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, socioeconomics 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.

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Methods

Data source

We analyzed poll data designed and collected by The Kaiser Family Foundation (KFF).[9] The 'KFF Coronavirus Poll'[10] was conducted between 11 and 15 March 2020 using a random digit dial telephone survey among 1216 adults (aged 18 year 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.[10] This dataset closely represents the US population ≥ 18 years after applying sampling weights.[10]

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 scores 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 population[a]

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 (15%)	120 (8%)	1500 (52%)	
Age (n, %)						
18–29	344 (54%)	57 (9%)	157 (25%)	79 (12%)	637 (22%)	<0.001
30–49	567 (58%)	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%)	
$90 K+	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	686 (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%)	

[a]Numbers 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	White, N (%)	Black, N (%)	Hispanic, N (%)	Asian/multiracial N (%)	Total N (%)	P-value
Low knowledge	563 (47%)	221 (19%)	277 (23%)	126 (11%)	1187 (41%)	<0.001
High knowledge	1291 (75%)	117 (7%)	192 (11%)	119 (7%)	1719 (59%)	
Attitudes toward COVID-19						
Poor attitude	510 (47%)	145 (14%)	303 (28%)	119 (11%)	1076 (37%)	<0.001
Good attitude	1345 (73%)	193 (11%)	166 (9%)	126 (7%)	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 $< \$40\,000$, respondents with higher income had higher ORs of having a high knowledge score (OR 3.07 and OR 6.45 for income $\geq 40\,000$ and $\$90\,000$, respectively; $P < 0.001$). Finally, respondents who were uninsured or on Medicare/Medicaid were 75% less likely to have high knowledge scores.

After adjustment in multivariate logistic regression, Black and Hispanic respondents were less likely than White respondents (67 and 54%, respectively, $P < 0.001$) to have high knowledge scores. Respondents with a high school degree or higher, annual income $\geq \$40\,000$ and 'moderate' or 'conservative' political views had a greater likelihood of high knowledge scores (Table 3).

Univariate and multivariate analyses of high attitude score

On univariate analysis, Black, Hispanic and Asian/multiracial respondents were less likely than White respondents to have a high attitude score (50, 79 and 60%, respectively, $P < 0.001$) (Table 4). Compared with those with less than high school education, increasing levels of education resulted in corresponding higher likelihood of having a high attitude score (OR 2.80 for high school graduates, 3.26 for some college education and 3.42 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 $\$90\,000$, 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)[a]
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)

[a] 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 anal-ysis; 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 (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)[a]
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)

[a]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,[3–5,8] 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,[11] shelter-in-place orders[4] and orders for mandatory mask use in public.[12] 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)[a]
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)

[a]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—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.[23–26] 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.

Acknowledgement

References

1 University JH. *COVID-19's Historic Economic Impact, in the U.S. and Abroad*. https://hub.jhu.edu/2020/04/16/coronavirus-impact-on-european-american-economies/ (18 April 2020, date last accesseed).

2 Statista. *COVID-19: Impact on the Global Economy*. https://www.statista.com/topics/6139/covid-19-impact-on-the-global-economy/ (18 April 2020, date last accessed).

3 Taylor K-Y. *The Black Plague*. https://www.newyorker.com/news/our-columnists/the-black-plague (18 April 2020, date last accessed).

4 Sternlicht A. *Higher Coronavirus Mortality Rates for Black Americans and People Exposed to Air Pollution*. https://www.forbes.com/sites/alexandrasternlicht/2020/04/07/higher-coronavirus-mortality-rates-for-people-exposed-to-air-pollution-black-americans/ (18 April 2020, date last accessed).

5 Joe Barrett CJaER. *Mayors Move to Address Racial Disparity in Covid-19 Deaths*. https://www.wsj.com/articles/black-hispanic-new-yorkers-account-for-disproportionate-number-of-coronavirus-deaths-11586359447 (18 April 2020, date last accessed).

6   Eligon JB, AUDRA Searcey, DIONNE OPPEL Richard. *Black Americans Face Alarming Rates of Coronavirus Infection in Some States*. https://www.nytimes.com/2020/04/07/us/coronavirus-race.html (18 April 2020, date last accessed).

