The Coronavirus (COVID-19) Fatality Risk Perception of US Adult Residents in March and April 2020

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Abstract

The study compares empirical results on the coronavirus SARS-CoV-2 (causing COVID-19) fatality risk perception of US adult residents stratified for age and gender in mid-March 2020 (N_1 = 1,182) and mid-April 2020 (N_2 = 953). While the fatality risk perception has increased from March 2020 to April 2020, our findings suggest that many US adult residents severely underestimated their absolute and relative fatality risk (i.e., differentiated for subgroups defined by preexisting medical conditions and age) at both time points compared to current epidemiological figures. These results are worrying because risk perception, as our study indicates, relates to actual or intended health-protective behavior that can reduce SARS-CoV-2 transmission rates.

Keywords: Coronavirus SARS-CoV-2; COVID-19; Risk Perception; Health-Protective Behavior; Repeated Cross-Sectional Design

Short Report:

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On December 31, 2019, China alerted the World Health Organization (WHO) of several cases of pneumonia induced by an unknown virus in the city of Wuhan. On March 11, 2020, it was declared a pandemic by the WHO (2020a) and by mid-March 2020, the novel coronavirus SARS-CoV-2 causing the disease COVID-19 had already spread to over 140 countries (WHO, 2020b), by April 2020 the US had become the country with the highest number of officially confirmed cases of COVID-19 worldwide according to Johns Hopkins University (2020). In the absence of established pharmaceutical protocols to treat affected individuals or vaccines to halt infections, most countries have implemented containment and mitigation strategies, requiring individuals to dramatically alter their lifestyle limiting personal freedom. The extent to which these measures will be politically acceptable and respected by populations is likely to depend, among other factors, on individuals' perceived risk of suffering severe consequences following infection (Sheeran, Harris, & Epton, 2014). In fact, not all individuals are at equal risk of dying if infected. In particular, existing data from affected regions suggest that especially individuals with preexisting medical conditions and older individuals are at an increased fatality risk if infected (Oke & Heneghan, 2020).

With this study, we aimed to provide time-critical insights on the SARS-CoV-2 fatality risk perception of the US population as a whole as well as for two crucial subgroups defined by preexisting medical conditions and age. Further, we aimed to examine risk perception as it relates to protective SARS-CoV-2-related behavior helping to avoid the virus from spreading. We did so by analyzing two different time points in the course of the COVID-19 crisis in the US: First, in mid-March (i.e., March 13-15, 2020) with 1,663 to

2,951 confirmed COVID-19 cases in the US, and, second, in mid-April (i.e., April 10-12, 2020) with 466,099 to 529,951 reported cases (Roser, Ritchie, Ortiz-Ospina, & Hasell, 2020). On March 3 schools in some states were closed and on March 12 public events were cancelled. However, it was not until March 17 that public information campaigns were organized and the US population was advised that anyone who could work from home should do so (Hale, Petherick, Phillips, & Webster, 2020).

Method

We drew on two independent samples of N_1 = 1,182 (March) and N_2 = 953 (April) US adult residents (i.e., ≥ 20 years, not positively tested for SARS-CoV-2) stratified for age, gender, and race (for N_1: 50.4% women, 48.6% men, 1% other; age: M = 45.6 years, SD = 15.72, range = 20 to 83; for N_2: 53.1% women, 46.5% men, 0.4% other; age: M = 41.14 years, SD = 14.87, range = 20 to 78; further demographic characteristics are listed in Table S1 in the supplemental material). Data were collected online on the platform Prolific (prolific.co). Data is available under [blinded for review]. The study was approved by the ethics review panel of the University of [blinded for review]; participation was voluntary and participants were compensated for their participation. In both samples, perceived personal risk of dying from SARS-CoV-2 if infected was assessed on a nine-point scale ranging from *Approximately zero (<0.0001%)* to *Approximately three-quarters (75%)*. We used published crude case-fatality risk estimators (Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, 2020; WHO, 2020c) for the entire population (i.e., around 1%) as well as for the different subgroups defined by preexisting medical conditions (i.e., if none present: around 1%; if present: around 10%) and age (i.e., for 20 to 49 years: around 0.1%; for 50 to 69 years: around 1%; for 70 years and older: around 10%). We operationalized preexisting medical conditions as a yes or no statement on whether the participant currently or ever experienced a serious medical condition such as heart disease, diabetes, chronic respiratory

disease, high blood pressure, or cancer. To examine the effect of perceived fatality risk on behavior, we assessed protective SARS-CoV-2-related behavior, which had been identified as key containment measures (Ferguson et al., 2020; WHO, 2020d) by means of an 8-item scale (e.g., "I am planning to/have already started avoiding crowded spaces"; five-point rating; for N_1: $\alpha = .87$, for N_2: $\alpha = .83$). Additional information on the data collection as well as a full list of employed items can be found in the supplemental material.

