

Differences in Report of Post-COVID Conditions Among Adults Tested for SARS-CoV-2 by Race and Ethnicity: 2022 Porter Novelli SummerStyles Survey, U.S.



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Introduction: Since March 2020, Hispanic and Black/African American persons have made up a disproportionate number of COVID-19 cases, hospitalizations, and deaths. However, little is known about whether the prevalence of postacute sequelae or post-COVID conditions differs by race/ethnicity.

Methods: This study used cross-sectional survey data collected by Porter Novelli Public Services to determine the prevalence of ≥ 1 ongoing symptom lasting ≥ 4 weeks by SARS-CoV-2 test status and racial/ethnic groups among 2,890 adults in the U.S.

Results: Overall, 57% (95% CI=54%, 60%) of respondents with positive SARS-CoV-2 tests reported ≥ 1 ongoing symptom, compared with 22% (95% CI=20%, 24%) of respondents who tested negative. Among those with positive SARS-CoV-2 tests, Hispanic respondents had higher AORs of experiencing ≥ 1 ongoing symptom (AOR=1.79, 95% CI=1.27, 2.53) than non-Hispanic White respondents. In addition, Hispanic respondents had significantly higher ORs of experiencing 2 or more ongoing symptoms (AOR=2.03, 95% CI=1.45, 2.86), respiratory/cardiac symptoms (AOR=1.47, 95% CI=1.03, 2.07), neurologic symptoms (AOR=1.77, 95% CI=1.26, 2.48), and other symptoms (AOR=1.53, 95% CI=1.09, 2.14) than non-Hispanic White respondents. Non-Hispanic other respondents who reported at least 1 positive SARS-CoV-2 test had significantly higher ORs of experiencing gastrointestinal symptoms (AOR=4.06, 95% CI=1.78, 8.89) than non-Hispanic White respondents.

Conclusions: These results highlight potential disparities in ongoing symptoms, even after accounting for demographic differences, and reinforce the need for culturally appropriate and targeted strategies to increase access to health care and reduce SARS-CoV-2 infections.

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INTRODUCTION

Since March 2020, the coronavirus disease 2019 (COVID-19) pandemic has exacerbated existing gaps in healthcare access and use in the U.S. across racial and ethnic groups.¹ In the U.S., Hispanic persons comprise 19% of the population but 25% of all reported COVID-19 cases, and Black/African American persons made up a disproportionate number of hospitalizations and deaths at various points throughout the pandemic.^{2–5}

As a result of COVID-19 illness, millions of adults have reported postacute sequelae or post-COVID conditions (PCC).^{6,7} People report a wide range of symptoms, but the most common symptoms include fatigue; post-exertional malaise; respiratory symptoms such as difficulty breathing, cough, and chest pain; and neurologic symptoms such as difficulty in thinking or concentrating, headache, sleep problems, dizziness, change in taste or smell, and depression or anxiety.⁸ Little is known about whether the prevalence of PCC differs by race/ethnicity.⁹ Further understanding of whether PCC varies by race/ethnicity may help communities and healthcare providers identify culturally appropriate and targeted interventions aimed at increasing access to health care. The purpose of this cross-sectional study was to determine whether the prevalence of PCC differed by racial/ethnic groups in the U.S.

METHODS

Study Population

This analysis was conducted using cross-sectional survey data collected by Porter Novelli (PN) Public Services in PN SummerStyles 2022, a nationwide survey of U.S. adults administered from May 31, 2022 to July 6, 2022.¹⁰ The PN SummerStyles 2022 survey was sent to 5,990 individuals aged ≥ 18 years who had answered the PN SpringStyles 2022 survey. The survey was administered by the market research firm Ipsos through their KnowledgePanel. Individuals were randomly recruited by mail using probability-based sampling by address to reach respondents regardless of having landline phones or internet. Respondents were not required to answer any of the questions and could exit the survey at any time. Those who completed the survey received cash-equivalent reward points for their participation.

