Information seeking, personal experiences, and their association with COVID-19 risk perceptions: demographic and occupational inequalities

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Abstract

Background

The impacts of COVID-19 are not evenly distributed in society. Understanding demographic and occupational differences in personal experiences and information seeking and how these shape perceptions of COVID-19 related risk may help to improve the effectiveness of public health strategies in the future.

Method

We surveyed a nationally representative sample of 496 participants during the strictest period of the first national UK lockdown, in May 2020. We recorded data to assess people's experiences of the pandemic, examining how they varied with demographic factors such as age, gender, occupational status, and key worker status. We also recorded data on COVID-19 related information seeking, and how experiences and information seeking behaviours were related to perceptions of COVID-19 related risk.

Results

We found that key workers reported greater exposure to COVID-19 and more extensive experience of the virus within their social circles. Those key workers who perceived their personal protective equipment to be more effective felt that the virus was less of a threat to their lives. Trust in COVID-19 information was highest in information from the UK Government and NHS, and lowest in information from social media. We also found that men reported lower levels of perceived threat to life from the virus than women – a difference that mirrors the gender difference in occupational risk within our sample, as indexed by disease exposure and proximity to others in the workplace. Among those in employment, lower occupational class was also associated with higher levels of both perceived risk of infection, and perceived threat to life.

Conclusions

Key workers who feel that they are insufficiently protected by their PPE experience increased levels of perceived threat, which may lead to negative health behaviours. This highlights the need for employers to ensure that key workers feel they are adequately protected from COVID-19. Our findings highlight some of the inequalities in the distribution of risk across society and discuss demographic differences in perceptions of risk.

Key words: Risk perceptions; Mortality risk; COVID-19; Information seeking; Key workers.

1. Introduction

1.1. The COVID-19 pandemic

Severe Acute Respiratory Syndrome-Coronavirus Disease 2019 (COVID-19) is caused by a novel coronavirus known as SARS-CoV-2 and has resulted in tremendous suffering, disruption and economic loss worldwide (Lal et al., 2020). The disease was first reported in Wuhan, China in December 2019 (Zhu et al., 2020). The disease spread rapidly with the World Health Organisation (WHO) declaring the outbreak of a global pandemic on 11 March 2020 (WHO, 2020). At the time of writing (February 2021), over 102.1 million cases of COVID-19 have been reported globally, resulting in over 2.2 million COVID-19 related deaths (WHO, 2021). In the UK there have been over 3.9 million reported cases of COVID-19 and over 100 thousand deaths since the beginning of the pandemic (Public Health England, 2021). COVID-19 continues to have a devastating impact on countless lives across the globe.

1.2. COVID-19 related risk

The impacts of COVID-19 are not evenly distributed in society. Gender differences have been identified in health outcomes related to COVID-19, with males experiencing a higher risk of death (Li et al., 2020). Mortality risk is also associated with age, with the elderly being at greater risk of dying due to COVID-19 (Dowd et al., 2020). Socioeconomic inequalities in the transmission of infectious disease have been reported (Pini et al., 2019) and, in the UK, early reports suggest that socioeconomic deprivation is associated with higher risk of COVID-19 infection (Niedzwiedz et al., 2020). COVID-19 related mortality rates are twice as high for those living in deprived areas compared to those in less deprived areas (Office for National Statistics, 2020). It has also been suggested that many of the societal measures that have been implemented to limit the spread of COVID-19 are likely to exacerbate socioeconomic inequalities that existed prior to the outbreak (Van Lancker & Parolin, 2020). Given these early signs of socioeconomic inequalities and COVID-19 related risk, it is vital that the underlying factors that drive these connections are investigated in

order to respond with effective public health strategies (Khalatbari-Soltani, Cumming, Delpierre & Kelly-Irving, 2020).

There are occupational inequalities with respect to COVID-19 related risk. A variety of occupations involve a risk of exposure to biological agents, with healthcare workers experiencing one of the highest overall levels of exposure to infection (Haagsma, Tariq, Heederik & Havelaar, 2011). Identifying which occupational groups experience greater exposure to disease can help to direct public health strategies for managing the outbreak of infectious disease (Baker, Peckham & Seixas, 2020). As part of the UK government's response to COVID-19, a nationwide lockdown was implemented on 23 March 2020, signalling the beginning of an unprecedented occupational shift in which vast numbers of people were asked not to attend their normal place of work (Cabinet Office, 2020a). Exempt from the newly implemented measures were 'key workers', whose work was deemed by the UK government as being critical to their response to COVID-19, and to maintaining the basic operation of the country (Cabinet Office, 2020b). At the time of data collection for this study (May, 2020), the Institute for Fiscal Studies (IFS; 2020) estimated that 22% of working-age individuals in the UK were categorised as key workers, which equates to 7.1 million adults, of whom approximately 60% were women.

During the outbreak of COVID-19, one of the most discussed issues relating to key workers has been the provision and sufficiency of personal protective equipment (PPE). Constraints in the availability of PPE have meant that many key workers have been left without adequate protection (Agius, 2020; Royal College of Nursing, 2020). Out of a sample of 11,314 healthcare workers in environments with patients with confirmed or possible COVID-19, 30% reported that they had not received sufficient eye and face protection (Royal College of Nursing, 2020). The lack, or inadequacy, of PPE has been identified as a serious concern for healthcare workers in the UK (Houghton et al., 2020).

The unequal distribution of risk across society impacts upon the differences in perceptions of risk experienced by certain groups (Beck, 1992; Bolte, Tamburlini & Kohlhuber, 2009; Curran, 2013; Wright, Steptoe & Fancourt, 2020). Key workers whose jobs require contact with others are likely to perceive their personal level of risk as being very different to those who are able to remain at home. Given that key workers are disproportionately female and of lower socioeconomic status (Kikuchi & Khurana, 2020), there is also a risk that socioeconomic and gender inequalities will be exacerbated by the pandemic. In the first instance there will be an unequal experience of risk due to differential COVID-19 exposure. However, since mortality risks that are perceived to be uncontrollable have been found to discourage health-promoting behaviour, it is also possible that this may lead to a secondary effect in which higher perceptions of risk trigger less healthy behaviours, thereby exacerbating these initial risk inequalities (Pepper & Nettle 2014a; Pepper & Nettle 2014b). Therefore, it is important to establish how the pandemic has affected perceived risk, and who among society has been most affected.

1.3. The role of COVID-19 related information

Understanding information seeking behaviours during the outbreak of COVID-19 may also provide some insight into differences in risk perceptions. Beliefs surrounding information related to the outbreak of infectious disease may also have an impact on the public's response to the pandemic. For example, during the Ebola epidemic in 2014-2015, low levels of trust in government information were associated with poor adherence to social distancing measures designed to limit the spread of the virus (Blair, Morse & Tsai, 2017). In the UK, during the outbreak of swine flu in 2009, trust in and perceived utility of government information were also associated with willingness to adhere to preventative behaviours (Rubin, Amlot, Page & Wessely, 2009). During the COVID-19 pandemic, greater levels of trust in local government and local media in China have been associated with lower rates of infection and greater cooperation in acting to reduce the spread of disease (Ye & Lyu, 2020).