Results

Figure 1 depicts the results. In a first step, we looked at the absolute and relative risk perception (i.e., differentiated for subgroups defined by preexisting medical conditions and age) as observed in March 2020 (Figure 1: depicted in darker shade). Looking at the overall sample (Figure 1a), one in five Americans (20%) perceived the absolute risk to die from SARS-CoV-2 if infected with the virus to be around 1% matching current epidemiological figures (Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, 2020; WHO, 2020c). Around 14% reported higher perceived risk, whereas the majority of around 67% reported lower perceived risk than the 1% benchmark. As many as one in two Americans (51%) reported that their own odds of dying if infected were approximately one in ten thousand or even lower, thereby severely underestimating fatality risk. Figure 1b and 1c depict the relative risk perception across the two subgroups defined by medical condition. Although individuals with preexisting medical conditions understood that their own risk of dying from SARS-CoV-2 if infected is higher than the average 1%, they still severely underestimated their fatality risk (77% vs. 74% in the no preexisting condition group). These results were mirrored by those of the three age subgroups. Figure 1d to 1f depict their results. Even though older Americans tended to know that their relative fatality risk is higher than 1%, they unambiguously underestimated their risk (69%). Slightly more than half (58% for

both) of the two younger age groups severely underestimated their risk of dying of SARS-CoV-2 if infected.

In a second step, we tested whether SARS-CoV-2 risk perception has changed from March to April 2020. Risk perception as observed in April 2020 is depicted in Figure 1 in lighter shade. A significant Mann-Whitney test indicated that absolute risk perception levels in March (*Mdn* = 0.01) differed significantly from April (*Mdn* = 0.1) for the overall sample (*U* = 453,726, *z* = -7.82, *p* < .001, small effect size: *r* = -.17). Americans thus reported higher risk perception in April compared to March, albeit a considerable number of Americans still severely underestimated their absolute fatality risk (e.g., 36.2% reported that their own fatality risk was approximately one in ten thousand or even lower). The relative risk perception levels for the different subgroups defined by medical conditions and age changed from March to April, too (see Figure 1b to f), indicating overall higher risk perception in April. With the exception for the oldest age group, where statistical power was lacking to detect smaller effect sizes, these observed subgroup differences were statistically significant (*p*s < .001) with small effects ranging from *r* = -.18 to *r* = -.21.

In a third step, we tested the relation between fatality risk perception and behavior. A significant Spearman's rho correlation (for March: *r* = .21, *p* < .001; for April: *r* = .14, *p* < .001) indicated that participants with a lower perceived risk tended to perform less behavior that can reduce SARS-CoV-2 transmission rates (e.g., not shaking hands or avoiding crowded spaces). The observed relation was descriptively lower in April. At the same time, Americans performed or intended to perform higher levels of protective SARS-CoV-2-related behavior in April (*M* = 4.41 *SE* = 0.02) than they did in March (*M* = 3.93 *SE* = 0.02). This difference was significant *t*(2118.087) = -15.658, *p* < .001, with a medium effect of *r* = .32.