This activity was reviewed by the Centers for Disease Control and Prevention (CDC) and was conducted consistent with applicable federal law and CDC policy (see e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. x241 [d]; 5 U.S.C. x551a; 44 U.S.C. x3501 et seq). CDC licensed the data from PN Public Services. Although PN Public Services and its vendors are not subject to CDC

IRB review, they do adhere to all professional standards and codes of conduct set forth by the Council of American Survey Research Organizations. Respondents are informed that their answers are being used for market research and that they may refuse to answer any question at any time. No personal identifiers are included in the data file that was provided to CDC.

Measures

For this analysis, PCC were defined as reports of 1 or more of 17 symptoms that lasted at least 4 weeks after a positive severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) test or lasted at least 4 weeks since symptoms first started for respondents who reported never testing positive.⁸ Ongoing symptoms were grouped by number of reported symptoms and according to the affected body system (i.e., respiratory/cardiac, gastrointestinal, neurologic, and other symptoms [such as fatigue, postexertional malaise, fever, joint or muscle pain, and hair loss]).

At the time of the survey, respondents reported their race/ethnicity, age, sex, highest level of education, marital status, past year or current health condition, vaccination status, and SARS-CoV-2 test result status. To be considered fully vaccinated, respondents reported having received 1 dose of a 1-dose vaccine (e.g., Johnson & Johnson vaccine) or 2 or more doses of a 2-dose vaccine (e.g., Pfizer or Moderna vaccines). Those considered partially vaccinated reported receiving only 1 dose of a 2-dose vaccine. COVID-19 cases were respondents who reported having tested positive at least once for SARS-CoV-2. To be considered negative for COVID-19, respondents reported always testing negative for SARS-CoV-2.

Statistical Analysis

Chi-square tests were used to examine differences in race/ethnicity, age, sex, education, marital status, vaccination status, and previous/current health conditions by self-reported SARS-CoV-2 test status. Multivariable logistic regression was performed among respondents who reported a positive SARS-CoV-2 test to estimate the ORs of experiencing 1 or more ongoing symptoms by race/ethnicity, adjusting for age, sex, marital status, highest level of education, previous/current health conditions, and COVID-19 vaccination status. Additional regression models were run to estimate the odds of experiencing ongoing symptoms grouped by the affected body system, adjusting for the same confounders. Respondents who reported receiving a partial vaccination ($n=26$) were excluded from the models owing to small numbers.

Analyses were performed using RStudio, Version 2022.07.1, with appropriate sampling weights to account for the complex survey design and provide nationally representative estimates. Statistical significance was defined as $p < 0.05$.

RESULTS

A total of 4,156 adults completed the survey with a response rate of 69.4%. Respondents were excluded from the analysis if they (1) did not answer whether they had been tested for SARS-CoV-2 ($n=23$), (2) reported that they were never tested for SARS-CoV-2 ($n=1210$), (3) were missing vaccination information ($n=10$), and (4) had missing information on having a current or previous health condition ($n=23$).

Of the 2,890 respondents included in the analysis, 1,171 (41%) reported at least 1 positive SARS-CoV-2 test result, and 1,719 (59%) reported always testing negative for SARS-CoV-2 (Table 1). Among those who reported receiving at least 1 positive SARS-CoV-2 test result, 64% reported identifying as non-Hispanic White, 54% were female, and 24% were in the age group of ≥ 60 years. Thirty-five percent reported having a 4-year college or postgraduate education, 77% had at least 1 health condition, and 74% reported being fully vaccinated. Among respondents who reported always testing negative, 63% identified as non-Hispanic White, 51% were female, and 38% were in the age group of ≥ 60 years. Forty-one percent reported having a 4-year college or postgraduate education, 81% reported having at least 1 health condition, and 88% reported being fully vaccinated. Respondents who reported at least 1 positive SARS-CoV-2 test differed from respondents who reported always testing negative for SARS-CoV-2 by age ($p < 0.001$), race/ethnicity ($p < 0.001$), marital status ($p < 0.01$), highest level of education ($p < 0.02$), self-report of current health conditions in the past year ($p < 0.05$), and self-report of vaccination status ($p < 0.001$).