Similarly, studies in other populations have shown that trust in health information during infectious outbreaks is associated with compliance with preventive measures designed to stop the spread of disease (Gilles et al., 2011; Vinck, Pham, Bindu, Bedford & Nilles, 2019). Identifying the sources of information that people are using, as well as studying attitudes towards these sources, will therefore provide insight into how perceptions of risk are being formed during the current outbreak.

1.4. Perceptions of risk

An accurate awareness of personal risk is an important component in risk-prevention behaviours (Brawarsky et al., 2018). However, there is often a large 'perception gap' between perceived and objectively calculated risks (Cainzos-Achirica & Blaha, 2015). In response to the outbreak of an infectious disease, health protection behaviours may well be motivated more by perceived risk rather than the actual prevalence of risk (Raude, Peretti-Watel, Ward, Flamand & Verger, 2018). Therefore, investigating differences in risk perceptions during the pandemic may be important for understanding the behavioural response to COVID-19. There are notable demographic differences in perceptions of risk. Being male is associated with lower levels of perceived risk of accident, despite males having higher levels of actual risk (Sund, Svensson & Andersson, 2015). There are also suggestions of gender differences in the accuracy of health risk perception: for example, women are more likely than men to overestimate their risk of diabetes (Brawarsky et al., 2018). Previous research has also found that lower socioeconomic status is associated with overall higher perceptions of risk (Slovic, 2000). Measuring perceptions of risk during the pandemic will help to understand demographic differences in the psychological response to COVID-19, and will assess whether these responses correspond with previously reported differences in risk perception.

1.5. Summary and predictions

In order to improve the effectiveness of public health strategies in response to COVID-19, more information is needed to understand the relationships between demographic and occupational factors, information seeking behaviours, and perceptions of risk during the pandemic (Betsch,

Wieler & Habersaat, 2020). To address this, we have surveyed experiences and information seeking behaviours during the pandemic, and measured perceptions of COVID-19 related risk. We predicted that age, gender and socioeconomic classification would be associated with levels of perceived risk relevant to COVID-19. This is due to the increased mortality risk experienced by the elderly (Dowd et al., 2020), the extensive literature outlining gender differences in risk perception (Brawarsky et al., 2018; Gustafsod, 1998), as well as early findings suggesting an association between socioeconomic deprivation and higher risk of COVID-19 infection (Niedzwiedz et al., 2020). We also expected higher levels of COVID-19 experience and increased exposure to risk to be positively associated with perceived risk of infection, due to the increased experience of actual risk. Finally, we predicted that key workers would have higher levels of perceived risk of infection from COVID-19 because of their proximity to the virus. We discuss the impact of COVID-19 through the lens of existing societal inequalities and examine the impact that the pandemic is having on different pockets of society.

2. Method

The Department of Psychology Ethics Committee at Northumbria University (23857) approved our study. Our measures, predictions and analytical plan are registered with the Open Science Framework [https://osf.io/8jqsn/].

A nationally-representative sample of 514 adults in the UK was anonymously surveyed using a Qualtrics questionnaire delivered by the platform Prolific [www.prolific.co]. Prolific's nationally representative sampling method screens participants based on age, gender, and ethnicity in proportion to UK population data derived from the Office for National Statistics (ONS, 2013; "Representative Samples on Prolific", 2019). Prolific stratifies age using five brackets: 18-27, 28-37, 38-47, 48-57, and 58+. Gender is divided into male and female and ethnicity is stratified into five categories: White, Mixed, Asian, Black and Other, pursuant to the ONS's 2011 UK census data (Office for National Statistics, 2013). Although no sample can ever be completely representative of a

national population (Zhang, Kuchinke, Woud, Velten & Margraf, 2017), Prolific provides effective stratified sampling based on key characteristics and has been shown to be a successful tool in providing representative samples of the UK population during the COVID-19 pandemic (Kooistra et al., 2020). We based our target sample size of 500 on recommended guidelines for conducting surveys in exploratory research (Daniel, 2012).

The survey was conducted on 6 and 7 of May 2020. For context, the UK became the second country to surpass 30,000 COVID-19 related deaths on 6 May 2020, meaning that the death rate would have been salient in the media at the time ("Coronavirus (COVID-19) in the UK", 2020). Therefore, our findings reflect the experiences of participants after the first peak of the pandemic, but still within the strictest period of the first UK lockdown (Cabinet Office, 2020a).

We excluded 16 participants from our analysis because they failed our data quality check, having given inconsistent responses for age and gender in our survey, when compared to the responses on their Prolific profile. We excluded two additional participants as extreme outliers, as they reported knowing 200 or more people who had contracted COVID-19. Our final sample therefore contains 496 participants: 254 females and 242 males, aged 19-85 (mean age = 45.95, SD = 15.41). Of our sample, 21.77% reported being a key worker. The Institute for Fiscal Studies (2020) estimated that 22% of working age individuals in the UK are key workers. The questionnaire is available as part of our pre-registration on the Open Science Framework.

2.1. Demographics and risk factors

Age, gender, ethnicity, National Statistics Socio-economic Classification (NS-SEC), and employment status were recorded. The latest-reported number of cases of COVID-19 in the participants' area of residence were recorded using search tools provided by the BBC and Telegraph online. Participants were asked whether they had been informed by the National Health Service (NHS) that they were in a higher risk category due to an existing health condition. Participants were also asked about whether they were a key worker and, if so, whether they were still working, in which sector, for how

many hours per week, and how many hours they were spending in contact with the public. Key workers were asked whether they had been provided with personal protective equipment (PPE), and whether they perceived this to be adequate in protecting them from COVID-19 infection (rated on a 7-point Likert scale from 'definitely not' to 'definitely yes').

Participants were asked about the extent of their personal experience of COVID-19, indicating whether they had personally been infected, the number of people they knew that had become infected, and the severity of the symptoms experienced in those cases (rated on a sliding scale from 0 'no symptoms' to 100 'the infection was deadly'). An overall COVID-19 experience score was calculated by using an experience-based point system. We allocated 3 points for personally having had COVID-19, 2 for being emotionally close to an infected person, 1 point for having an infected acquaintance, and 0 for not having known anyone who'd had COVID-19. These scores were combined to provide an overall COVID-19 experience score (0-6). For analyses of the effects of experience on perceptions, we excluded the 19 participants who reported having personally had COVID-19, because having experienced infection would have skewed their responses regarding perceived risk of infection (towards certainty) and perceived threat to life from COVID-19 (towards zero).

