
| Male                             | Referent          | Referent             |
| Female                           | 1.85 (1.43–2.40)  | 1.92 (1.34–2.74)     |
| **Age (year)**                   |                   |                      |
| <30                              | Referent          | Referent             |
| 30–49                            | 0.88 (0.61–1.27)  | 1.10 (0.68–1.76)     |
| 50–64                            | 0.66 (0.45–0.98)  | 0.84 (0.50–1.38)     |
| ≥65                              | 0.70 (0.48–1.03)  |                      |
| **Marital status**               |                   |                      |
| Married/living together          | Referent          | Referent             |
| Single/widowed/divorced          | 0.96 (0.74–1.24)  | 0.80 (0.53–1.19)     |
| **Education level**              |                   |                      |
| Less than high school            | Referent          | Referent             |
| High school graduate             | 0.75 (0.44–1.28)  | 1.00 (0.51–1.99)     |
| Some college                     | 0.80 (0.50–1.35)  | 0.95 (0.47–1.92)     |
| College+                         | 1.32 (0.78–2.24)  | 1.72 (0.81–3.64)     |
| **Income**                       |                   |                      |
| <$40 000                         | Referent          | Referent             |
| $40 000–$89 000                  | 0.72 (0.52–1.0)   | 0.80 (0.48–1.33)     |
| ≥$90 000                         | 1.01 (0.73–1.42)  | 1.07 (0.569–1.92)    |
| **Insurance coverage**           |                   |                      |
| Employer-sponsored               | Referent          | Referent             |
| Medicare                         | 0.94 (0.51–1.74)  | 1.01 (0.48–2.15)     |
| Medicaid/State-specific insurance| 1.79 (1.07–2.99)  | 1.70 (0.87–3.34)     |
| Uninsured, <65 years             | 1.44 (0.94–2.19)  | 1.42 (0.80–2.51)     |
| **Political views**              |                   |                      |
| Liberal                          | Referent          | Referent             |
| Moderate                         | 0.75 (0.51–1.09)  | 0.90 (0.56–1.46)     |
| Conservative                     | 0.48 (0.33–0.70)  | 0.67 (0.41–1.09)     |

*Adjusted for race, sex, age, marital status, education level, income, insurance coverage and political views.

they feel more empowered and engage more freely in shared decision-making.13–15 Recent reports suggest that African–American and Hispanic individuals are at higher risk of infection and mortality from COVID-19.3–5,8 However, not much is known regarding disparities in the KAPs among different racial and socioeconomic groups.

**What this study adds**
In this study, we found that White respondents, respondents with higher level of education and those with higher income were more likely to have high knowledge scores. These results underscore the negative impact of low socioeconomic status (SES) on knowledge of COVID-19. More importantly, it highlights failures in our current systems of distributing information related to COVID-19. Racial disparities in knowledge have been widely reported for other diseases.16–19 Tools to widely disseminate accurate information among Black and Hispanic communities impacted by high infection and mortality rates of COVID-19 are urgently needed. Racial inequalities exist in the access to and use of existing digital platforms for knowledge dispersal—they by themselves, these methods may be inadequate.20 Alternative modes of information transmission such as those used in global health settings,21,22 text
messaging, door tags and radio announcements should be considered.

In this study, attitude toward COVID-19 was evaluated by understanding how respondents viewed the disease, and to what extent they were affected by COVID-19. These questions reviewed the potential negative impact of COVID-19 on health, finances and access to care. Black, Hispanic and Asian/multiracial respondents as well as the uninsured, and those with low income (particularly the uninsured and people on public health (Medicaid) insurance), were much less likely to report high attitudes toward COVID-19. These results indicate the disproportionate financial and health impact that COVID-19 can have on minority racial/ethnic groups and people of lower SES.

According to our results, women and participants from minority racial/ethnic backgrounds were more likely to report engaging in practices that lead to reduced spread of infection and risk of being infected (i.e. canceling travel plans, avoiding large gatherings, etc.). Age, education level and income were not associated with reported practice scores. These findings indicate that despite their low knowledge scores, people of minority racial/ethnic background report being engaged in efforts to reduce the spread of COVID-19.

Put together, despite a reported effort by people of minority racial/ethnic backgrounds in adhering to current public health recommendations, people from these backgrounds have overall low knowledge of COVID-19. There is tremendous potential for reducing the risk of infection and mortality among all communities in the USA by diversifying tools used in education related to COVID-19. Existing public health education on COVID-19 has been more effective among White populations. Developing resources that are targeted, useful and relatable to different racial and socioeconomic groups could improve engagement even further.

Limitations of this study

Our study has several limitations. First, given the small sampling size, sampling error could be present. However, we used sampling weights when analyzing the dataset in accordance with survey methodology. Secondly, this survey provides information reported by respondents, which lends the results to potential response bias. Thus, the actual observed behaviors may be different than what is reported in the survey. Finally, due to the lack of infection and mortality data in this dataset, we cannot infer causality between race, low SES and mortality related to COVID-19. However, it is important to recognize that low health literacy has been associated with increased mortality in other patient populations. Further research is therefore required to explore the role of low knowledge on increased risk of infection and mortality related to COVID-19.

Conclusions

Racial disparity in KAP regarding COVID-19 exists in the USA. To effectively improve KAPs related to COVID-19 among all Americans, it is imperative to identify, design and implement strategies for knowledge dissemination that do not discriminate by race or SES. Identifying health literacy tools that enable access of knowledge and improve attitude of COVID-19 is urgently needed. It is our hope that we can leverage insights gained during the COVID-19 pandemic to reduce health inequalities for all Americans.

Supplementary data

Supplementary data are available at the Journal of Public Health online.

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