Among respondents who reported a positive SARS-CoV-2 test, 57% reported at least 1 ongoing symptom, and 39% reported at least 2 ongoing symptoms. Comparatively, among those who self-reported always testing negative for SARS-CoV-2, 22% reported experiencing at least 1 ongoing symptom, and 12% reported at least 2 ongoing symptoms (Table 1). By race/ethnicity categories, 54% of non-Hispanic White respondents reported experiencing at least 1 ongoing symptom compared with 67% of Hispanic respondents, 54% of non-Hispanic Black/African Americans, and 55% of non-Hispanic other race respondents (including Asian, American Indian, Alaskan Native, and Hawaiian/Pacific Islander) (Table 2). In addition, 35% of non-Hispanic White

respondents reported experiencing 2 or more ongoing symptoms compared with 51% of Hispanic respondents, 35% of non-Hispanic African American/Black respondents, and 34% of non-Hispanic other respondents. A greater proportion of Hispanic respondents reported experiencing neurologic symptoms (48%) and other symptoms (49%) than non-Hispanic White respondents (neurologic: 35% and other symptoms: 37%).

After adjustment for confounders, Hispanic respondents who reported at least 1 positive SARS-CoV-2 test had a significantly higher OR of experiencing 1 or more ongoing symptoms than non-Hispanic White respondents (AOR=1.79, 95% CI=1.27, 2.53). In addition, Hispanic respondents had significantly higher ORs of experiencing 2 or more ongoing symptoms (AOR=2.03, 95% CI=1.45, 2.86), respiratory/cardiac symptoms (AOR=1.47, 95% CI=1.03, 2.07), neurologic symptoms (AOR=1.77, 95% CI=1.26, 2.48), and other symptoms (AOR=1.53, 95% CI=1.09, 2.14). Non-Hispanic other respondents who reported at least 1 positive SARS-CoV-2 test had significantly higher ORs of experiencing gastrointestinal symptoms (AOR=4.06, 95% CI=1.78, 8.89). Non-Hispanic Black/African American respondents did not have significantly different odds of experiencing 1 or more ongoing symptoms, respiratory/cardiac symptoms, gastrointestinal symptoms, or neurologic symptoms compared with those of non-Hispanic White respondents.

DISCUSSION

This study estimated the self-reported prevalence of PCC, defined by ongoing symptoms, by race/ethnicity among U.S. adults who reported testing for COVID-19 at least once. Overall, respondents who reported a positive SARS-CoV-2 test reported more than twice the prevalence of at least 1 ongoing symptom than respondents who reported never testing positive for SARS-CoV-2 (57% vs 22%). Hispanic respondents comprised 17% of the study sample population and 21% of those who reported a positive SARS-CoV-2 test, which is similar to their national demographic makeup (19%) and proportion of national COVID-19 cases (25%). However, among those who reported a positive test, Hispanic respondents were more likely to report experiencing 1 and 2 or more ongoing symptoms than non-Hispanic White respondents. They were also more likely to experience respiratory/cardiac; neurologic; and other symptoms, such as fatigue and joint pain, than their non-Hispanic White counterparts. African American/Black respondents in this study population also reflected their national demographic makeup, comprising 11% of the study sample (compared with 12% of the U.S.

Table 1. Characteristics of Respondents Stratified by Self-Reported SARS-CoV-2 Test Result, Weighted