An analytic class was calculated for each participant who reported a usable Standard Occupational Classification (SOC) code using the Office for National statistics' (ONS) NS-SEC simplified method (Office for National Statistics, 2010). For participants who provided their occupation but not their SOC code, analytic class scores were manually derived from the ONS's online tool ("ONS Occupation Coding Tool", 2010). Participant SOC codes were matched with ONS scores for occupational proximity to others and exposure to disease (Office for National Statistics, 2020). There were 14 participants who provided SOC codes that did not have accompanying ONS risk scores for proximity to others and exposure to disease. Out of these 14 participants, 11 were manually allocated occupational risk scores by matching their occupations with related fields based

on the ONS's categorisation. To avoid missing data, we imputed the mean proximity and exposure scores for the 3 remaining participants for whom occupational risk scores could not be manually allocated, as well as for 3 additional participants whose occupational codes could not be determined based on the job titles they provided. The R scripts used for data processing and imputation are available alongside our pre-registration on the Open Science Framework.

2.2. Sources of information

Participants were asked to identify the primary source from which they had been receiving COVID-19 related information, and were asked to estimate how many minutes a day they spend looking up COVID-19 related information. The questionnaire also investigated perceptions of trust in information from different sources. Participants were asked the extent to which they agreed or disagreed with statements asserting the trustworthiness of information from broadcast media, print media, internet media, social media, friends and family, the UK Government and NHS, as well as COVID-19 information received overall (answered on a 7-point Likert scale ranging from 'strongly disagree' to 'strongly agree'). Participants were also asked whether they thought there was enough available information on COVID-19 (on a 7-point Likert scale from 'far too little' to 'far too much'). Finally, participants were asked how useful they found the available COVID-19 information (on a 7-point Likert scale from 'extremely useless' to 'extremely useful').

2.3. Perceptions of risk

Participants provided a measure of perceived risk of infection by stating a score for their believed likelihood of contracting COVID-19, provided they made the maximum effort to follow what were Government-recommended preventative measures at the time. This was reported on a scale from 0 (no chance) to 100 (certain) of being infected. A score for perceived threat to life from COVID-19 was also recorded, again with a scale ranging from 0 (not at all) a threat to life, to 100 (absolutely) a threat to life.

In the same survey, data were also collected on perceived extrinsic mortality risk and both general health and COVID-19-prevention behaviours. These findings are reported in "COVID-19: the relationship between perceptions of risk and behaviours during lockdown" (Brown, Coventry & Pepper, 2020) which can be found alongside our pre-registration on the Open Science Framework [https://osf.io/8jqsn/].

2.4. Analysis

All statistical analyses were performed using R (R Core Team, 2019). The R scripts used for data processing and analysis are available alongside our preregistration on the Open Science Framework. The following packages were used for data processing, analysis, and data visualisation: tidyverse (Wickham, 2017), tidyr (Wickham & Henry, 2019), pysch (Revelle, 2018), apaTables (Stanley, 2018) car (Fox & Weisberg, 2019), ggeffects (Lüdecke, 2018).

Our main variables are categorised under 4 key themes: 1) Demographics, 2) Risk exposure and experience variables, 3) COVID-19 information sources, and 4) Risk perceptions. For comparisons between groups, such as key workers and non-key workers, independent samples t-tests were used, unless parametric assumptions were not satisfied, in which case Mann Whitney U tests were used. We used linear multiple regression models to assess which of our experience variables were associated with each of our risk perception variables, controlling for any demographic variables that showed significant effects in the previous models. These models also included interaction terms for occupational exposure to disease and proximity to others, because we hypothesised that disease exposure may have attenuated effects on perceived risk in jobs where people are not physically close to others. Meanwhile, proximity to others may be less concerning if not in a setting where people tend to be unwell (e.g. in a sport setting, rather than a healthcare setting). For those models that assessed potential associations between demographic variables and perceptions of risk, additional analyses were conducted which included only those participants who reported being employed at the time of the study. This was done because, although participants of

lower socioeconomic classification (NS-SEC) could be expected to report greater perceived risk, this might not be true for those who were unemployed (treated as the lowest socioeconomic classification under NS-SEC), and therefore experiencing less occupational exposure.

3. Results

3.1. Descriptive statistics

Table 1 presents the descriptive statistics for our sample, whose ages ranged from 19-85 (M = 45.95, SD = 15.41). The full range of NS-SEC occupational classes were represented, and representative proportions were achieved in gender and ethnicity.

Table 1. Sample characteristics for age, gender, ethnicity, employment status, vulnerability, key worker status and sector, and occupational class

	Category	Number *(N = 496)*	Percentage of sample
Age	18-27	79	15.93
	28-37	85	17.14
	38-47	97	19.56
	48-57	84	16.94
	58+	151	30.44
Gender	Female	254	51.21
	Male	242	48.79
Ethnicity	White	400	80.65
	Asian	42	8.47
	Black	24	4.84
	Mixed	16	3.23
	Other	14	2.82
Employment status	Employed	254	51.21
	Retired	99	19.96
	Unemployed	73	14.72
	Furloughed	42	8.47
	Unemployed student	24	4.84
	Employed student	4	.81
COVID-19 vulnerability	Non-high risk	463	93.35
	High risk	33	6.65
Key worker status	No	388	78.23
	Yes	108	21.77
Key workers sector	Health and social care	34	31.48
	Food and necessary goods	18	16.67
	Education and childcare	13	12.04
	Utilities and communication	11	10.19
	Government	9	8.33
	Key services	6	5.56
	Transport	6	5.56
	Security	2	1.85
	Other	9	8.33
Occupational class (NS-SEC) *(N = 393)*	1.1 Large employers and higher managerial and administrative occupations	11	2.80
	1.2 Higher professional occupations	58	14.76
	2. Lower managerial, administrative and professional occupations	74	18.83
	3. Intermediate occupations	75	19.08
	4. Small employers and own account workers	13	3.31
	5. Lower supervisory and technical occupations	8	2.04
	6. Semi-routine occupations	32	8.14
	7. Routine occupations	25	6.36
	8. Never worked and long-term unemployed	97	25.68

3.2. Experiences of the COVID-19 pandemic

The reported median hours of participant weekly contact with members of the public (including activities such as shopping or volunteering in addition to work) was 2 hours (M = 10.17, SD = 17.5). We found that 53.43% of our participants reported having had no personal experience of COVID-19. On average (median), most participants didn't know anyone who had become infected with COVID-19 but there was a range between 0 and 20 (M = 1.67, SD = 2.93). The mean severity of symptoms experienced was 55.51 (SD = 33.07), where 50 represents moderate subjective severity. However, 45 people reported knowing someone whose infection had been deadly (see supplement, figure S1). Table 2 shows descriptive statistics for the COVID-19 experience variables.

Table 2. Descriptive statistics for variables related to COVID-19 experience

	Number	Mean	Median	SD	Min	Max
Contact hours with the public	496	10.17	2	17.5	0	80
Number of infected people known to the participant	496	1.67	0	2.93	0	20
Severity of symptoms experienced by those known to participant	221[a]	55.51	53	33.07	0	100
Occupational proximity to others	496[b]	59.22	54	14.63	33	100
Occupational exposure to disease	496[b]	19.57	11	22.08	0	98

SD = Standard deviation.

a Severity of symptoms values are missing either because participants reported no experience of COVID-19 (n = 265) or because participants failed to provide a score despite reporting experience of COVID-19 (n = 10).

b Occupational exposure and proximity values are zero where participants were not currently working, either because they were unemployed, retired, unemployed students, or furloughed (n = 238). Where participants failed to report an occupation that could be classified using the ONS SOC 2010 (n = 6), mean exposure and proximity values were imputed.

