Cross-cultural comparisons of psychosocial distress in the USA, South Korea, France, and Hong Kong during the initial phase of COVID-19

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ABSTRACT

The COVID-19 crisis has resulted in disruption of everyday life worldwide but the impact and response to the pandemic have not been uniform. Many countries rapidly deployed physical-distancing mandates to curb the spread of the virus; others did not. Social distancing strategies are necessary to reduce the transmission of the virus but there may be unintended consequences. We examined psychological distress in four societies with distinct public health strategies (South Korea, Hong Kong, France and the United States) to identify common and region-specific factors that may contribute to mental health outcome during the pandemic. From March to July of 2020, a survey of demographics, general health, mental health, loneliness and social networks was conducted. Overall, younger age, greater concern for COVID, and more severe loneliness predicted worse psychological outcome but the magnitudes of these effects varied across the four regions. Objective measures of social isolation did not affect mental health. There were also notable differences in psychological outcome; Hong Kong, with very strict social distancing protocols plus ongoing political unrest, suffered the most drastic deterioration of mental health. To prepare for an impending mental health crisis, concerted efforts to reduce loneliness should be integrated into a comprehensive public health strategy.

1. Introduction

Beginning in December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the accompanying COVID-19 pandemic has dramatically altered the lives of people around the world. As of September 1, 2020, 25.3 million people worldwide have tested positive for the virus and 848,000 people have died, although the actual numbers are likely higher (https://COVID-19.who.int/).

Psychiatric consequences of COVID-19 worldwide will permeate all layers of society long after the end of the pandemic (Holmes et al., 2020). Trauma and stress directly stemming from the COVID-19 infection as well as disruptions of routine due to quarantines and social distancing practices are likely to affect mental health. Even prior to the current pandemic, psychological disorders were ranked worldwide as the 5th leading cause of disability, according to the 2013 Global Burden of Diseases study, with 266 million cases of anxiety disorders and 253 million cases of major depressive disorder (Salomon et al., 2015; Vos

et al., 2015; Murray et al., 2015). The extraordinary societal burden of mental illness is likely to grow rapidly in the near future, as trauma, distress, and desolation saturate the aftermath of the pandemic.

Unfortunately, lockdowns and quarantines that are designed to curtail the spread of COVID-19 may also increase feelings of social disconnection, loneliness, and distress. Loneliness and social disconnection are known to play a major role in poor physical health and mental illness (Badcock et al., 2020; Cacioppo et al., 2015; Holt-Lunstad et al., 2017). Based on the catastrophic psychiatric outcomes of SARS survivors (cumulative incidence of DSM disorder in 58.9% of the survivors) (Mak et al., 2009), a significant increase in the incidence of post-traumatic stress disorder (PTSD), depression, anxiety, substance use, suicide, and other mental disorders is expected. A rapidly developing body of work indicates that survivors of COVID-19 suffer from a variety of psychiatric conditions. Preliminary results from China confirm the high prevalence of PTSD among the survivors of COVID-19 (Bo et al., 2020) and mental illness among the general population (Gao

et al., 2020). However, it is relatively unknown whether the general public may also be at risk for COVID-related negative mental health outcomes due to social distancing strategies. In the United States of America (USA), a recent community report from the Centers for Disease Control and Prevention (CDC) in late June reported that younger adults, racial/ethnic minorities, healthcare workers, and caregivers are experiencing mental health problems at high rates, raising the concern for substance use and suicide (Czeisler et al., 2020). A large cohort of at-risk groups for both physical and mental illness in France (patients with breast cancer, asthma, depression and migraine) reported elevated rates of psychological distress, with female gender, unemployment, depression diagnosis, and smartphone usage predicting higher distress (Chaix et al., 2020). In addition, college students in France reported elevated levels of anxiety and stress, particularly among those who do not live with their family (Husky et al., 2020). Given the potential exacerbation of loneliness during the pandemic, it would be informative to compare mental health outcomes across different regions of the world.

In two earlier reports, elevated levels of depression, stress, anxiety, and loneliness in residents of South Korea and Hong Kong were documented (Lee et al., 2020; Tso and Park, 2020) but mental health outcome of Hong Kong residents appeared to be much worse than that of South Koreans. In order to curtail the spread of the COVID-19, distinct strategies were implemented by different countries (e.g., different types of confinement or lockdown procedures and mitigation efforts). Hong Kong adopted a stringent containment strategy in stages; testing, surveillance and contact tracing with strict quarantines, border control, and closure of schools, offices and public gathering places between January and May of 2020 (Lam et al, 2020). France went into a nationwide confinement with travel restrictions from mid-March to the end of May (Peretti-Watel et al., 2021). South Korea adopted a nationwide "test, trace, isolate" strategy with targeted regional implementation of partial lockdown measures and closure of schools and offices during the spring of 2020 (Dighe et al. 2020; Shin and Lee, 2020). Thus, France and Hong Kong imposed more stringent and uniform social distancing measures than South Korea but all three societies shared an important feature; rapid and efficient deployment of centralized resources in response to COVID-19 crisis. In contrast, the United States did not have a unified nationwide strategy. Instead, different states adopted various public health strategies ranging from strict shelter-in-place/stay-at-home orders (e.g. New York) to zero regulations (e.g. South Dakota) (e.g. Dave et al., 2020; Ortiz and Hauck, 2020).