Characteristics	Tested negative ^a n (%) [95% CI]	Tested positive ^a n (%) [95% CI]	p-value
Overall	1,719 (59.5%)	1,171 (40.5%)	
Age groups, years			<0.001
18–29	262 (15.8%) [13.3%, 18.5%]	269 (22.5%) [19.5%, 25.6%]	
30–44	400 (24.2%) [21.7%, 26.9%]	354 (29.6%) [26.6%, 32.7%]	
45–59	368 (22.3%) [19.7%, 24.9%]	289 (24.2%) [21.2%, 27.2%]	
≥60	621 (37.6%) [35.1%, 40.2%]	284 (23.8%) [20.7%, 26.8%]	
Sex			0.2
Male	812 (49.2%) [46.7%, 51.7%]	552 (46.1%) [43.2%, 49.1%]	
Female	839 (50.8%) [48.3%, 53.4%]	644 (53.9%) [50.9%, 56.8%]	
Race/ethnicity			<0.001
Non-Hispanic White	1,034 (62.7%) [60.4%, 65.0%]	759 (63.5%) [60.8%, 66.3%]	
Non-Hispanic Black/African American	209 (12.7%) [10.4%, 15.0%]	97 (8.1%) [5.4%, 10.9%]	
Non-Hispanic other ^b	169 (10.2%) [7.9%, 12.6%]	91 (7.6%) [4.9%, 10.4%]	
Hispanic	238 (14.4%) [12.1%, 16.8%]	249 (20.8%) [18.1%, 23.6%]	
Marital status			0.01
Currently married	976 (59.1%) [56.7%, 61.6%]	630 (52.7%) [49.7%, 55.7%]	
Not married	675 (40.9%) [38.5%, 43.4%]	566 (47.3%) [44.4%, 50.3%]	
Highest level of education completed			0.02
Some high school or less	128 (7.7%) [5.2%, 10.3%]	115 (9.6%) [6.7%, 12.6%]	
High school graduate/some college	840 (50.9%) [48.3%, 53.4%]	659 (55.1%) [52.1%, 58.0%]	
4-year college or postgraduate education	683 (41.4%) [38.8%, 43.9%]	423 (35.3%) [32.4%, 38.3%]	
Past-year or current self-reported health conditions			0.04
At least 1 health problem	1,336 (80.9%) [79.0%, 82.8%]	920 (76.9%) [74.5%, 79.3%]	
No health problems	315 (19.1%) [17.2%, 21.0%]	277 (23.1%) [20.8%, 25.6%]	
Receipt of vaccination ^c			<0.001
Full vaccination (including booster)	1,446 (87.6%) [86.1%, 89.1%]	881 (73.6%) [71.1%, 76.2%]	
Partial vaccination	34 (2.1%) [0.5%, 3.6%]	29 (2.4%) [0%, 4.9%]	
Unvaccinated	171 (10.4%) [8.8%, 11.9%]	286 (23.9%) [21.4%, 26.4%]	
Ongoing symptoms ^d			<0.001
No ongoing symptoms	1,289 (78.1%) [76.1%, 80.1%]	517 (43.2%) [40.4%, 46.2%]	
One or more ongoing symptom	362 (21.9%) [19.9%, 23.9%]	680 (56.8%) [54.0%, 59.8%]	
Two or more ongoing symptoms	200 (12.1%) [10.6%, 13.7%]	461 (38.5%) [35.7%, 41.4%]	

Note: Statistical weighting was used to align the sample with U.S. population distributions, adjusting for sex, age, and education. Weights were designed to match the U.S. Census ACS proportions for these variables.

^aRespondents self-reported ever having received a positive test result or always receiving a negative test result.

^bRespondents who reported a race other than non-Hispanic White or Black, including Asian, American Indian, Alaskan Native, and Hawaiian/Pacific Islander, or reported 2 or more non-Hispanic races.

^cVaccination status was defined as full vaccination, reported receiving 1 dose of Johnson & Johnson or 2 or more doses of Pfizer or Moderna; partial vaccination, reported receiving 1 dose of Pfizer or Moderna; and unvaccinated, reported not receiving any doses of a COVID-19 vaccine.

^dOngoing symptoms included fatigue, weakness, change in smell or taste, headache, cough, joint/muscle pain, change in mood, brain fog, diarrhea, shortness of breath/breathlessness, chest pain/pressure, fever or chills, sore throat, nausea/vomiting, stomach pain, problems in sleeping, post-exertional malaise, and palpitations.