3.3. How did the experiences of key workers differ from those of others?

Key workers who were working during the pandemic reported working up to 60 hours a week, with the mean being 30.92 hours (SD = 14.73). Key workers reported a significantly higher number of weekly contact hours with the public (M_{key} = 35.71 hours) compared to non-key workers ($M_{non\text{-}key}$ = 3.08 hours), $t(118.06) = -18.37$, $p < 0.001$. They also had significantly higher average scores for occupational exposure to disease (M_{key} = 31.87) than non-key workers ($M_{non\text{-}key}$ = 12.43), $t(129.13)$

289 = 6.62, $p < 0.001$. Finally, key workers scored more highly on proximity to others in the workplace
290 ($M_{key} = 66.60$) than non-key workers ($M_{non\text{-}key} = 54.93$), $t(168.33) = 6.46$, $p < 0.001$.

291 Key workers were more likely than non-key workers to have been personally infected, or to
292 have known someone who had been infected $U(n_{key} = 108, n_{non\text{-}key} = 388) = 17457$, $z = -2.94$, $p < .01$.
293 They also reported knowing a greater number of people who had been infected ($M_{key} = 2.77$, $M_{non\text{-}key} = 1.36$, $t(134.16) = -3.59$, $p < 0.001$). Finally, key workers reported more severe worst-case
295 symptoms (either experienced personally or by individuals known to the participant; $M_{key} = 36.94$)
296 compared to non-key workers ($M_{non\text{-}key} = 21.90$), $t(155.29) = 3.63$, $p < .001$.

297 Only 41% of the key workers from our sample (44 out of 108) reported having received
298 personal protective equipment (PPE) at work. The average response from those who had received
299 PPE (n=44), regarding whether they believed it to be sufficient for protecting them against COVID-
300 19, was that it "might or might not be" (a 4 out of 7 on the Likert scale). Among those who received
301 PPE, greater perceived PPE sufficiency was associated with a lower perceived threat to life from
302 COVID-19, $\beta = -6.75$, s.e. = 2.86, $p < .05$.

303 *3.4. Consumption of COVID-19 related information*

304 Television (43.35%) and internet media (23.59%) were the most commonly reported sources of
305 COVID-19 related information (see supplement, figure S2). On average, participants reported
306 spending half an hour a day (M = 35.64 minutes) looking for COVID-19 related information. On
307 average, participants stated that the information that they had received regarding COVID-19 was
308 "moderately useful" (a 6 out of 7 on the Likert scale; see supplement, figure S3). The highest
309 reported median level of trust was for information from broadcast media and the UK Government
310 and NHS (a 5 out of 7 on the Likert scale). The lowest median level of trust was reported for
311 information from social media (a 3 out of 7 on the Likert scale; see supplement, figure S4).

312

313 *3.5. Perceptions of risk*

314 The overall mean score for perceived risk of infection was 25.89, suggesting that, on average,
315 members of our sample believed they had a one in four chance of contracting COVID-19, even if
316 they followed all recommended measures for preventing infection. Of our sample, 17% thought
317 they had a one in two or greater chance of contracting the virus, even if they took all recommended
318 precautions. We found that the average extent to which COVID-19 was considered to pose a threat
319 to life was 46 (0 and 100 representing 'not at all' and 'absolutely' respectively).

320 In models examining demographic differences in our risk perception variables (see
321 supplement, tables S3-4 for full details), age was significantly associated with perceived threat to
322 life, with older participants reporting higher scores, b = .24, (95% CI = .01, .48) p < .05. There was
323 also a gender difference in perceived threat to life; male participants reported a lower perceived
324 threat to life from the virus (M = 42.33) compared to female participants (M = 50.26), b = -10.60,
325 (95% CI = -16.87, -4.32) p < .01. There was no difference between men and women in perceived risk
326 of infection (M_{women} = 28.14, M_{men} = 28.29, t(243) = .05, p = .96). Female participants reported
327 working in professions with higher levels of exposure to disease (M = 37.63) compared to male
328 participants (M = 23.17), t(105.17) = 2.79, p < 0.01. Female participants also reported working in
329 professions with greater levels of proximity to others (M = 69.28) compared to male participants (M
330 = 60.18), t(101.44) = 2.65, p < 0.01.

331 Amongst those participants who reported being employed at the time of the study, having
332 a lower occupational status (a higher NS-SEC score) was associated with a higher perceived risk of
333 infection (b = 1.51, (95% CI = .11, 2.90), p < .05) and greater perceived threat to life from COVID-19
334 (b = 1.96, (95% CI = .05, 3.87), p < .05; see supplement, tables S5-6 for full details). However, there
335 were no associations between NS-SEC and perceptions of risk in analyses that included those who
336 reported being unemployed at the time of the study (see supplement, tables S3-4 for full details).

Of our experience variables, a greater number of contact hours with the public was associated with a higher perceived risk of infection, b = .25 (95% CI = .12, .38), p < .01 (see supplement, tables S7-8 for full details).

There was a difference in perceived risk of infection reported by key workers (M = 31.78) compared to non-key workers (M = 24.26), $t(162.09) = 3.12$, p < .01. However, there was no significant difference between key workers and non-key workers in perceived threat to life (M_{key} = 42.53, $M_{non\text{-}key}$ = 47.47, $t(165.06) = -1.39$, p = .17).

4. Discussion

This study measured experiences of COVID-19 and information seeking regarding the virus, during the first UK national lockdown, relating these to perceptions of COVID-19 related risk. Our findings reflect the experiences of participants after the first peak of the pandemic, but still within the strictest period of the first UK lockdown (Cabinet Office, 2020a). As predicted, age, gender and NS-SEC were associated with perceptions of COVID-19 related risk. However, contrary to our predictions, we found few associations between experiences and information seeking behaviours relevant to COVID-19, and levels of perceived risk. Key workers reported higher levels of perceived risk of infection than non-key workers, but this did not correspond with an increase in perceived threat to life from the virus.

4.1. Differences in experience of the COVID-19 pandemic

Over half of our sample reported having had no personal experience of COVID-19. This is perhaps not surprising: our data were collected in early May 2020 (during the initial UK lockdown) and it has been suggested that as many as four fifths of COVID-19 cases are asymptomatic (Cabinet Office, 2020a; Day, 2020). There was large variation in reported contact hours with the public, and contact hours were positively associated with perceived risk of infection. This most likely reflects the increase in objective risk of infection due to higher levels of exposure to the public.