In this study, we examined the psychosocial distress experienced by the general public during the initial phase of the pandemic (from March through July 2020) in four distinct societies: the United States of America (USA), Republic of Korea, France and Hong Kong. There were two aims. First, we investigated possible differences in psychological distress among these four societies with significant different mitigation strategies. Second, we examined how psychological distress might be associated with demographic characteristics (age, sex, education, employment status, marital status, and living arrangement), concern for COVID-19, loneliness, and social network sizes. We hypothesized that people in all four societies would show increased psychological distress during the pandemic. We also hypothesized that age, female sex, unemployment, living alone, concern for COVID, loneliness, and reduced social network would be related to worse psychological outcome.

2. Methods

2.1. Participants

There were 1306 participants (age 18-85). The survey was conducted online using RedCap in the USA, LimeSurvey in France, Google Forms in South Korea, and Qualtrics in Hong Kong. Links to each survey were distributed via social media (e.g., Twitter, Facebook, Reddit, and emailing lists). The survey, conducted in English, French, Korean and Chinese, was completely anonymous, and no identifying information

was recorded. This study received exempt determination from the Vanderbilt University Institutional Review Board (IRB #200337) and University of Michigan IRB (IRB# HUM00179454). For the survey in France, ethics approval was obtained from the University of Strasbourg (Unistra/CER/2020-10).

Participants from the USA (n=334) completed the survey between March 16, 2020 to July 19, 2020. Participants from South Korea (n=395) completed the survey between March 22, 2020 to June 1, 2020. Participants from France (n=145) completed the survey between April 17 and April 30, 2020. Participants from Hong Kong (n=432) completed the survey between March 30, 2020 and May 30, 2020.

2.2. Measures

The survey collected self-reported information on demographics, general health, mental health, loneliness, and social networks. Demographic variables included age, sex, years of education, employment status, marital status, and living arrangement (living alone or living with others). Education was transformed into a binary variable to make comparisons consistent across samples: the two levels included those who had secondary education or lower and those who had completed at least a bachelor's degree. Marital status and living arrangement were collapsed into one variable because all married couples reported that they lived with family while unmarried people (never married, divorced, separated or widowed) either lived alone or lived with family. Concern for COVID-19 was measured on a 4-point scale ranging from "no concern" to "extremely concerned".

General health questions encompassed 6 variables and included self-report of overall health, rated on a 1 (excellent) – 5 (poor) scale; number of days within the past 30 days that the respondent had experienced a physical illness or poor mental health; number of days when physical or mental illness impacted usual activities; number of days when pain affected usual activities; and days spent feeling worried, stressed, or anxious.

In order to measure specific mental health domains we administered the Depression Anxiety Stress Scales (DASS) (Lovibond and Lovibond, 1995). For DASS, scores for Depression, Anxiety, and Stress subscales were calculated for each participant.

To understand the psychosocial impact of COVID-19, we administered the UCLA Loneliness Scale (Russell, 1996; Knight et al., 1988) to gauge subjective feelings of loneliness and the Social Network Index (Cohen, 1997) to quantify objective levels of social isolation by incorporating the diversity (i.e., number of social roles) and size (number of people with whom the respondent has regular contact in person or remotely) of social networks.

2.3. Statistical analysis

All analyses were carried out in R v3.6.2. Comparisons of continuous and categorical demographic variables between geographic regions were conducted using one-way analysis of variance (ANOVA) and chi-squared tests, respectively.

A psychological distress score was calculated using the 6 single-items from the physical/mental health inventory (general health, days physical health not good, days mental health not good, days physical or mental health affected usual activities, days of physical pain, days spent worried/stressed/anxious) and the DASS subscales. Each variable for each participant was transformed into a z-score, then summed together to create a total psychological distress score where more positive numbers indicated worse psychological distress overall.

Regional differences in mental health (consisting of individual items that constituted the psychological distress score, loneliness, diversity of social networks, and size of social networks) were investigated using an analysis of covariance (ANCOVA) controlling for demographic variables.

In order to compare the contribution of demographic, loneliness, and

social network variables to psychological distress among the four regions, a stepwise linear regression model comparison approach was used. In each model, the individual variable intercept and coefficient varied by region. The demographic variables were included in the first step, loneliness in the second step, and social network variables in the third and final step. For each step, a significant change in the adjusted R^2 was used to examine whether the addition of each variable explained a significant proportion of variance in psychological distress. The Akaike information criterion (AIC) was further used to investigate the best fitting model. The summary function was used to examine the coefficients of the selected model.

Using the variables specified in the model comparison, a series of 4 multiple linear regressions were conducted to examine the contribution of those variables to psychological distress within each region separately.

3. Results

3.1. Demographic characteristics of the samples

A total of 1306 participants were included in the analysis; 69.2% identified as female, 30.6% as male. Age ranged from 18 to 85 years (mean=35.3, SD=14). Of the participants, 66.1% had a college degree or higher level of education. 58.1% were never married, divorced or widowed and 40.7% married or cohabiting with a partner. Most of the participants (79.9%) were living with others at the time of the survey, and 58.1% were employed.

With respect to concerns about COVID-19, 72.5% expressed moderate (41.8%) or extreme (34.3%) concerns and 2.4% expressed no concern.