7   Melinda D. *Louisiana Data: Virus Hits Blacks, People with Hypertension*. https://www.usnews.com/news/best-states/louisiana/articles/2020-04-07/louisiana-data-virus-hits-blacks-people-with-hypertension (18 April 2020, date last accessed).

8   Koons C. *Black, Hispanic New Yorkers are Dying at High Rates of Covid-19*. https://www.bloomberg.com/news/articles/2020-04-08/black-hispanic-new-yorkers-are-dying-at-high-rates-of-covid-19 (18 April 2020, date last accessed).

9   Filling the need for trusted information on national health issues. The Henry J. Kaiser Family Foundation. https://www.kff.org/ (18 April 2020, date last accessed).

10 The Henry J. Kaiser Family Foundation. *Kaiser Family Foundation Poll: March 2020 Coronavirus Poll, Mar, 2020 [dataset]. 31117233, Version 2. SSRS [producer]*. Ithaca: Roper Center for Public Opinion Research, 2020.

11 CDC. *Social Distancing, Quarantine, and Isolation*. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html (18 April 2020, date last accessed).

12 Fink J. *These Are the States Where Wearing a Mask is Now Required in Public*. https://www.newsweek.com/these-are-states-where-wearing-mask-now-required-public-1498350 (18 April 2020, date last accessed).

13 Paixão MM, Ballouz T, Lindahl JF. Effect of education on improving knowledge and behavior for Arboviral diseases: a systematic review and meta-analysis. Am J Trop Med Hyg 2019;**101**(2):441–47.

14 Pereira DA, Costa NM, Sousa AL *et al.* The effect of educational intervention on the disease knowledge of diabetes mellitus patients. *Rev Lat Am Enfermagem* 2012;**20**(3):478–85.

15 Yin HS, Dreyer BP, Vivar KL *et al.* Perceived barriers to care and attitudes towards shared decision-making among low socioeconomic status parents: role of health literacy. *Acad Pediatr* 2012;**12**(2):117–24.

16 Fussman C, Rafferty AP, Reeves MJ *et al.* Racial disparities in knowledge of stroke and heart attack risk factors and warning signs among Michigan adults. *Ethn Dis* 2009;**19**(2):128–34.

17 Mandimika CL, Murk W, McPencow AM *et al.* Racial disparities in knowledge of pelvic floor disorders among community-dwelling women. *Female Pelvic Med Reconstr Surg* 2015;**21**(5):287–92.

18 Ojeaga A, Alema-Mensah E, Rivers D *et al.* Racial disparities in HPV-related knowledge, attitudes, and beliefs among African American and white women in the USA. *J Cancer Educ* 2019;**34**(1):66–72.

19 Freedman RA, Kouri EM, West DW, Keating NL. Racial/ethnic disparities in knowledge about one's breast cancer characteristics. *Cancer* 2015;**121**(5):724–32.

20 Bureau UC. *Differences in Accessing Online Health Resources by Race and Ethnicity*. https://www.census.gov/newsroom/blogs/research-matters/2017/04/accessing-online-resources-by-race-ethnicity.html (18 April 2020, date last accessed).

21 Quakyi IA, Adjei GO, Sullivan DJ *et al.* Targeted community based interventions improved malaria management competencies in rural Ghana. *Global Health Res Policy* 2017;**2**(1):1–10.

22 Sastry S, Dutta MJ. Health communication in the time of Ebola: a culture-centered interrogation. *J Health Commun* 2017;**22**(sup1):10–4.

23 Cavanaugh KL, Wingard RL, Hakim RM *et al.* Low health literacy associates with increased mortality in ESRD. *J Am Soc Nephrol* 2010;**21**(11):1979–85.

24 Bostock S, Steptoe A. Association between low functional health literacy and mortality in older adults: longitudinal cohort study. *BMJ* 2012. doi: 10.1136/bmj.e1602.

25 McNaughton CD, Cawthon C, Kripalani S *et al.* Health literacy and mortality: a cohort study of patients hospitalized for acute heart failure. *J Am Heart Assoc* 2015;**4**(5):e001799.

26 King A. Poor health literacy increases mortality. *Nature Reviews Cardiology* 2011;**8**(7):363–3.