We found stark differences in exposure to risk related to occupational inequalities, with key worker status being a main driver of increased contact with the public during the pandemic. Key workers reported a significantly higher number of contact hours with the public, and worked in occupations with greater exposure to disease and proximity to others, based on objective scores from the ONS, compared to non-key workers. These objective scores for occupational exposure and proximity were based on data collected prior to the outbreak of COVID-19 and do not reflect the fact that most key workers' occupational risk will have increased during lockdown due to the threat of viral infection. Additionally, most non-key workers' occupational risk of infection and proximity to others will have been substantially reduced during lockdown, due to working from home (Department for Business, Energy & Industrial Strategy, 2020). Therefore, although it is noteworthy that there is a significant difference in occupational risk between key workers and non-key workers based on assessments of occupational risk made prior to the pandemic, this difference will undoubtedly have expanded when taking the effects of the pandemic into account. This supports the notion that different societal groups experience an unequal distribution of risk (Beck, 1992; Bolte et al., 2009; Curran, 2013; Wright et al., 2020). We suggest that the events of the pandemic have most likely exacerbated this existing inequality in occupational risk. In terms of addressing occupational risk, only 41% of key workers from our sample reported having received PPE. Those who had received PPE were mostly ambivalent regarding its sufficiency for protecting them against infection. This speaks to concerns regarding the quality and provision of PPE during this pandemic (Houghton et al., 2020; Royal College of Nursing, 2020).

4.2. The role of COVID-19 related information

The most commonly reported primary sources of COVID-19 related information during the pandemic were television and internet media. Participants reported spending an average of approximately half an hour a day looking up information relevant to the pandemic, suggesting that

the majority of participants were interested in staying informed. The highest level of trust was reported for information from the UK Government and NHS, whereas the lowest level of trust was reported for information from social media. This supports recent findings from research conducted in the US into trust in information during the pandemic in which, again, social media was the least trusted source, and healthcare professionals and health officials were the most trusted (McFadden, Malik, Aguolu, Willebrand & Omer, 2020). The success of public health strategies are generally determined by the level of societal compliance. Trust in government health information has been shown to be associated with adherence to preventative measures designed to stop the spread of disease (Blair et al., 2017; Gilles et al., 2011; Vinck et al., 2019). Recent research into the impact of trust during the initial stages of the outbreak of COVID-19 in China found that greater levels of trust in local government were associated with lower rates of infection (Ye & Lyu, 2020). It is encouraging that the highest reported level of trust from our sample was for the UK Government and NHS, given that higher degrees of trust in government information are associated with increased compliance with public health strategies. However, despite being the most trusted information source, the average (both mean and median) response from our sample was that they "somewhat agree" (a 5 on a scale from 1 to 7) that government information was trustworthy, which is not a strong endorsement of trust.

4.3. Perceptions of risk

Our results suggest that the UK population generally consider COVID-19 to be a significant risk. On average, participants believed that they had a one in four chance of contracting COVID-19, even if they followed all recommended measures for preventing infection. Furthermore, 17% of our sample thought that, even when following all relevant prevention advice, they had a 50% or higher chance of contracting the virus. Our sample also reported relatively high levels of perceived threat to life. It is possible that this perception of risk was amplified in part due to the novelty of COVID-19, since people tend to underestimate common causes of death and overestimate novel causes of death

(Frost, Frank & Maibach, 1997; Young, King, Harper & Humphreys, 2013). Similarly, extensive media coverage has been shown to elevate the perceived severity of a threat (Young et al., 2013). Furthermore, perceptions of mortality risk have been reported to be higher towards the beginning of an infectious outbreak (Ibuka et al., 2010). Therefore, it is possible that, as the public becomes increasingly familiar with COVID-19 as a threat, levels of perceived threat to life may decrease. The overall high levels of perceived risk reported by our sample are consistent with concurrent research into pandemic-related risk perception which found that, although perceived risk of COVID-19 was globally high, it was at its highest in the UK compared to national samples from 9 other countries across Europe, America, and Asia (Dryhurst et al., 2020).

As predicted, age was significantly associated with perceived threat to life. Older participants generally reported the belief that the virus posed a greater threat to their life than younger participants, reflecting the well-reported fact that the elderly experience a much greater risk of COVID-19 related death (Dowd et al., 2020). Additionally, male participants reported a lower level of perceived threat to life. Men generally report lower levels of perceived risk than women (Hitchcock, 2001). However, this gender difference in perceived threat to life is at odds with the widely reported gender difference in actual risk of death due to COVID-19, which is significantly higher for men (Li et al., 2020). However, it is uncertain as to whether this perceptual difference reflects the reported effect of underestimation of risk by males, despite higher levels of mortality (Sund et al., 2015) or a reduced level of exaggerated perceived risk in comparison to females, who are reported to be more likely to overestimate certain health risks (Brawarsky et al., 2018). At present, we do not have an effective measure of objective risk with which to assess the accuracy of perceived risk of COVID-19. However, our occupational measures of exposure to disease and proximity to others may provide some insight into the influence of gender-based differences in occupational risk on perceived risk. Women reported working in professions with higher levels of exposure to disease and proximity to others, which may suggest that they experience greater levels

of occupational risk from COVID-19. It is possible that this experience of enhanced occupational risk may contribute towards the higher rates of perceived threat to life reported by women. However, it should be noted that there was no significant difference between men and women in their perceived risk of infection.

The ONS's occupation-based NS-SEC scores for socioeconomic class were associated with higher levels of perceived risk in those participants who reported being employed at the time of the study. People in lower occupational classes reported higher levels of perceived risk of contracting COVID-19, reflecting recent findings which suggest that lower socioeconomic status is associated with higher risk of COVID-19 infection (Niedzwiedz et al., 2020). Lower occupational class also predicted greater fear for one's life which also reflects recent findings in which lower socioeconomic status correlated with higher actual risk of death due to COVID-19 (The OpenSAFELY Collaborative et al., 2020). Our findings suggest participants working in lower socioeconomic status roles perceived higher levels of risk compared to unemployed participants of lower socioeconomic status. This is most likely the result of the unemployed being more able to shield themselves from COVID-19 related risk, whereas those in employment may be more exposed to risk because of their work.

Key workers reported higher levels of perceived risk of infection which confirmed our expectation that those whose employment increases the likelihood of having COVID-19 related experiences (either directly or indirectly) may experience heightened perceptions of risk. However, our study found no difference between key workers and non-key workers in the extent to which participants believed COVID-19 posed a threat to their life.

Having a higher proportion of mortality risk that is perceived to be uncontrollable is associated with lower engagement with health-promoting behaviours (Pepper & Nettle 2014a; Pepper & Nettle 2014b). However, we did not find that key workers reported a greater perceived threat to life than non-key workers. Therefore, although the experiences of key workers provides evidence of the unequal distribution of risk across society (Beck, 1992; Bolte et al., 2009; Curran,

2013; Wright et al., 2020), the good news is that this experiential inequality does not seem to be accompanied by greater levels of those perceptions of risk that are typically associated with decreased health-promoting behaviours. However, perceived sufficiency of PPE was negatively associated with perceived threat to life, suggesting that those who felt that they were without adequate protection from infection feared for their life more so than those who believed their PPE was sufficient. Therefore, this increased level of fear experienced by key workers who feel they are inadequately protected against infection may potentially lead to negative health behaviours.