There were significant regional differences in all demographic categories including age (F(3,1302)=37.43, p<0.001, η_p=0.08), sex (χ^2=50.9, df=3, p<0.001, education (χ^2=114.4, df=3, p<0.001), employment (X^2=193.77, df=3, p<0.001), and living arrangement (χ^2=185.98, df=6, p<0.001). In addition, there were significant regional differences with regard to overall concern for COVID-19, (F(3, 1300)=37.02, p<0.001, η_p=0.08). See Table 1 for more details.

In an exploratory analysis we investigated regional differences in the individual variables that defined the psychological distress score. There were significant regional differences in several of the psychological distress variables including self-reported overall health, days physical health not good, days mental health not good, days feeling worried or anxious as well as DASS subscales for depression, anxiety, and stress. There were no regional differences in days usual activities affected by physical or mental health, or days affected by pain. See Table 2 for regional comparisons.

3.2. Predictors of psychological distress among geographic regions

There was a significant regional/societal difference in the psychological distress score (F(3, 1283)=15.92, p<0.001, η_p=0.05). Post hoc testing using a Tukey HSD correction for multiple comparisons showed that people in Hong Kong reported worse psychological distress compared to the USA, South Korea, and France (all p-values<0.001). There were no significant differences in psychological distress scores among the USA, South Korea, and France (all p-values>0.05) (see Figs. 1 and 2).

Model comparison indices showed that there was a significant difference between the base model with only demographic variables and the second model including both demographic variables and loneliness F (4, 1189)=99.84, p < 0.001, R^2=0.35, ΔR^2=21.5%, AIC=7658.41. There were no differences between the second model and the third model which included demographic, loneliness, and social network variables F(8, 1181)=0.51, p=0.85, R^2=0.35, ΔR^2=0.21%, AIC=7670.22. This suggests that differences in social network between regions did not significantly improve the variance explained by demographic and loneliness variables. Coefficients in model 2 suggest that there were differential effects between regions in terms of age, employment, living arrangement, and loneliness. Younger age (β=-0.13, t=-2.98, p=0.002), greater concern for COVID-19 (β=0.15, t=3.01, p=0.003), and greater feelings of loneliness (β=-0.23, t=8.20, p < 0.001) were significant predictors across regions. See Table S1 for more information.

In the USA, younger age (β=-0.18, t= -5.58, p < 0.001) and unemployment (β=-0.10, t= -1.98, p=0.049) was related to more psychological distress. Married/partnered people reported less psychological distress compared to singles living alone (β=0.10, t=1.98, p=0.049). There were no differences between singles living alone and living with family (β=0.01, t=0.22, p=0.83). Greater concern for COVID-19 was associated with more psychological distress (β=0.16, t=3.22, p=0.001) as was more loneliness (β=0.42, t=8.77, p < 0.001). Sex and education were not significant predictors of psychological distress in the USA.

In South Korea, female sex (β=0.16, t=3.95, p < 0.001), greater concern for COVID (β=0.11, t=2.78, p=0.006), and greater loneliness (β=0.60, t=15.05, p < 0.001) predicted worse psychological distress. Age, education, employment, and living arrangement were not significant predictors.

In France, younger age (β=-0.37, t=-4.83, p < 0.001), greater concern for COVID-19 (β=0.30, t=4.04, p < 0.001), and loneliness (β=0.18, t=2.40, p=0.02) were significant predictors of greater psychological distress. Unemployment was marginally related to greater psychological distress. Sex, education, and living arrangement were not significant predictors of psychological distress in France.

In Hong Kong, greater concern for COVID-19 (β=0.27, t=6.07, p < 0.001) and loneliness were significant predictors of psychological distress. Age, sex, education, employment, and living arrangement were not significant predictors of psychological distress in Hong Kong.

4. Discussion

The current findings highlight the complexity of psychosocial responses to COVID-19 in four distinct societies (USA, South Korea, France, and Hong Kong). Our model comparison approach suggests that demographic characteristics and loneliness but not social network index

Table 1
Demographic characteristics of the sample by region and total.

	USA	Korea	France	Hong Kong	Total
	n=334	n=395	n=145	n=432	n=1306
Age	38.4 (16.9)	31.8 (12.3)	43.8 (15.1)	33.4 (10.6)	35.3 (14.0)
Sex (F/M)	254/78	286/109	118/27	246/186	904/400
Education					
Secondary or lower	65	212	38	126	441
Bachelor's degree or higher	269	175	107	306	857
Employed (Y/N)	239/95	120/275	120/25	280/152	759/547
Living Arrangement					
Married/ Partnered	172	118	98	143	531
Singles living alone	82	97	34	37	250
Singles living with family	80	180	13	252	525
Concern for COVID19					
No Concern	1	8	17	5	31
Somewhat Concerned	61	90	61	67	279
Moderately Concerned	146	168	48	184	546
Extremely Concerned	124	129	19	176	448

Table 2

Mean (SD) of individual items among regions that make up the psychological distress score, loneliness, and social network diversity and number of people in network. ANCOVA comparisons included covariates for age, sex, education, employment, living arrangement and concern for COVID-19.