Discussion

Our results are limited by the use of a repeated cross-sectional design instead of a longitudinal panel design. Further, we assessed risk perception with nine predefined response categories thereby reducing statistical power and restricting participants from indicating their fatality risk with greater precision. However, our study provides time-critical insights into different stages of the unfolding COVID-19 crisis in the US aiming at informing health professionals, scholars, and political stakeholders alike. Overall, given the current epidemiological figures (Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, 2020; WHO, 2020c), our findings suggest that many US adult residents severely underestimated their absolute and relative fatality risk if infected with SARS-CoV-2 in March 2020. Risk perception changed from March to April towards more accuracy and overestimation albeit still in April, many US adult residents underestimated their fatality risk. These results are worrying because risk perception, as our study suggests, guides behavior that can reduce transmission rates (see also Sheeran et al., 2014) and thus saves lives. These results confirm previous evidence on the role risk perceptions play in shaping health-protective behaviors during pandemics (Bish & Michie, 2010) and highlight the importance of ensuring that policy interventions, regulations and guidelines as well as communication strategies target the population in general and some demographic groups in particular, to ensure an alignment between the risk they face and the risk they perceive. Suppression and mitigation strategies to halt viral spread during pandemics require drastic behavioral changes that individuals need to implement rapidly and in a sustained way. Our work suggests that ensuring that individuals have an accurate perception of the threat posed by COVID-19 is an important condition if individuals are to implement such changes. This appears to be especially the case in the early phases of a pandemic, when information and advice is often sparse and contradictory, but was also important in the presence of mandatory requirements,

thus indicating that individuals are more likely to comply with government advice and regulations if they have a more accurate risk perception. Furthermore, we expect that risk perceptions will continue to play an important role in the long run. In the absence of vaccines and pharmacological treatments, current social distancing and health-protective behavior are likely to remain necessary for many months. Because many individuals infected with COVID-19 are asymptomatic or have only light symptoms (Bai et al., 2020), surges in infections and fatality manifest themselves after a lag from the time people stop washing their hands thoroughly, start shaking hands, visit crowded places or go out despite feeling sick. The success of public health strategies will therefore continue to depend on the population to develop and maintain accurate risk perceptions in order to show protective behavior despite personal psychological, physical, and cognitive fatigue.

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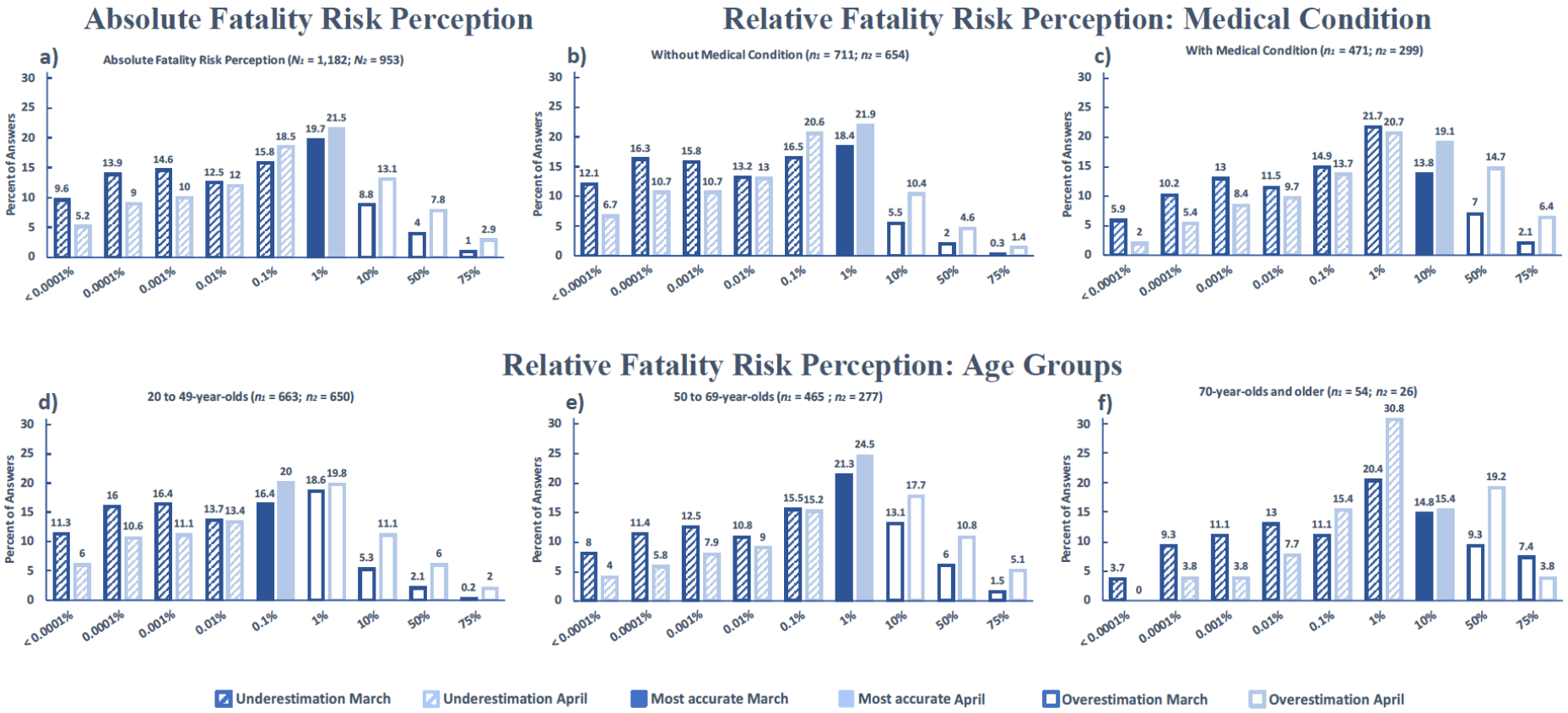