4.4. Limitations

The results of this study are not without limitation. Firstly, we are limited by the absence of a practical objective measure of risk for COVID-19. Individual perceptions of risk are often inaccurate when compared to the best available measurements of 'actual risk' (Leventhal, Kelly & Leventhal, 1999). We utilised scores for exposure to disease and proximity to others, which provide some indication of non-COVID-19 specific infection risk (Office for National Statistics, 2020). However, these scores only relate to occupational risk and do not provide a comprehensive measure that captures the range of factors that affect COVID-19 related risk. Such a measure would allow us to assess the accuracy of perceived risk during a pandemic and to further understand some of the differences in risk perception that we have presented. Secondly, although our sample covered the full range of socioeconomic classes, it only included a small number of respondents for some NS-SEC analytic classes (see table 1). This potential underrepresentation of certain occupational classes may have had an impact on those analyses that sought to examine the relationships between socioeconomic classification and risk perceptions.

5. Conclusion

We found that demographic differences in actual risk are sometimes, but not always, accurately reflected by differences in perceived risk. The increased actual risk from COVID-19 experienced by both the elderly and lower socioeconomic status individuals corresponded with differences in

perceived risk. However, the increased threat to life from COVID-19 experienced by males was at odds with reports of perceived risk. This may be partly explained by females working in professions with higher levels of exposure to disease and proximity to others, suggesting greater occupational risk from COVID-19. Given that health protection behaviours are likely to be motivated more by perceived risk than actual risk (Raude et al., 2018), ensuring that demographic differences in actual risk are reflected in perceptions of risk may help to promote protective behaviours in those most vulnerable to COVID-19.

This study has highlighted that the experiences of key workers during the pandemic are significantly different to those of non-key workers. Their previously high levels of exposure to disease and proximity to others, exacerbated by the risk from the current pandemic, may cause key workers to rightly consider themselves to be bearing a disproportionate level of personal risk. Working as a key worker during the pandemic was not associated with increased perceptions of risk known to trigger negative health outcomes. However, key workers who feel that they are inadequately protected against infection experience increased levels of fear, which may be associated with negative health behaviours. This highlights the need for employers of key workers to not only ensure that their employees are provided with PPE, but that their workers also feel that their PPE is sufficient.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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683

Supplement

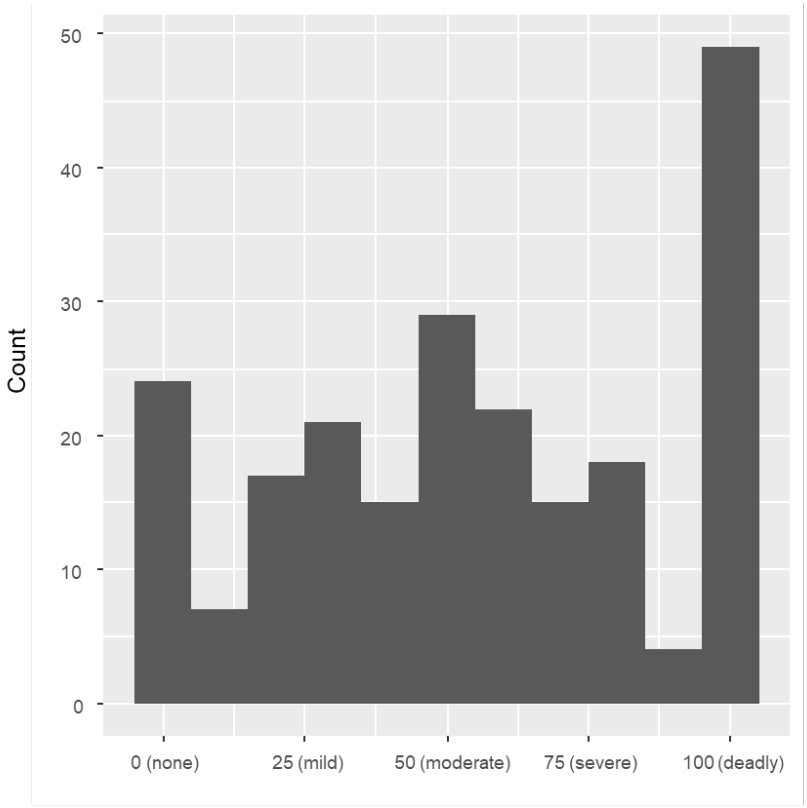

Figure S1. The reported severity of the worst experience of COVID-19 within our participants' personal social circles

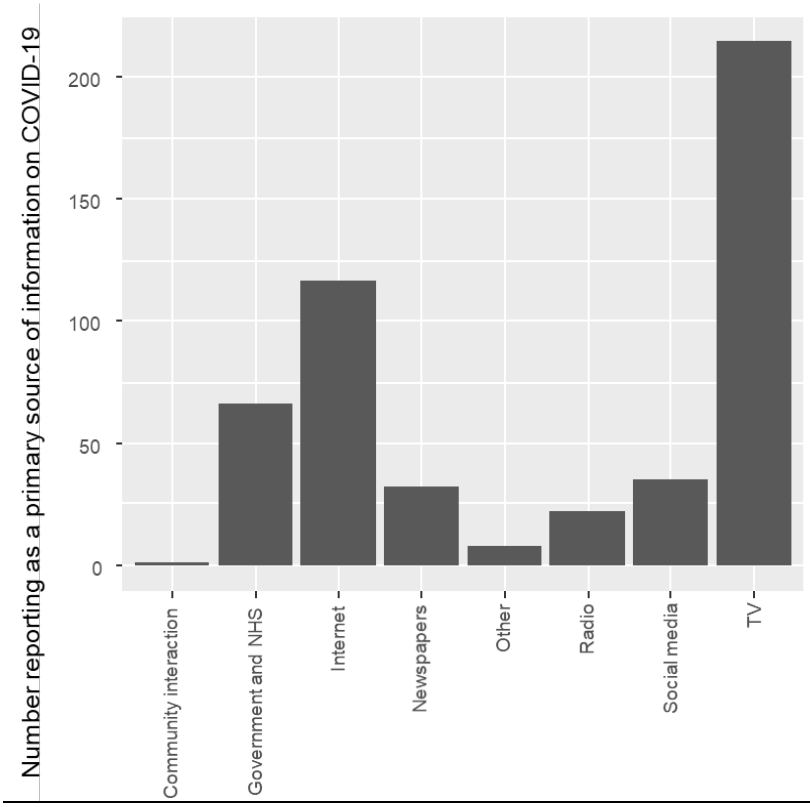

Figure S2. The number of respondents using each media type as their primary source of COVID-19 related information

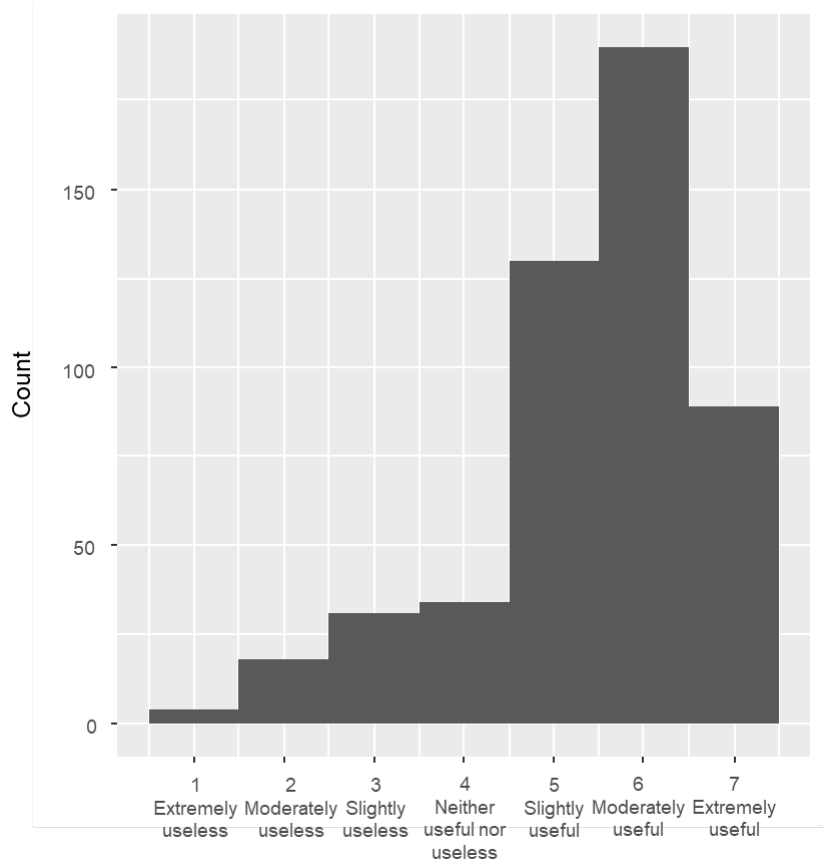

Figure S3. The perceived utility of the available information on COVID-19

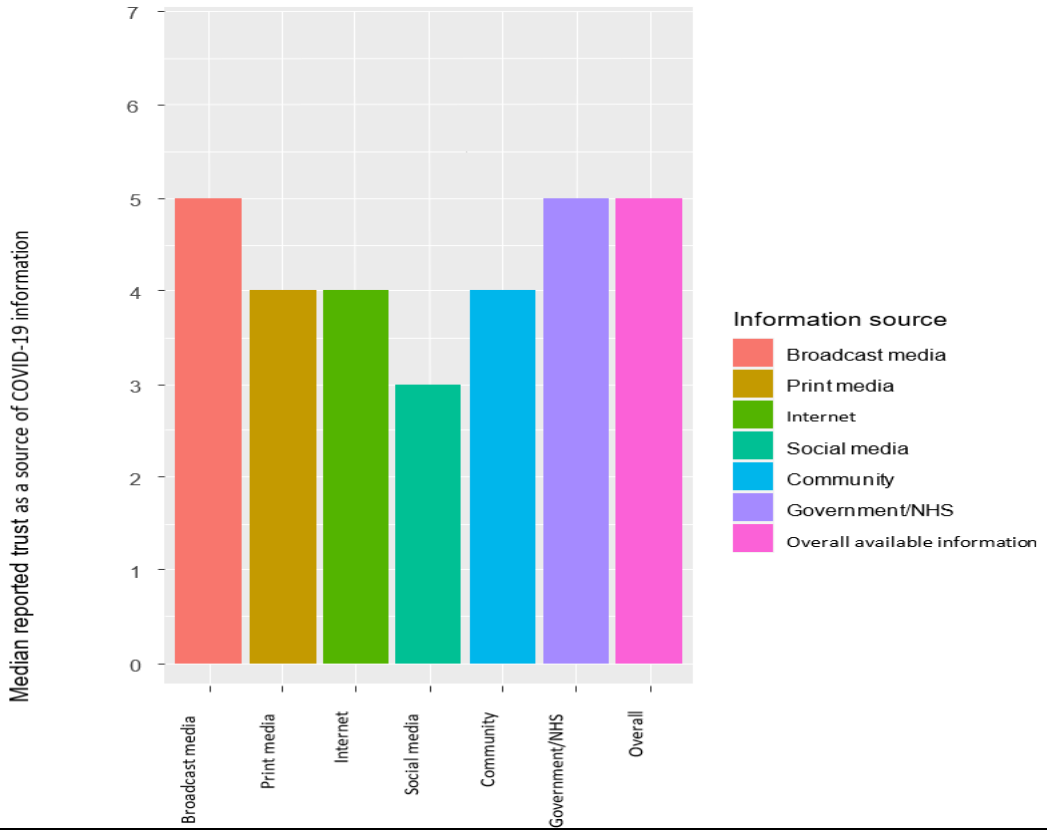

Figure S4.Median trust in sources of COVID-19 related information

Table S1. Fixed-Effects ANOVA results for primary information source differences in perceived threat to life from COVID-19

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*	$_{partial}\eta^2$	$_{partial}\eta^2$ 90% CI [LL, UL]
(Intercept)	38697.63	1	38697.63	41.42	.000		
information source	14868.66	5	2973.73	3.18	.008	.03	[.00, .05]
Age	19506.38	1	19506.38	20.88	.000	.04	[.02, .07]
Gender	7105.39	1	7105.39	7.61	.006	.02	[.00, .04]
Error	447520.68	479	934.28				

Table S2. Regression results assessing how different primary sources of COVID-19 information predict perceived threat to life from COVID-19

Predictor	*b*	*b* 95% CI [LL, UL]	sr^2	sr^2 95% CI [LL, UL]	Fit
(Intercept)	34.72**	[24.12, 45.32]			
Primary source of COVID-19 information					
Internet media	-10.27*	[-19.64, -0.91]	.01	[-.01, .02]	
Newspapers	-5.17	[-18.15, 7.82]	.00	[-.00, .01]	
Radio	-21.05**	[-36.16, -5.94]	.01	[-.01, .03]	
Social media	-5.94	[-18.51, 6.63]	.00	[-.01, .01]	
Television	-0.44	[-9.21, 8.32]	.00	[-.00, .00]	
Age	0.43**	[0.25, 0.62]	.04	[.01, .07]	
Gender (Male)	-7.75**	[-13.27, -2.23]	.01	[-.01, .03]	
					R^2 = .092**
					95% CI[.04,.13]

Note. A significant *b*-weight indicates the semi-partial correlation is also significant. *b* represents unstandardized regression weights. sr^2 represents the semi-partial correlation squared. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

* indicates p < .05. ** indicates p < .01.

Table S3. Regression results assessing how age, gender, and simplified NS-SEC predict people's perceived risk of contracting COVID-19 despite following Government recommendations

Predictor	*b*	*b* 95% CI [LL, UL]	sr^2	sr^2 95% CI [LL, UL]	Fit
(Intercept)	28.67**	[19.58, 37.76]			
Age	-0.01	[-0.18, 0.16]	.00	[-.00, .00]	
Gender (Male)	-1.20	[-5.69, 3.29]	.00	[-.00, .01]	
Simplified NS-SEC	-0.26	[-1.11, 0.59]	.00	[-.01, .01]	
					R^2 = .002 95% CI[.00,.01]

Note. A significant b-weight indicates the semi-partial correlation is also significant. b represents unstandardized regression weights. sr^2 represents the semi-partial correlation squared. LL and UL indicate the lower and upper limits of a confidence interval, respectively.
** indicates p < .05. ** indicates p < .01.*

Table S4. Regression results assessing how age, gender, and simplified NS-SEC predict people's perceived threat to life from COVID-19

Predictor	*b*	*b* 95% CI [LL, UL]	sr^2	sr^2 95% CI [LL, UL]	Fit
(Intercept)	34.01**	[21.30, 46.72]			
Age	0.24*	[0.01, 0.48]	.01	[-.01, .03]	
Gender (Male)	-10.60**	[-16.87, -4.32]	.03	[-.00, .06]	
Simplified NS-SEC	1.03	[-0.16, 2.22]	.01	[-.01, .02]	
					R^2 = .048** 95% CI[.01,.09]

Note. A significant b-weight indicates the semi-partial correlation is also significant. b represents unstandardized regression weights. sr^2 represents the semi-partial correlation squared. LL and UL indicate the lower and upper limits of a confidence interval, respectively.
** indicates p < .05. ** indicates p < .01.*

Table S5. Regression results assessing how age, gender, and simplified NS-SEC predict people's perceived risk of contracting COVID-19 despite following Government recommendations (excluding those participants who reported being unemployed)

Predictor	*b*	*b* 95% CI [LL, UL]	sr^2	sr^2 95% CI [LL, UL]	Fit
(Intercept)	23.84**	[13.42, 34.26]			
Age	-0.02	[-0.23, 0.19]	.00	[-.00, .00]	
Gender (Male)	0.07	[-5.18, 5.32]	.00	[-.00, .00]	
Simplified NS-SEC	1.51*	[0.11, 2.90]	.02	[-.01, .04]	
					R^2 = .016 95% CI[.00,.05]

Note. A significant b-weight indicates the semi-partial correlation is also significant. b represents unstandardized regression weights. sr^2 represents the semi-partial correlation squared. LL and UL indicate the lower and upper limits of a confidence interval, respectively.
** indicates p < .05. ** indicates p < .01.*

Table S6. Regression results assessing how age, gender, and simplified NS-SEC predict people's perceived threat to life from COVID-19 (excluding those participants who reported being unemployed)

Predictor	*b*	*b* 95% CI [LL, UL]	sr^2	sr^2 95% CI [LL, UL]	Fit
(Intercept)	31.69**	[17.42, 45.96]			
Age	0.25	[-0.03, 0.54]	.01	[-.01, .03]	
Gender (Male)	-11.47**	[-18.65, -4.28]	.03	[-.01, .07]	
Simplified NS-SEC	1.96*	[0.05, 3.87]	.01	[-.01, .04]	
					R^2 = .058** 95% CI[.01,.11]

Note. A significant b-weight indicates the semi-partial correlation is also significant. b represents unstandardized regression weights. sr^2 represents the semi-partial correlation squared. LL and UL indicate the lower and upper limits of a confidence interval, respectively.
** indicates p < .05. ** indicates p < .01.*

Table S7. Regression results showing the effect of COVID-19 experience variables on perceived risk of COVID-19 infection

Predictor	*b*	*b* 95% CI [LL, UL]	sr^2	sr^2 95% CI [LL, UL]	Fit
(Intercept)	25.63**	[21.45, 29.81]			
Occupational exposure to disease	0.19	[-0.45, 0.83]	.00	[-.00, .01]	
Occupational proximity to others	0.01	[-0.08, 0.11]	.00	[-.00, .00]	
Contact hours with the public	0.25**	[0.12, 0.38]	.03	[.00, .06]	
Confirmed number of COVID-19 cases in participant's area	-0.06**	[-0.10, -0.01]	.01	[-.01, .03]	
COVID-19 experience score	-2.63	[-7.09, 1.84]	.00	[-.01, .01]	
Severity of symptoms experienced	-0.05	[-0.17, 0.06]	.00	[-.01, .01]	
Number of COVID-19 infected people known to the participant	0.65	[-0.40, 1.69]	.00	[-.01, .01]	
Occupational exposure: Occupational proximity	-0.00	[-0.01, 0.01]	.00	[-.00, .00]	
COVID experience score: Severity of symptoms experienced	0.07	[-0.02, 0.16]	.01	[-.01, .02]	
					R^2 = .090** 95% CI[.03,.13]

Note. A significant b-weight indicates the semi-partial correlation is also significant. b represents unstandardized regression weights. sr^2 represents the semi-partial correlation squared. LL and UL indicate the lower and upper limits of a confidence interval, respectively.
** indicates p < .05. ** indicates p < .01.*

Table S8. Regression results showing the effect of COVID-19 experience variables on perceived threat to life from COVID-19

Predictor	*b*	*b* 95% CI [LL, UL]	sr^2	sr^2 95% CI [LL, UL]	Fit
(Intercept)	35.18**	[23.33, 47.02]			
Age	0.35**	[0.16, 0.54]	.03	[-.00, .05]	
Gender (male)	-4.92	[-10.80, 0.96]	.01	[-.01, .02]	
Occupational exposure to disease	0.10	[-0.88, 1.07]	.00	[-.00, .00]	
Occupational proximity to others	-0.12	[-0.27, 0.02]	.01	[-.01, .02]	
Contact hours with the public	-0.08	[-0.28, 0.11]	.00	[-.01, .01]	
Confirmed number of COVID-19 cases in participant's area	-0.02	[-0.09, 0.04]	.00	[-.00, .01]	
COVID-19 experience score	3.30	[-3.43, 10.03]	.00	[-.01, .01]	
Severity of symptoms experienced	0.15	[-0.03, 0.33]	.01	[-.01, .02]	
Number of infected people known to the participant	-1.81*	[-3.39, -0.23]	.01	[-.01, .03]	
Occupational exposure: Occupational proximity	0.00	[-0.01, 0.01]	.00	[-.00, .00]	
COVID experience score: Severity of symptoms experienced	-0.02	[-0.15, 0.11]	.00	[-.00, .00]	
					R^2 = .084**
					95% CI[.02,.11]

Note. A significant b-weight indicates the semi-partial correlation is also significant. b represents unstandardized regression weights. sr^2 represents the semi-partial correlation squared. LL and UL indicate the lower and upper limits of a confidence interval, respectively.

** indicates p < .05. ** indicates p < .01.*