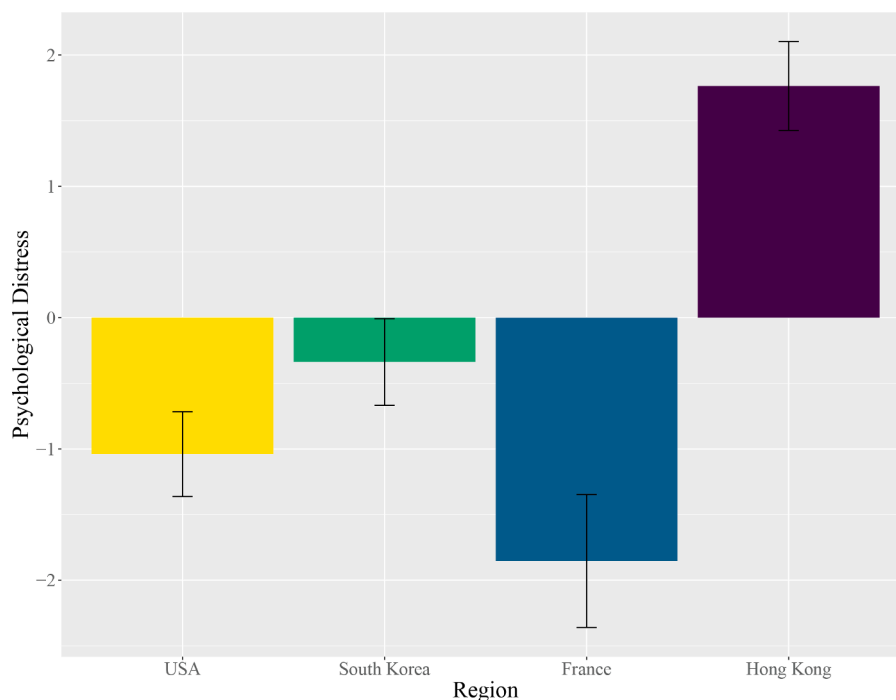|	USA $n=334$	South Korea $n=395$	France $n=145$	Hong Kong $n=432$	Total $n=1306$	Regional Comparison*
Self-Reported Health	2.28 (0.85)	2.94 (0.93)	2.54 (0.93)	2.90 (0.97)	2.71 (0.98)	$F(3, 1249)=38.95, p<0.001, \eta_p=0.08$
Days physical health not good	3.62 (6.72)	4.02 (5.57)	4.75 (7.70)	4.77 (6.85)	4.23 (6.56)	$F(3, 1248)=2.99, p=0.03, \eta_p=0.01$
Days mental health not good	8.33 (8.28)	6.74 (7.97)	6.03 (7.94)	11.5 (9.79)	8.58 (8.91)	$F(3, 1248)=22.48, p=0.001, \eta_p=0.06$
Days usual activities affected by physical and mental health	6.32 (6.50)	6.50 (6.71)	5.76 (6.02)	5.14 (6.21)	5.94 (6.44)	$F(3, 1239)=1.44, p=0.23, \eta_p=0.01$
Days usual activities affected by pain	2.20 (5.22)	2.62 (5.32)	2.10 (5.00)	1.86 (4.48)	2.21 (5.01)	$F(3, 1247)=0.88, p=0.47, \eta_p=0$
Days feeling worries, anxious, or tense	12.7 (9.95)	7.41 (8.89)	8.55 (8.55)	14.22 (10.8)	11.1 (10.2)	$F(3, 1246)=28.57, p=0.001, \eta_p=0.08$
DASS Depression	8.96 (9.28)	11.7 (9.92)	8.85 (8.79)	15.1 (11.0)	11.7 (10.3)	$F(3, 1230)=19.27, p=0.001, \eta_p=0.06$
DASS Anxiety	5.68 (6.39)	7.39 (7.21)	4.96 (6.11)	9.46 (7.97)	7.29 (7.31)	$F(3, 1230)=12.26, p=0.001, \eta_p=0.05$
DASS Stress	13.2 (9.41)	12.2 (9.06)	10.7 (9.36)	16.0 (9.53)	13.5 (9.50)	$F(3, 1230)=9.39, p=0.001, \eta_p=0.04$
UCLA Loneliness	41.2 (11.0)	43.3 (12.5)	35.8 (11.8)	49.7 (10.5)	43.8 (12.3)	$F(3, 1217)=44.6, p=0.001, \eta_p=0.13$
Diversity of Social Networks	4.17 (1.57)	4.46 (2.03)	6.35 (1.72)	4.93 (1.80)	4.74 (1.92)	$F(3, 1214)=57.3, p=0.001, \eta_p=0.12$
Number of people in social networks	14.0 (6.58)	13.5 (8.58)	21.4 (9.39)	8.67 (7.14)	12.9 (8.61)	$F(3, 1282)=81.2, p=0.001, \eta_p=0.18$

Fig. 1. Comparisons of psychological distress among regions. The psychological distress variable was created by transforming individual items measuring general health, psychological health, and DASS subscales into a z-score and then summing those measures. Error bars represent standard error of the standardized psychological distress score.