Figure 1. Perceived absolute and relative SARS-CoV-2 fatality risk perception in US adult residents for March and April 2020

Supplementary Materials:

THE CORONAVIRUS (COVID-19) FATALITY RISK PERCEPTION OF US ADULT RESIDENTS IN MARCH AND APRIL 2020

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Additional information on data collection

The current study was part of the larger project]), which focused on psychological and behavioral effects of the COVID-19 crisis on US adult residents. The decision to conduct the PANIC project was taken in early March 2020. The project aimed at investigating a range of different psychological constructs related to the pandemic such as risk perception but also variables, which were not part of the current study. The project encompasses two waves of data collection in using a repeated cross-sectional design. Data were collected online on the platform Prolific (prolific.co), a paid survey platform. All US residents aged 20 years or above were eligible to participate. The study was approved by the ethics review panel of the University of Luxembourg; participation was voluntary and participants were compensated for their participation.

The first wave of data collection took place in mid-March (March 13–15, 2020). Participants were paid 6.74 £ per hour, with funding provided by the University of Luxembourg (no external funding bodies involved). The first wave of data collection resulted in an *N* of 1,217 participants. Participants who did not complete the entire questionnaire (n = 31) or indicated that they had tested positive for Coronavirus (n = 4) were excluded from the data set. The final sample consisted of N = 1,182 US adult residents (i.e., N_1). According to Prolific (prolific.co), the data collection procedure included measures to stratify the sample for gender, age, and race.

The second wave of data collection took place in mid-April (April 10–12, 2020), thus, exactly four weeks after the first wave. Data were again collected online via Prolific (prolific.co) and stratified for gender, age, and race. Participants were paid 7.64 £ per hour, with funding provided by the University of Luxembourg (no external funding bodies involved). N = 1,369 participants completed the questionnaire. Again, participants who did not complete the entire questionnaire (n = 127) and who indicated that they had tested positive for Coronavirus (n = 5) were excluded from the data set. Further, n = 284 participants were removed from the data set as they had already completed the questionnaire in the first wave of data collection to ensure independence of both data sets within our repeated cross-sectional design. Thus, the final sample of the second wave consisted of N = 953 US adult residents (i.e., N_2). Table S1 depicts sample characteristics for both samples N_1 and N_2.

Table S1
Sample characteristics for N_1 (collected from March 13 to 15, 2020) and N_2 (collected from April 10 to 12, 2020)

Sample characteristics	N_1	N_2
N	1,182	953
Gender (%)		
Women	596 (50.4)	506 (53.1)
Men	574 (48.6)	443 (46.5)
Other	12 (1.0)	4 (0.4)
Age		
Mean (*SD*)	45.60 (15.72)	41.14 (14.87)
20 - 29 years (%)	250 (21.2)	275 (28.9)
30 - 39 years (%)	219 (18.5)	205 (21.5)
40 - 49 years (%)	194 (16.4)	170 (17.8)
50 - 59 years (%)	223 (18.9)	165 (17.3)
60 - 69 years (%)	242 (20.5)	112 (11.8)
70+ years (%)	54 (4.6)	26 (2.7)
Race (%)		
Asian	64 (5.4)	71 (7.5)
African American/Black	141 (11.9)	130 (13.6)
Hispanic	47 (4.0)	46 (4.8)
Native American/Hawaiian	7 (0.6)	6 (0.6)
White	903 (76.4)	688 (72.2)
Other	20 (1.7)	12 (1.3)
Education (%)		
Less than a high school diploma	6 (0.5)	8 (0.8)
High school diploma or equivalent (e.g. GED)	124 (10.5)	93 (9.8)
Some college, no degree	269 (22.8)	223 (23.4)

Associate degree (e.g. AA, AS)	139 (11.8)	100 (10.5)
Bachelor's degree (e.g. BA, BS)	414 (35.0)	340 (35.7)
Master's degree (e.g. MA, MS, MEd)	155 (13.1)	130 (13.6)
Professional degree (e.g. MD, DDS, DVM)	33 (2.8)	24 (2.5)
Doctorate (e.g. PhD, EdD)	33 (2.8)	22 (2.3)
Vocational training/trade	7 (0.6)	9 (0.9)
Other school-leaving qualification	2 (0.2)	4 (0.4)
Relationship (%)		
Single	363 (30.7)	295 (31.0)
Unmarried, but in a relationship	141 (11.9)	147 (15.4)
Married, or in a domestic partnership	530 (44.8)	410 (43.0)
Widowed	25 (2.1)	18 (1.9)
Divorced	111 (9.4)	71 (7.5)
Separated	12 (1.0)	12 (1.3)

Table S1 (continued)
Sample characteristics for N_1 (collected from March 13 to 15, 2020) and N_2 (collected from April 10 to 12, 2020)

Sample characteristics	N_1	N_2
Gross annual household income (%)		
I do not have personal income	30 (2.5)	36 (3.8)
Less than $20 000	179 (15.1)	122 (12.8)
$20 000 to $34 999	190 (16.1)	151 (15.8)
$35 000 to $49 999	190 (16.1)	122 (12.8)
$50 000 to $74 999	215 (18.2)	192 (20.1)
$75 000 to $99 999	144 (12.2)	138 (14.5)
$100 000 up to $ 114 999	77 (6.5)	53 (5.6)
$115 000 up to $129 999	45 (3.8)	30 (3.1)
$130 000 or more	95 (8.0)	89 (9.3)
I do not wish to answer	17 (1.4)	20 (2.1)
Employment (%)		
Employed full time (40 or more hours a week)	428 (36.2)	357 (37.5)
Employed part time (up to 39 hours a week)	157 (13.3)	125 (13.1)
Unemployed and currently looking for work	78 (6.6)	90 (9.4)
Unemployed and not currently looking for work	12 (1.0)	35 (3.7)
Student	61 (5.2)	92 (9.7)
Retired	176 (14.9)	75 (7.9)
Homemaker	63 (5.3)	45 (4.7)
Self-employed	161 (13.6)	106 (11.1)
Unable to work	46 (3.9)	28 (2.9)

Table S2.
List of variables and constituent items

Variable name	Items	Scale
SARS-CoV-2 Fatality Risk perception	Assuming that you personally have been infected with Coronavirus, what do you believe is your likelihood of dying from it?	1 = Approximately zero (< 0.0001%); 2 = Approximately one in a million (0.0001%); 3 = Approximately one in a hundred thousand (0.001%); 4 = Approximately one in ten thousand (0.01%); 5 = Approximately one in a thousand (0.1%); 6 = Approximately one in a hundred (1%); 7 = Approximately one in ten (10%); 8 = Approximately half (50%); 9 = Approximately three-quarters (75%)
Protective SARS-CoV-2-related behavior	I am planning to/have already bought disinfectant I am planning to/have already shaken hands with people less I am planning to/have already been doing more work or leisure activities from home I am planning to/have already limited my travel plans I am planning to/have already started washing my hands more	1 = Strongly Disagree; 2 = Strongly Agree; 3 = Neither agree nor disagree; 4 = Agree; 5 = Strongly Agree

	I am planning to/have already started avoiding crowded spaces I am planning to/have already stayed home when I feel ill I am planning to/have already cleaned and disinfected surfaces in my home more often	
Preexisting medical conditions	Have you ever had a serious medical diagnosis? (e.g. heart disease, diabetes, chronic respiratory disease, high blood pressure, cancer)	1= Yes, I currently have a serious medical condition; 2 = Yes, I had a serious medical condition in the past; 3 = No
Age	How old are you?	Free numeric text entry