ACS, American Community Survey.

population) and 8% of positive COVID-19 cases (compared with 12.3% of all COVID-19 cases) and had a prevalence of ongoing symptoms similar to that of non-Hispanic White respondents.

Results from this study are consistent with U.S. Census Bureau estimates of PCC by race/ethnicity, which showed that 18% of Hispanic or Latino respondents and 19% of non-Hispanic other races reported Long COVID (defined as symptoms lasting

3 or more months) compared with 14% of non-Hispanic White and 12% of non-Hispanic Black respondents.¹¹ Similar results were reported from the COVID States Project.⁷ Another study among U.S. adults found a lower prevalence of PCC among Hispanic and Asian/Pacific Islander respondents than among non-Hispanic White respondents; however, the authors acknowledged that their sample size was small and that additional studies were warranted.¹²

Table 2. Prevalence and AORs of Self-Reported Ongoing Symptoms Among Respondents Who Reported Testing Positive for SARS-CoV-2 Stratified by Race/Ethnicity, Weighted

Number and type of symptom among respondents with a positive SARS-CoV-2 test	Non-Hispanic White	Non-Hispanic Black/African American	Hispanic	Non-Hispanic other ^a
	n (%) [95% CI]	n (%) [95% CI]	n (%) [95% CI]	n (%) [95% CI]
One or more ongoing symptom ^b	402 (53.7%) [50.1%, 57.5%]	48 (53.5%) [43.5%, 64.6%]	159 (67.2%) [61.2%, 73.3%]	50 (54.8%) [44.9%, 65.9%]
AOR ^c [95% CI]	ref	1.13 [0.70, 1.83]	1.79 [1.27, 2.53]	1.50 [0.92, 2.46]
Two or more ongoing symptoms ^b	263 (35.2%) [31.6%, 38.7%]	32 (35.3%) [26.4%, 46.2%]	122 (51.4%) [45.1%, 58.2%]	31 (33.8%) [25.0%, 44.5%]
AOR ^c [95% CI]	ref	1.16 [0.69, 1.92]	2.03 [1.45, 2.86]	1.39 [0.82, 2.33]
Respiratory/cardiac conditions ^d	221 (29.5%) [26.3%, 32.9%]	30 (33.0%) [24.2%, 43.6%]	88 (36.9%) [30.9%, 43.4%]	25 (27.3%) [18.5%, 36.5%]
AOR ^c [95% CI]	ref	1.50 [0.89, 2.48]	1.47 [1.03, 2.07]	1.24 [0.71, 2.11]
Gastrointestinal conditions ^e	68 (9.0%) [7.2%, 11.1%]	11 (11.7%) [6.1%, 18.5%]	27 (11.5%) [7.7%, 15.3%]	14 (15.3%) [8.7%, 23.4%]
AOR ^c [95% CI]	ref	1.78 [0.73, 3.95]	1.42 [0.77, 2.56]	4.06 [1.78, 8.89]
Neurological conditions ^f	264 (35.2%) [31.8%, 38.8%]	34 (37.8%) [27.8%, 48.1%]	113 (47.5%) [41.2%, 54.2%]	29 (32.1%) [23.2%, 42.5%]
AOR ^c [95% CI]	ref	1.24 [0.74, 2.04]	1.77 [1.26, 2.48]	1.22 [0.72, 2.05]
Other ongoing symptoms ^g	280 (37.3%) [33.9%, 41.0%]	35 (38.6%) [28.6%, 48.9%]	116 (48.8%) [42.4%, 55.5%]	30 (32.6%) [23.8%, 43.0%]
AOR ^c [95% CI]	ref	1.12 [0.68, 1.83]	1.53 [1.09, 2.14]	1.13 [0.67, 1.88]

Note: Statistical weighting was used to align the sample with U.S. population distributions, adjusting for sex, age, and education. Weights were designed to match the U.S. Census ACS proportions for these variables. Estimates that are significantly different from the non-Hispanic White respondents are bolded.