(diversity and size) predict psychological distress although there are differential effects among these regions in the degree to which age, employment status, living arrangement, and loneliness play a factor. Across samples, younger age, greater concern for COVID-19, and greater loneliness predict worse psychological distress. In the USA, multiple factors predict psychological distress including age, employment, living arrangement (married vs single), concern for COVID-19, and loneliness. In South Korea, female sex, concern for COVID-19, and loneliness predicted psychological distress. In France, age, greater concern for COVID-19, and loneliness were significant predictors. In Hong Kong, where psychological distress was greatest, only concern for COVID-19 and loneliness predicted the poor mental health outcome.

Pandemics of the 20th and early 21st century have shaped response to the current COVID-19 pandemic. Summarizing influenza pandemics of the 20th century, Kilbourne noted that "all pandemics are different" and responses to pandemic have varied across the world (Kilbourne, 2006). It is important to point out that people in Hong Kong, many of whom experienced the SARS epidemic, reported the worst psychological distress and highest levels of loneliness despite a very low prevalence rate of COVID-19 cases. Concern for COVID-19 was uniformly high for people in the USA, Korea, and Hong Kong; people in France reported less concern than the other regions (see Table 1). The magnitude of concern for COVID-19 is somewhat incongruent with the rates of total cases and deaths due to the virus during the study timeframe (see Fig. 3). The number of cases and deaths were higher in the U.S.A. and France than in Korea and Hong Kong. However, it is important to note that although both Korea and Hong Kong mitigated the spread of the virus successfully and the vast majority of the population were never in danger, residents reported very high levels of distress. The psychological distress of people in Hong Kong during the initial phases of COVID-19 may also have been exacerbated by the ongoing political turmoil (Tso and Park, 2020). Arguably, France had one of the most stringent lockdowns that required individuals to only leave their homes on essential errands and required signed documents for traveling, yet the French reported the lowest level of concern for COVID. The USA, in contrast, had varying levels of 'Stay-at-Home' directives with uneven compliance and timing across the 50 states. Despite these substantial differences in public health strategies and vastly different death rates, American, French and Korean
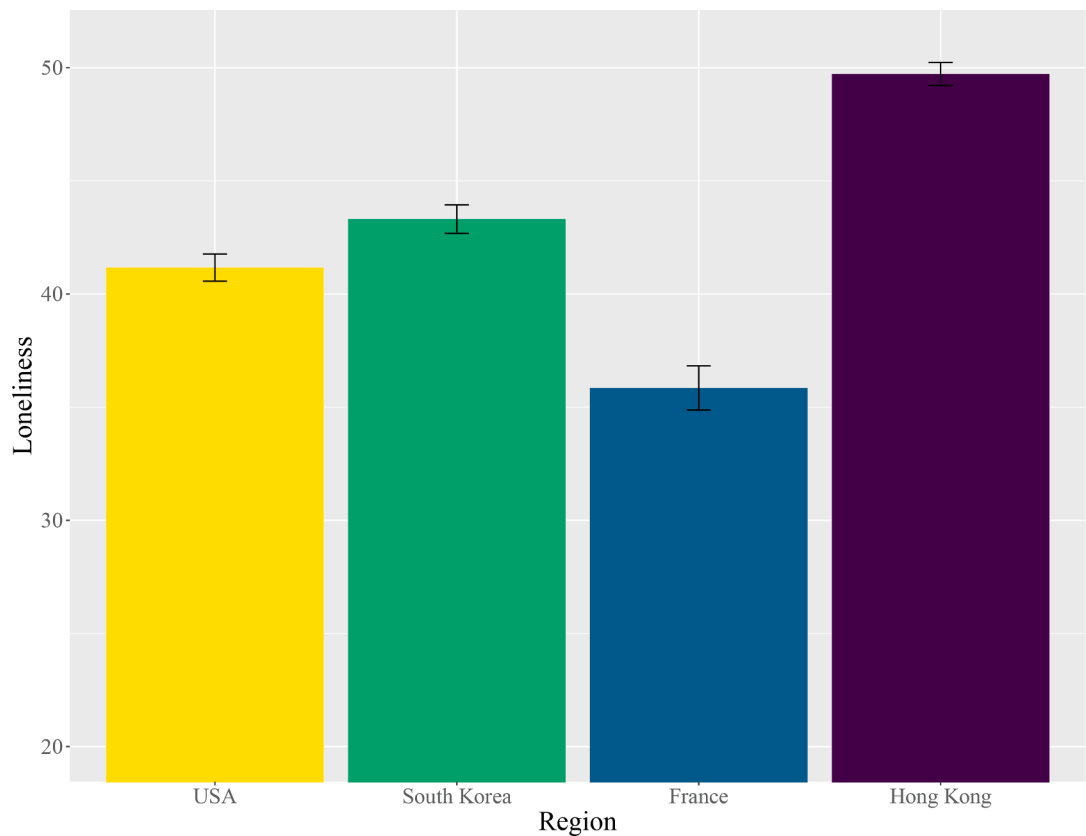
Fig. 2. Comparisons of the UCLA Loneliness total score among USA, Korea, France and Hong Kong. Error bars represent standard error.
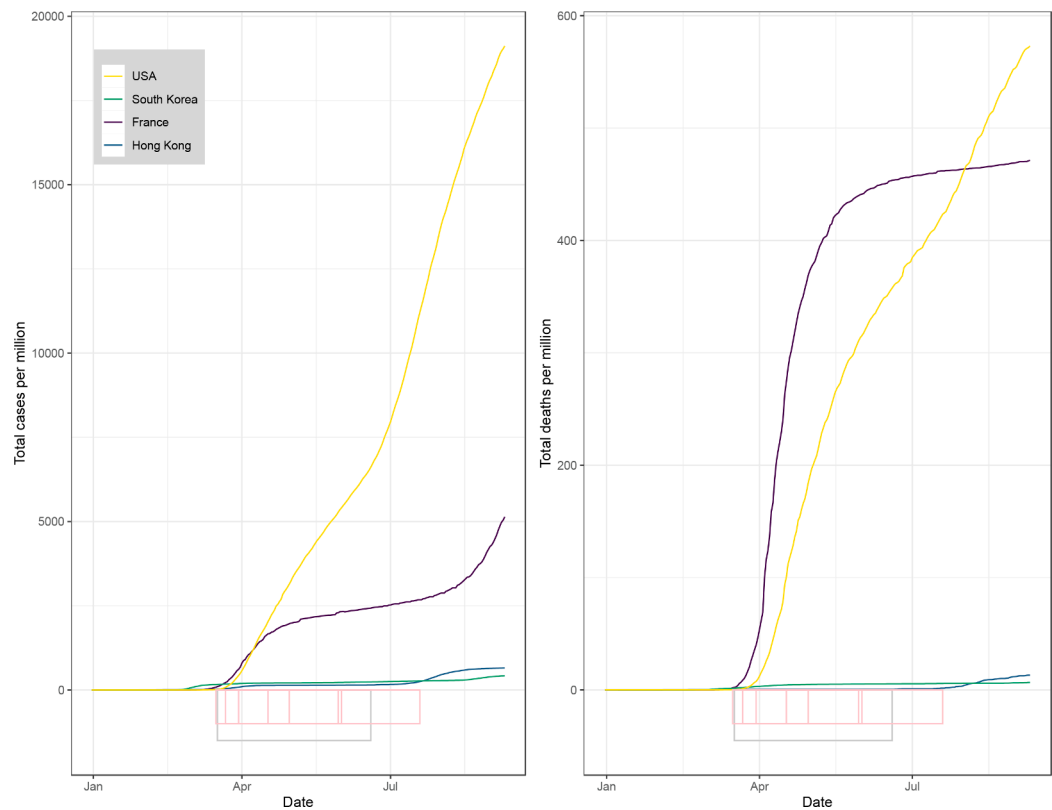

Fig. 3. Data from ourworldindata.org and data.gov.hk showing the total number of cases and total deaths from COVID-19 during the initial phase of pandemic. The approximate dates of lockdowns in the USA and France are noted on the x-axis using a grey bar. The dates of data collection for each region are noted on the x-axis using pink bars.

participants reported similar levels of psychological distress. This result suggests that specific public health strategies and death rates may not be the primary drivers for psychological distress, at least during the early phase of the pandemic. Rather, disruptions to people's livelihoods and uncertainty regarding the future may play an important role in increased psychological distress.

Across the four societies, younger age was associated with worse psychological distress. Surveys of college students have noted that economic effects of the COVID-19 pandemic, changes in daily life, and delays of academic achievement are associated with greater anxiety (Cao et al., 2020). Disruption to daily life has been cited as an important contributor to mental illness during early in the course of the pandemic (Tull et al., 2020). Younger people may lack sufficient coping skills to meet the uncertainty and fear generated by the pandemic. They may also feel powerless to change their circumstances because they are dependent on others (e.g., government, parents, employers, college administrators). They may also be worried about not achieving important milestones such as entry into the workforce. While younger people do not seem to be at substantially greater risk of physical health problems during the pandemic, the disruption to their lives and resulting mental health crises are critital to consider. Consistent support for psychological wellbeing, opportunities to engage meaningfully with others and maintenance of social connectedness are much needed.

The economic effects of the pandemic will be felt for a long time to come. Unemployment and being single is a significant predictor of worse psychological distress across the four regions studied. Unemployment is an important predictor of mental health, and epidemiologists have suggested that the unemployment resulting from COVID-19 could result in a catastrophic increase in suicide rates worldwide this year (Kawohl and Nordt, 2020). Having a strong social support system and a spouse or partner can be protective of wellbeing (Soulsby and Bennett, 2015). We observed that being married was associated with better wellbeing than being single and living with family, suggesting that intimate relationships may provide more support than other family relationships. Loneliness was also a strong predictor of greater psychological distress. In previous work by our group, loneliness accounted for a large proportion of the variance in psychological health in both South Korean and Hong Kong samples (Lee et al., 2020; Tso and Park, 2020). Here we re-iterate the importance of the quality of relationships during the pandemic than the quantity of relationships, especially since the number of social roles or people in social networks does not predict psychological distress in any of the societies studied or across the entire sample. Arguably, when people are constrained at home with significantly reduced levels of daily social interactions, the quality of their core relationships and living situations may play an even greater role in exacerbating or alleviating the impact of social isolation. Our results indicate that loneliness poses a much more serious risk for mental illness than quantitative indicators of social isolation such as the social network size or living with one's family.

There are some limitations that need to be carefully considered. First, it was a cross-sectional study and the data were collected during the initial phases of the pandemic when it was still unclear how long the pandemic would last and how extensive its effects would be. It is not possible to know if the psychological distress persisted, or if changes during the second half of 2020 produced a different outcome, as many nations entered the second or even the third wave of the pandemic. Second, our sampling strategy relied on social media and email lists. This may have introduced a selection bias towards academic institutions and colleagues; the education levels of the sample tended to be high. We tried to address it by employing a variety of sampling methods (e.g., social media, internet forums) but future studies should aim to reach people at all levels of income and education. Another potential limitation is the lack of information about pre-existing mental health problems in our participants. However, published data on DASS prior to 2020 indicate that psychological distress and loneliness reported in the present study is significantly higher. For example, in previous work prior to COVID-19, 27% of college students reported moderate or greater depression, 47% reported moderate or worse anxiety, and 27% reported moderate or worse stress (Bayram and Bilgel, 2008). In our data collected during the initial phase of the pandemic, 34% of respondents reported moderate or greater depression, 24% reported moderate or worse anxiety, and 25% moderate or worse stress.

With respect to the effects of social isolation, American adults were already reporting high levels of loneliness prior to the onset of the pandemic. In a nationwide survey of 20,096 Americans, the mean UCLA loneliness score was reported to be 44.3 (Bruce et al., 2019), which is comparable to the mean UCLA scores of the American sample reported in our study. Moreover, a recent American study that tracked loneliness from February to April of 2020 found that mean loneliness scores did not increase during this early phase of the pandemic (Luchetti et al, 2020). However, rather than focusing on the average loneliness scores, it seems more instructive to focus on the significant relationship between loneliness and mental illness across all four societies; our results suggest that loneliness may represent a general risk factor for psychological disorders during a global pandemic. Those who feel socially disconnected and lonely are at a greater risk for poor mental health regardless of demographic or cultural factors.

To summarize, we observed both regional differences and commonalities in mental health outcome and psychological distress during the early phase of the pandemic. Residents of Hong Kong reported more pronounced psychological distress compared with South Korean, American and French residents, possibly due to the combined effects of the pandemic-related disruptions and ongoing political unrest. There were also similarities across the four societies. Youth, greater concern for COVID and severity of loneliness predicted worse psychosocial distress, although the magnitudes of the effects differed among the four regions. These findings highlight the need to proactively target and allocate social support for individuals who may be at a heightened risk for psychological disorders. Social upheaval, economic uncertainty and loss of routine during the pandemic may all contribute significantly to poor mental health outcome. Lonely individuals may be especially vulnerable to negative social impact of the pandemic and are more likely to experience deterioration of mental health. To meet the challenges of the impending mental illness crisis, it is imperative to integrate efforts to mitigate loneliness into a comprehensive public health strategy.

CRediT authorship contribution statement

Derek J. Dean: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. **Ivy F. Tso:** Methodology, Investigation, Data curation, Formal analysis, Writing - original draft, Writing - review & editing. **Anne Giersch:** Methodology, Investigation, Data curation, Writing - original draft, Writing - review & editing, Resources. **Hyeon-Seung Lee:** Investigation, Data curation, Writing - original draft, Writing - review & editing. **Tatiana Baxter:** Methodology, Data curation, Writing - original draft, Writing - review & editing. **Taylor Griffith:** Methodology, Data curation, Writing - original draft, Writing - review & editing. **Lijun Song:** Methodology, Writing - review & editing. **Sohee Park:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing, Resources, Supervision, Project administration, Funding acquisition.

Declaration of Competing Interest

None

Acknowledgments

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.113593.

References

Badcock, J.C., Adery, L.H., Park, S., 2020. Loneliness in psychosis: a practical review and critique for clinicians. Clin. Psychol. Sci. Pract. https://doi.org/10.1111/cpsp.12345.

Bayram, N., Bilgel, N., 2008. The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. Soc. Psychiatry Psychiatr. Epidemiol. 43, 667–672. https://doi.org/10.1007/s00127-008-0345-x.

Bo, H.X., Li, W., Yang, Y., Wang, Y., Zhang, Q., Cheung, T., Wu, X., Xiang, Y.T., 2020. Posttraumatic stress symptoms and attitude toward crisis mental health services among clinically stable patients with COVID-19 in China. Psychol. Med. 1–2 https://doi.org/10.1017/S0033291720000999.

Bruce, L.D., Wu, J.S., Lustig, S.L., Russell, D.W., Nemecek, D.A., 2019. Loneliness in the United States: a 2018 national panel survey of demographic, structural, cognitive, and behavioral characteristics. Am. J. Health Promot. 33 (8), 1123–1133.

Cacioppo, S., Grippo, A.J., London, S., Goossens, L., Cacioppo, J.T., 2015. Loneliness: clinical import and interventions. Perspect. Psychol. Sci. 10, 238–249. https://doi.org/10.1177/1745691615570616.

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., Zheng, J., 2020. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Res. 287, 112934 https://doi.org/10.1016/j.psychres.2020.112934.

Chaix, B., Delamon, G., Guillemasse, A., Brouard, B., Bibault, J.-E., 2020. Psychological distress during the COVID-19 pandemic in France: a national assessment of at-risk populations. medRxiv 2020.05.10.20093161. DOI: 10.1101/2020.05.10.20093161.

Cohen, S., 1997. Social ties and susceptibility to the common cold. JAMA J. Am. Med. Assoc. 277 https://doi.org/10.1001/jama.1997.03540480040036, 1940.

Czeisler, M.É., Lane, R.I., Petrosky, E., Wiley, J.F., Christensen, A., Njai, R., Weaver, M. D., Robbins, R., Facer-Childs, E.R., Barger, L.K., Czeisler, C.A., Howard, M.E., Rajaratnam, S.M.W., 2020. Mental health, substance use, and suicidal ideation during the COVID-19 pandemic — United States, June 24–30, 2020. MMWR. Morb. Mortal. Wkly. Rep. 69, 1049–1057. https://doi.org/10.15585/mmwr.mm6932a1.

Dave, DM, Friedson, AI, Matsuzawa, K, Sabia, JJ, 2020. When do shelter-in-place orders fight COVID-19 best? Policy heterogeneity across states and adoption time. In: National Bureau of Economic Research Working Paper No. 27091.. https://www.nber.org/papers/w27091.

Dighe, A., Cattarino, L., Cuomo-Dannenburg, G., et al., 2020. . Response to COVID-19 in South Korea and implications for lifting stringent interventions. BMC Med 18, 321. https://doi.org/10.1186/s12916-020-01791-8.

Gao, W., Ping, S., Liu, X., 2020. Gender differences in depression, anxiety, and stress among college students: a longitudinal study from China. J. Affect. Disord. 263, 292–300. https://doi.org/10.1016/j.jad.2019.11.121.

Holmes, E.A., O'Connor, R.C., Perry, V.H., Tracey, I., Wessely, S., Arseneault, L., Ballard, C., Christensen, H., Cohen Silver, R., Everall, I., Ford, T., John, A., Kabir, T., King, K., Madan, I., Michie, S., Przybylski, A.K., Shafran, R., Sweeney, A., Worthman, C.M., Yardley, L., Cowan, K., Cope, C., Hotopf, M., Bullmore, E., 2020. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. Lancet Psychiatry. https://doi.org/10.1016/S2215-0366(20)30168-1.

Holt-Lunstad, J., Robles, T.F., Sbarra, D.A., 2017. Advancing social connection as a public health priority in the United States. Am. Psychol. 72, 517–530. https://doi.org/10.1037/amp0000103.

Husky, M.M., Kovess-Masfety, V., Swendsen, J.D., 2020. Stress and anxiety among university students in France during Covid-19 mandatory confinement. Compr. Psychiatry 102, 152191. https://doi.org/10.1016/j.comppsych.2020.152191.

Kawohl, W., Nordt, C., 2020. COVID-19, unemployment, and suicide. Lancet Psychiatry. https://doi.org/10.1016/S2215-0366(20)30141-3.

Kilbourne, E.D., 2006. Influenza pandemics of the 20th century. Emerg. Infect. Dis. https://doi.org/10.3201/eid1201.051254.

Knight, R.G., Chisholm, B.J., Marsh, N.V., Godfrey, H.P.D., 1988. Some normative, reliability, and factor analytic data for the revised UCLA Loneliness scale. J. Clin. Psychol. 44, 203–206.

Lam, H.Y., Lam, T.S., Wong, C.H., Lam, W.H., Leung, C.M.E., Au, K.W.A., Lam, C.K.Y., Lau, T.W.W., Chan, Y.W.D., Wong, K.H., Chuang, S.K., 2020. The epidemiology of COVID-19 cases and the successful containment strategy in Hong Kong–January to May 2020. Int. J. Infect. Dis. 98, 51–58.

Lee, H.S., Dean, D., Baxter, T., Griffith, T., Park, S., 2020. Deterioration of mental health despite successful control of the COVID-19 pandemic in South Korea. Psychiatry Res. https://doi.org/10.1016/j.psychres.2020.113570.

Lovibond, P.F., Lovibond, S.H., 1995. The structure of negative emotional states: comparison of the depression anxiety stress scales (DASS) with the beck depression and anxiety inventories. Behav. Res. Ther. 33, 335–343. https://doi.org/10.1016/0005-7967(94)00075-U.

Luchetti, M., Lee, J.H., Aschwanden, D., Sesker, A., Strickhouser, J.E., Terracciano, A., Sutin, A.R., 2020. The trajectory of loneliness in response to COVID-19. Am. Psychol.

Mak, I.W.C., Chu, C.M., Pan, P.C., Yiu, M.G.C., Chan, V.L., 2009. Long-term psychiatric morbidities among SARS survivors. Gen. Hosp. Psychiatry 31, 318–326. https://doi.org/10.1016/j.genhosppsych.2009.03.001.

Murray, C.J., Barber, R.M., et al., 2015. Global, regional, and national disability-adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990-2013: quantifying the epidemiological transition. Lancet 386 (10009), 2145–2191. https://doi.org/10.1016/S0140-6736(15)61340-X.

Ortiz, J.L., Hauck, G. 2020, Coronavirus in the US: How all 50 states are responding – and why eight still refuse to issue stay-at-home orders. USA today. https://www.usatoday.com/story/news/nation/2020/03/30/coronavirus-stay-home-shelter-in-place-orders-by-state/5092413002/.

Peretti-Watel, P, Seror, V, Cortaredona, S, Launay, O, Raude, J, Verger, P, et al., 2021. Attitudes about COVID-19 lockdown among general population, France, March 2020. