Perceived Severity of COVID-19 in a Longitudinal Study in Detroit, Michigan

Danting Yang, MPH[1]; Abram L. Wagner, PhD, MPH[2];
Sherri Sheinfeld Gorin, PhD[3]

Objective: To slow down the spread of SARS-CoV-2, many countries have instituted preventive approaches (masks, social distancing) as well as the distribution of vaccines. Adherence to these preventive measures is crucial to the success of controlling the pandemic but decreased perceptions of disease severity could limit adherence. The aim of our study was to observe changes in perceived personal severity and perceived community severity; the study also explored their predictors.

Method: In a longitudinal study from an address-based probability survey in Detroit, we asked participants to rate their perceived severity of COVID-19 for themselves and for their community. In our analysis, 746 participants were queried across 5 waves of the Detroit Metro Area Communities Study surveys from March 31 to October 27 in 2020. We tested for trends in changes of self-reported perceived severity for themselves and for their community; we assessed the effects of different predictors of the two severities through mixed effects logistic regression models.

Results: Our results highlight that the overall levels of perceived community and personal severity were decreasing over time even though both severities were fluctuating with rising confirmed case counts. Compared with non-Hispanic (NH) White Detroiters, NH Black Detroiters reported a higher perceived personal severity (OR: 5.30, 95% CI: 2.97, 9.47) but both groups reported similar levels of perceived community severity. We found steeper declines in perceived severity in NH White than NH Black Detroiters over time; the impact of education and income on perceived severity was attenuated in NH Black Detroiters compared with NH White Detroiters.

Introduction

Since the first case of COVID-19 was identified in Wuhan, China in December 2019, the pandemic has spread to more than 190 countries worldwide. As of the date of this writing, the number of confirmed cases had exceeded 130,000,000 and more than 2,850,000 deaths had been reported globally. The United States was one of the most affected countries with more than 30,703,000 total confirmed cases and neatly 555,000 deaths.[1]

Before the vaccine was introduced to the general population, traditional public health infection-control interventions (social isolation, masks) were adopted by different nations and regions to slow the pace of infection rates. China was the first to take action in response to the pandemic. Chinese authorities issued restrictions on movement nationally and internationally, locked down cities that were close to the center of the outbreak, required mask-wearing and quarantined suspected cases.[2] Social distancing measures were soon adopted by other countries.

Since mid-April 2020, the United States has led the world in the number of confirmed cases and total deaths. California first issued stay-at-home orders on March 19, 2020, followed by 41 other states between March 1 to May 31, 2020.[3] However, poor coordination and inconsistent messaging often limited the effectiveness of the stay-at-home order.[4]

In the state of Michigan, two confirmed cases of COVID-19 were first identified on March 10, 2020. On that same day, Michigan entered into an emergent situation. A few days

Conclusions: Our findings suggested that perceived severity for COVID-19 decreased through time and was affected by different factors among varied racial/ethnic groups. Future interventions to slow the pace of the pandemic should take into account perceived personal and community severities among varied ethnic/racial subgroups. *Ethn Dis.* 2022;32(3):231-238; doi:10.18865/ed.32.3.231

[1] Department of Epidemiology, University of Florida, Gainesville, FL
[2] Department of Epidemiology, University of Michigan, Ann Arbor, MI
[3] Department of Family Medicine, University of Michigan, Ann Arbor, MI

Address correspondence to Sherri Sheinfeld Gorin, PhD; Department of Family Medicine, University of Michigan, Ann Arbor, MI; ssgorin@med.umich.edu

later, schools were closed to protect children from infection, and bars, restaurants, as well as other places where large gatherings could be held were closed. Once the virus had spread across Michigan with thousands of confirmed cases and hundreds of deaths from COVID-19, Governor Gretchen Whitmer issued a stay-at-home order on March 23, 2020.[5] After more than one month of stay-at-home orders, the high demand to reopen the economy led the governor to decide to reopen restaurants in May 2020. Starting in July, expanded testing sites made COVID-19 tests more accessible to more Michigan residents.[5]

Then, the introduction of vaccines brought hope for halting the rapid increase of infection rates in the United States. In April 2021, the US Food and Drug Administration authorized the emergency use of vaccines produced by Pfizer, Moderna, and Johnson & Johnson and more than 30% of US residents received at least one dose of the COVID-19 vaccine.[6]

Yet, this level of population adherence is not sufficient to effectively control the pandemic on the longer term. Misleading campaigns led to distrust toward authorities and even poorer adherence to pandemic controlling measures. Anti-mask and anti-vaccine campaigns disseminated incorrect and exaggerated information; these campaigns were supported by millions of followers.

Several previous studies, conducted across different countries, found that perceived severity is positively correlated with COVID-19 preventive behaviors, including vaccine uptake.[7-9] In addition to perceived severity, level of education and female gender have also been found to be positively associated with these preventive behaviors.[10] Older adults are more motivated by perceived severity than younger people, so are more likely to follow recommendations from the US Centers for Disease Control and Prevention (CDC).[11] Conversely, people who reported low perceived severity were less likely to engage in COVID-19 preventive measures.[12] Understanding perceptions of severity among the general population and the associations between perceived severity and sociodemographic characteristics are urgently needed to increase public adherence to COVID-19 preventive measures.

Since the start of the pandemic, Detroit, Michigan led other cities in COVID-19 incidence and mortality rates. Using a robust longitudinal survey, the Detroit Metro Area Communities Study (DMACS), between March to October 2020, we analyzed the changes in perceived disease severity over time, amidst changing rates of disease prevalence. We explored the potential predictors of perceived severity at the personal and community levels. Further, we systematically examined differences in perceived severity by racial/ethnic group in this diverse city.

METHODS

Participants

The Detroit Metro Area Communities Study (DMACS), initiated in 2016, is a panel survey of Detroit residents; it has completed 12 waves of surveys. The original panel of the survey mainly focused on health, health care, health access priorities, and related questions. The scope of the survey questions was expanded in later waves, incorporating investments, policies, and Detroiters' experiences with COVID-19. Participants were drawn from an address-based probability sample that represented all adult residents in Detroit. Surveys were administered online or administered by telephone interviewers. In this article, we included five waves of data collected by DMACS in 2020. These waves were administered to Detroit residents as follows: wave 7 from March 31 to April 14; wave 8 from April 23 to May 7; wave 9 from May 28 to June 11; wave 10 from July 15 to July 30; and wave 11 from October 13 to October 27. The response rates for wave 7 to wave 11 were 55.3%, 61.8%, 66.1%, 64.6%, and 62%, respectively.

All procedures of this study were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants included in the study.

Measures

The main outcomes in this study were perceived personal and community severity of COVID-19. The same questions for perceived personal and community severity were asked across survey waves 7 to 11: "How serious a problem would you say the COVID-19 pandemic is right now... For you personally" and "How serious a problem would you say the COVID-19 pandemic is right now... For people in your community." The answers to the two questions used the same five response categories; "very serious," "somewhat serious,"

"not too serious," "not at all serious," "don't know." In our analysis, we reclassified these two outcomes. We kept "don't know" as missing values. For non-missing values, we dichotomized them into two groups: "very serious"; and all other responses grouped as "less than very serious." We asked participants to rate perceived severity, both personal and community, from their own perspectives based on their personal experiences. For example, one participant who worked from home and always wore personal protective equipment when he left his home would rate perceived personal severity low; but, if many people living in his neighborhood were infected, he would rate perceived community severity high.

The predictors of perceived severity included: sex, race, education, and income, since these factors could shape how people think, and have been predictive of perceived severity in other studies. We included a variable on survey waves to capture changes as the pandemic spread. We collapsed the eight levels of education starting from "no formal education" to "professional or doctorate degree" to a dichotomous variable, whether the person attended college or not. In the survey, income had 19 levels starting from "less than $5,000" to "$150,000 to $174,999"; in these analyses, household income was categorized by whether it exceeded $35,000 or not. In the survey, age had five levels ranging from aged ≤30 years to aged 76-100 years. Age was reclassified into two mutually exclusive categories, as aged ≤45 years or aged >45 years. The other variables retained their original survey coding.

Data Analysis

For each wave of data, we conducted descriptive analyses by sex, race/ethnicity, education level, income, and age. The aim of this study was to observe changes in perceived severity and explore predictors of perceived severity. However, some participants dropped out and some participants joined the study after the first survey. We only kept 746 records of people who had completed all five waves of survey. Sex, race/ethnicity, education level, income, and age were retrieved from wave 7. As a longitudinal study aims to monitor the long-term change in perceived severities, we excluded participants who missed at least one wave of survey.

Trend tests were used to measure if perceived community and personal severity changed over time in response to varied case counts and mortality. We plotted the data to observe the trends of both perceived severities, alongside confirmed cases and deaths.

We analyzed the data using mixed effects logistic regression with the outcomes of perceived personal severity and perceived community severity; we adjusted for sex, race/ethnicity, education, income, and survey waves. As the data included repeated measures from wave 7 to wave 11, we used a mixed effects logistic regression.

To further investigate the differences between non-Hispanic White (NHW) Detroiters and non-Hispanic Black (NHB) Detroiters in perceived disease severity, we conducted a stratified analysis using the same model. In each model, we adjusted for sex, race/ethnicity, education level, income, age, and survey wave. We also included interaction terms of race and each covariate in our models. We

completed the analyses using R version 4.0.4, with alpha equal to .05.

RESULTS

The number of participants varied by different waves: wave 7 (March) – 1,039 participants; wave 8 (April) – 1,100 participants; wave 9 (May) – 1,171 participants; wave 10 (July) – 1,137 participants; and wave 11 (October) – 1,012 participants. Overall, distributions of sex, race/ethnicity, educational level, income, and age did not vary significantly among the five waves. Participants from low-income families (household income ≤$35,000) and high-income families (household income >$35,000) were evenly interviewed across the five waves. More females, residents who had completed college, residents aged >45 years, and NHB Detroiters participated in the five waves of surveys than their counterparts (Table 1).

Figure 1 shows the percentage of participants reporting different levels of perceived severity in the community and the numbers of confirmed cases and deaths of COVID-19 among Detroit residents. Overall, 83.53% of participants perceived the pandemic in the community was "very serious" in the March wave, followed by 75.40%, 64.96%, 74.26%, and 66.40% in later waves. Overall, 81.15%, 76.02%, 65.31%, 74.46%, and 66.49% of participants responded "very serious" for perceived personal severity respectively from the March wave to the October wave (data not displayed). Overall, confirmed cases, deaths, as well as the percentage of people who thought the pandemic was

very serious for them (personally) and their community were decreasing over time. Results from trend tests (data not displayed) suggested a trend in increasing levels of perceived community and personal severity with increasing confirmed cases and death counts.

In our mixed effects logistic regression model, we included 746 participants who completed five waves of the survey. Of the participants, 72.65% were female, 75.07% were NHB Detroiters. Overall, 75.65% of the 746 participants answered "very serious" when asked about perceived severity for their community, 72.09% answered "very serious" when asked about perceived personal severity.

Results from the mixed effects logistic regression model are shown in Table 2. From the April wave to the October wave of the survey, perceived personal severity was significantly lower than in the March wave. ORs and 95% CIs for April wave to October wave were (April vs March OR: .46, 95% CI: .32,0.68), (May vs March OR: .20, 95% CI: .14,0.29), (July vs March OR: .60, 95% CI: .41,0.89), and (October vs March OR: .25, 95% CI: .17,0.36), respectively. When asked about perceived personal severity, NHB Detroiters were more than five times more likely to report a higher severity than NHW Detroiters (OR: 5.30, 95%

CI: 2.97,9.47). Females were 1.8 times more likely to report "very serious" (OR: 1.80, 95% CI: 1.20,2.71).

According to the results of the mixed effects logit regression model, perceived community severity seemed negatively associated with length of time. From the May wave to the October wave, perceived community severity was significantly lower than for the March wave. It appeared as a decreasing trend throughout the three waves, with ORs and 95% CIs for May wave to October wave as (May vs March OR: .39, 95% CI: .26,0.57), (July vs March OR: .37, 95% CI: .25,.55), (October vs March OR: .33, 95% CI: .22,.48), respectively. Hispanic Detroiters reported lower se-

Table 1: Descriptive analysis: sex, race/ethnicity, education level, income, and age distributions in each wave

Wave and survey date	Wave 7, 3/31-4/14	Wave 8, 4/23-5/7	Wave 9, 5/28-6/11	Wave 10, 7/15-7/30	Wave 11, 10/13-10/27	Wave 7 to 11[a]
	N=1,039, n (%)[b]	N=1,100, n (%)[b]	N=1,171, n (%)[b]	N=1,137, n (%)[b]	N=1,012, n (%)[b]	N=746, n (%)[b]
Sex						
Male	305 (29.4)	334 (30.4)	343 (29.3)	335 (29.5)	287 (28.4)	204 (27.3)
Female	734 (70.6)	765 (69.5)	825 (70.5)	799 (70.3)	723 (71.4)	542 (72.7)
NA	0 (0)	1 (.1)	3 (.3)	3 (.3)	2 (.2)	0 (0)
Race						
Non-Hispanic White	138 (13.3)	146 (13.3)	152 (13.0)	147 (12.9)	129 (12.7)	96 (12.9)
Non-Hispanic Black	724 (69.7)	766 (69.6)	822 (70.2)	796 (70.0)	714 (70.6)	521 (69.8)
Non-Hispanic multi	56 (5.4)	62 (5.6)	64 (5.5)	62 (5.5)	53 (5.2)	39 (5.2)
Non-Hispanic other	20 (1.9)	20 (1.8)	20 (1.7)	19 (1.7)	48 (4.7)	15 (2.0)
Hispanic	62 (6.0)	63 (5.7)	67 (5.7)	67 (5.9)	57 (5.6)	49 (6.6)
NA	39 (3.8)	43 (3.9)	46 (3.9)	46 (4.0)	11 (1.1)	26 (3.5)
Education						
HSD or below	274 (26.4)	304 (27.6)	326 (27.8)	307 (27.0)	272 (26.9)	163 (21.8)
Some college and above	763 (73.4)	792 (72.0)	836 (71.4)	823 (72.4)	736 (72.7)	576 (77.2)
NA	2 (.2)	4 (.4)	9 (.8)	7 (.6)	4 (.4)	7 (.9)
Income						
< $35000	530 (51.0)	553 (50.3)	593 (50.6)	567 (49.9)	507 (50.1)	370 (49.6)
≥ $35000	441 (42.4)	462 (42.0)	488 (41.7)	481 (42.3)	424 (41.9)	330 (44.2)
NA	68 (6.5)	85 (7.7)	90 (7.7)	89 (7.8)	81 (8.0)	46 (6.2)
Age, years						
≤ 45	460 (44.3)	487 (44.3)	514 (43.9)	493 (43.4)	422 (41.7)	321 (43.0)
> 45	570 (54.9)	597 (54.3)	640 (54.7)	631 (55.5)	580 (57.3)	422 (56.6)
NA	9 (.9)	16 (1.5)	17 (1.5)	13 (1.1)	10 (1.0)	3 (.4)

HSD, high school diploma; NA, data not available.
a. Included participants who completed all five waves of survey.
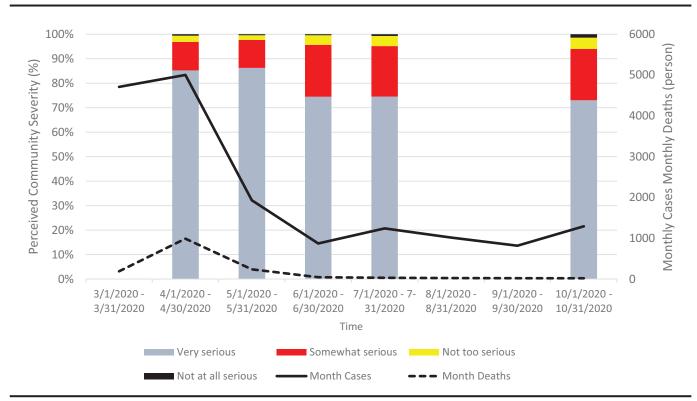b. Column percentages were reported for overall sample

Figure 1. Perceived severity of COVID-19 in the community over five waves of the Detroit Metro Area Community Survey

verity when asked about perceived community severity compared with NHW Detroiters (OR: .22, 95% CI: .10,.48).

Stratified analysis showed some differences between NHW Detroiters and NHB Detroiters (Table 3). The relationship between being aged >45 years and perceived community severity differed significantly by race/ethnicity. NHW Detroiters aged >45 years rated perceived community severity lower than NHW Detroiters aged <45 years (OR: .21, 95% CI: .08,.56). For perceived personal severity, NHB female Detroiters reported higher levels than NHB males (OR: 1.7, 95% CI:1.02,2.84). Among NHW Detroiters, residents who attended college reported lower perceived personal severity than residents who did not attend college (OR: .21, 95% CI: .04,.98).

DISCUSSION

SARS-CoV-2 has spread rapidly throughout the globe since 2020; by April 2021, the pandemic was seriously impacting the city of Detroit, Michigan. Using a robust, probability-based sample from Detroit, we evaluated changes in perceptions of disease severity over the course of the first months of the pandemic to better understand patterns of responses affecting pandemic interventions. We found that overall perceived severity for the community decreased over the period studied (March – July, 2021). Perceived personal severity and perceived community severity differed among those from different ethnic and racial backgrounds. The curve of the confirmed cases

and deaths were tightly linked to the timeline of change of the policy in the state of Michigan. Confirmed cases and deaths dropped rapidly after the issue of stay-at-home orders. With the reopening of the economy, the "flattened curve" of COVID-19 cases did not last for long; confirmed cases reached another peak in late June. Starting from July to October, the number of confirmed cases fluctuated, which may reflect the effect of enhanced testing and a decreasing number of infections. The results of trend tests suggest that the numbers of cases and deaths affected how people perceived disease severity for themselves and for their communities.

Several factors may account for the decreases in both perceived personal severity and perceived commu-

Table 2: ORs and 95% CIs from mixed logistic regressions of perceived community severity and perceived personal severity of COVID-19 in all participants

	Community severity		Personal severity	
	OR	**95% CI**	**OR**	**95% CI**
Race				
Non-Hispanic White	Ref		Ref	
Non-Hispanic Black	1.60	(.92, 2.97)	5.30	(2.97, 9.47)
Non-Hispanic multi	.85	(.15, 4.84)	1.31	(.24, 7027)
Non-Hispanic other	2.64	(.10, 0.48)	1.11	(.02, 54.09)
Hispanic	0.22	(.10, 0.48)	1.68	(.73, 3.83)
Sex				
Male	Ref		Ref	
Female	1.45	(.98, 2.14)	1.80	(1.20, 2.71)
Education				
HSD or below	Ref		Ref	
Some college and above	.92	(.60, 1.41)	.66	(.42, 1.04)
Age				
≤ 45	Ref		Ref	
> 45	.88	(.60, 1.30)	1.23	(.82, 1.85)
Income				
< \$35000	Ref		Ref	
≥ \$35000	1.14	(.77, 1.70)	.72	(.47, 1.09)
Wave				
Wave 7	Ref		Ref	
Wave 8	1.24	(.81, 1.90)	.46	(.32, .68)
Wave 9	.39	(.26, .57)	.20	(.14, .29)
Wave 10	.37	(.25, .55)	.60	(.41, .89)
Wave 11	.33	(.22, .48)	.25	(.17, .36)

HSD, high school diploma

nity severity found in our study. In our study, we observed that perceived personal and community severity were decreasing over time even though the number of confirmed cases was fluctuating. Being tired of following rules and low adherence to COVID-19 preventive measures[13] may have led to the decline. Or, as people gained more information or knowledge about the virus, they felt less at risk. Although both perceived personal severity and perceived community severity were decreasing over time, we noticed that perceived personal severity seemed to be affected more by confirmed cases in Detroit compared with perceived community severity.

Previous studies indicate that perceived severity for COVID-19 is higher in older generations,[9,14] females,[14] and people with higher levels of education.[10] With a robust longitudinal study, we further investigated changes in perceived severity over time.

Further, in this study, we asked participants to rate perceived severity for them personally, and for their community over time. For perceived personal severity, females reported a higher severity compared with males. This result corresponds to previous research.[9] NHB residents expressed much more concern about COVID-19 than NHW residents, which may suggest that NHB Detroit residents thought

they were much more vulnerable than other Detroiters in the face of the pandemic. The high perceived personal severity of COVID-19 among NHB may be partially explained by the high risk of death. A recent study revealed that, across Michigan, the COVID-19 mortality of NHB Michigan residents was more than three times that of NHW residents.[15] In stratified analysis, a higher perceived personal severity was found in NHB female Detroiters than NHW residents, which is also consistent with results from a previous study.[16] Although one study suggests that a higher education level is positively linked to perceived severity[10], our study found that NHW De-

Table 3: ORs and 95% CIs from mixed logistic regressions of perceived severity of COVID-19 in non-Hispanic White Detroiters and non-Hispanic Black Detroiters

	Community severity			Personal severity		
	NHW	NHB		NHW	NHB	
			OR, 95%CI, P[a]			
Sex						
Male		Ref				
Female	1.97 (.69, 6.70)	1.55 (.98,2.43)	.75	1.38 (.48, 3.96)	1.7 (1.02, 2.84)	.82
Education						
HSD or below		Ref				
College or above	3.69 (.79, 18.66)	.69 (.42,1.13)	.15	.21 (.04, .98)	.57 (.32, 1.00)	.25
Age						
≤ 45		Ref				
> 45	.21 (.08, .56)	1.18 (.75,1.86)	<.01	.77 (.29, 2.07)	1.25 (.75, 2.07)	.58
Income						
< $35000		Ref				
≥ $35000	.3 (.10, 1.10)	1.34 (.84, 2.15)	.08	.61 (.19, 1.93)	.97 (.57, 1.62)	.53
Wave						
Wave 7		Ref				
Wave 8	.26 (.09, 1.06)	1.57 (.93, 2.63)	.04	.74 (.26, 2.08)	.33 (.20, .52)	.17
Wave 9	.08 (.03, .30)	.41 (.26, .65)	.03	.31 (.11, .86)	.14 (.09, .23)	.20
Wave 10	.085 (.03, .33)	.42 (.27, .65)	.04	.43 (.16, 1.17)	.57 (.35, .93)	.63
Wave 11	.09 (.03, .36)	.39 (.25, 0.61)	.08	.15 (.05, .42)	.22 (.14, .35)	.38

NHW, non-Hispanic White; NHB, non-Hispanic Black; HSD, high school diploma
a. Interaction between race and that variable

troiters with a higher education level (attended college) had lower perceived personal severity than others. Several causes may contribute to the difference. First, we used data from a panel survey, whereas they retrieved the data from Twitter. In addition, their study[10] did not separate perceived severity into personal and community. Finally, with only 96 NHW Detroiters included in our study, the result may be less robust due to the small sample size.

For perceived community severity, Hispanic residents reported the lowest severity compared with NHW Detroi-ters (data not shown in tables). A previous study found that Hispanics were the least afraid of COVID-19 due to being less receptive to information and less likely to search for information regarding COVID-19.[17] Several studies show that the language barrier is an influential factor in low health care-seeking behavior among Hispanic individuals.[17,18] These findings are helpful to understand the low perceived community severity in our study.

We also found that older age (aged >45 years) was inversely associated with perceived community severity in NHW Detroiters, at variance with existing studies.[11,14] As we discovered in perceived personal severity, these differences in findings may be due to different age categories, and to analyzing perceived personal severity and perceived community severity separately. A small sample size is also likely to influence the result.

Study Limitations

Inconsistencies in responses to some survey questions may have biased the findings. In this study, we used perceived severities in five waves

of data; however, we only included potential impact factors in March wave (wave 7). Although factors like race/ethnicities, education level, and sex were not likely to change over time, household income and age did change. Household income would have been severely affected by the pandemic due to unemployment and economic stagnation. Our study may have failed to fully capture the effects of varying household income on perceived severities in Detroit residents. Another limitation is that only participants who participated in all five waves of data collection were included in our analysis, which may introduce selection bias.

Conclusion

Among Detroit residents, perceived personal and community severity of COVID-19 decreased over time during the early months of the pandemic and were affected by the numbers of cases and deaths. Differences in perceived personal and community severity were found in racial and ethnic groups. These findings may inform future approaches to decrease vaccine hesitancy, by tailoring interventions to account for perceived personal and community severities among age, sex, and ethnic/racial subgroups.

Author Contributions

Research concept and design: Wagner, Gorin; Acquisition of data: Gorin; Data analysis and interpretation: Yang, Wagner, Gorin; Manuscript draft: Yang, Gorin; Statistical expertise: Yang, Wagner, Gorin; Acquisition of funding: Gorin; Administrative: Gorin; Supervision: Wagner, Gorin

References

1. COVID-19 map. Johns Hopkins Coronavirus Resource Center. Last accessed April 4, 2021 from https://coronavirus.jhu.edu/map.html.
2. Lai S, Ruktanonchai NW, Zhou L, et al. Effect of non-pharmaceutical interventions to contain COVID-19 in China. Nature. 2020;585(7825):410-413. https://doi.org/10.1038/s41586-020-2293-x PMID:32365354
3. Moreland A, Herlihy C, Tynan MA, et al. Timing of state and territorial COVID-19 stay-at-home orders and changes in population movement - United States, March 1-May 31, 2020. *Morb Mortal Wkly Rep*. 2020;69(35):1198-1203. https://doi.org/10.15585/mmwr.mm6935a2
4. Laura A, Sarah J. COVID-19: The Global Shutdown. Harvard Business School Case 320-108, May 2020. (Revised July 2020.) https://www.hbs.edu/faculty/Pages/item.aspx?num=58124
5. Executive Order 2020-21: Temporary requirement to suspend activities that are not necessary to sustain or protect life - RESCINDED. Last accessed April 28, 2022 from https://www.michigan.gov/whitmer/news/state-orders-and-directives/2020/03/23/executive-order-2020-21
6. Coronavirus (covid-19). Google News. Last sccessed April 4, 2021 from https://news.google.com/covid19/map?hl=enUS&mid=%2Fm%2F02xry&state=7&gl=US&ceid=US%3Aen
7. Berg MB, Lin L. Prevalence and predictors of early COVID-19 behavioral intentions in the United States. *Transl Behav Med*. 2020;10(4):843-849. https://doi.org/10.1093/tbm/ibaa085 PMID:32893867
8. Hsing JC, Ma J, Barrero-Castillero A, et al. Influence of health beliefs on adherence to COVID-19 preventative practices: International, Social Media-Based Survey Study. *J Med Internet Res*. 2021;23(2):e23720. https://doi.org/10.2196/23720
9. Magnan RE, Gibson LP, Bryan AD. Cognitive and affective risk beliefs and their association with protective health behavior in response to the novel health threat of COVID-19. *J Behav Med*. 2021;44(3):285-295. https://doi.org/10.1007/s10865-021-00202-4 PMID:33517487
10. Li JB, Yang A, Dou K, Wang LX, Zhang MC, Lin XQ. Chinese public's knowledge, perceived severity, and perceived controllability of COVID-19 and their associations with emotional and behavioural reactions, social participation, and precautionary behaviour: a national survey. *BMC Public Health*. 2020;20:1589. https://doi.org/10.1186/s12889-020-09695-1 PMID:33087109
11. Luo Y, Cheng Y, Sui M. The moderating effects of perceived severity on the generational gap in preventive behaviors during the COVID-19 pandemic in the U.S. *Int J Environ Res Public Health*. 2021;18(4):2011. https://doi.org/10.3390/ijerph18042011 PMID:33669713
12. Fragkaki I, Maciejewski DF, Weijman EL, Feltes J, Cima M. Human responses to Covid-19: the role of optimism bias, perceived severity, and anxiety. *Pers Individ Dif*. 2021;176:110781. https://doi.org/10.1016/j.paid.2021.110781 PMID:33623178
13. Michie S, West R, Harvey N. The concept of "fatigue" in tackling COVID-19. *BMJ*. 2020;371:m4171. https://doi.org/10.1136/bmj.m4171
14. Shauly O, Stone G, Gould D. The public's perception of the severity and global impact at the start of the SARS-COV-2 pandemic: a crowdsourcing-based cross-sectional analysis. *J Med Internet Res*. 2020;22(11):e19768. https://doi.org/10.2196/19768
15. Parpia AS, Martinez I, El-Sayed AM, et al. Racial disparities in COVID-19 mortality across Michigan, United States. *eClinicalMedicine*. 2021;33:100761. https://doi.org/10.1016/j.eclinm.2021.100761
16. Niño M, Harris C, Drawve G, Fitzpatrick KM. Race and ethnicity, gender, and age on perceived threats and fear of COVID-19: Evidence from two national data sources. *SSM Popul Health*. 2021;13:100717. https://doi:10.1016/j.ssmph.2020.100717
17. Arnold B, Mitchell SA, Lent L, et al and the PRO-CTCAE Spanish Translation and Linguistic Validation Study Group. Linguistic validation of the Spanish version of the National Cancer Institute's Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events (PRO-CTCAE). *Support Care Cancer*. 2016;24(7):2843-2851. https://doi.org/10.1007/s00520-015-3062-5 PMID:26838022
18. Heck JE, Franco R, Jurkowski JM, Sheinfeld Gorin S. Awareness of genetic testing for cancer among United States Hispanics: the role of acculturation. *Community Genet*. 2008;11(1):36-42. https://doi.org/10.1159/000111638 PMID:18196916