^a Respondents who reported a race other than non-Hispanic White or Black, including Asian, American Indian, Alaskan Native, and Hawaiian/Pacific Islander, or reported 2 or more non-Hispanic races.

^b Post-COVID conditions included fatigue, weakness, change in smell or taste, headache, cough, joint/muscle pain, change in mood, brain fog, diarrhea, shortness of breath/breathlessness, chest pain/pressure, fever or chills, sore throat, nausea/vomiting, stomach pain, problems in sleeping, postexertional malaise, and palpitations.

^c Adjusted for age, sex, highest education, marital status, past year or current self-reported health conditions, and receipt of vaccination.

^d Respiratory/cardiac conditions include cough, chest pain, heart palpitations, sore throat, and shortness of breath.

^e Gastrointestinal conditions include diarrhea, stomach pain, and nausea/vomiting.

^f Neurologic conditions include difficulty in thinking/concentrating/brain fog, headache, problems in sleeping, change in smell or taste, and change in mood.

^g Other ongoing symptoms include tiredness or fatigue, postexertional malaise, fever, joint or muscle pain, and hair loss.

ACS, American Community Survey.

Little is known about differences in the prevalence of reported ongoing symptom categories by racial/ethnic groups or whether any observed differences may be explained by additional factors. This study found that although there was no meaningful difference in the prevalence of respiratory/cardiac conditions among Hispanic respondents from that among non-Hispanic White respondents in unadjusted analyses, after adjusting for confounding variables (demographics and clinical characteristics), respiratory/cardiac conditions were more likely to be reported among Hispanic respondents. Similarly, after adjusting for confounders, gastrointestinal symptoms were more likely to be reported among non-Hispanic other respondents than among non-Hispanic White respondents. Although this study was not able to explore why differences may exist across racial/ethnic groups, it does highlight the importance of accounting for additional demographic and clinical features when comparing prevalence of PCC by racial/ethnic groups.

Limitations

These data are subject to limitations. First, the survey respondents who agreed to complete the survey may not be representative of the general population of U.S. adults. In addition, respondents who did not report testing for SARS-CoV-2 were excluded and may be different from respondents who did test. Second, although this study highlighted that there are differences in the burden of ongoing symptoms by racial/ethnic groups, conclusions about whether disparities exist owing to other factors, such as degree of social vulnerability, cannot be made.¹³ Third, this analysis relied on self-report of a SARS-CoV-2 test result, receipt of COVID-19 vaccination, and presence of ongoing symptoms, which is subject to response bias and potential misclassification of the exposure (SARS-CoV-2 status). In particular, the frequency of and access to SARS-CoV-2 testing was not a part of the survey and therefore remained unmeasured. Furthermore, the survey did not capture timing of

infection or vaccination, so it is possible that vaccination status for some respondents may not have reflected vaccination status at the time of their infection owing to lack of temporal clarity. Fourth, prevalence of PCC may vary by variant period and number of infections, neither of which were examined in this analysis^{14,15}; however, there is evidence showing that after accounting for vaccine status, there is no difference in PCC by variant period¹⁶ and that second infections do not increase risk of PCC.¹⁷ Fifth, PCC was defined as a report of 1 or more symptoms lasting at least 4 weeks, whereas other studies have defined PCC as ongoing symptoms lasting at least 3 months; therefore, this analysis may have overestimated the prevalence of PCC. Finally, this study did not account for treatment of ongoing symptoms, which could affect the reported prevalence of PCC.

CONCLUSIONS

Our findings illustrate that self-reported prevalence of ongoing symptoms, even after accounting for demographic differences, differs by racial/ethnic groups. These results highlight the need to better understand PCC across diverse communities. Development of culturally appropriate and community-informed strategies that reduce SARS-CoV-2 infections, improve vaccination rates (which has been shown to reduce the risk of PCC if received before SARS-CoV-2 infection),¹⁸ inform treatment, and decrease the stigma surrounding PCC may reduce the burden of illness.

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CREDIT AUTHOR STATEMENT

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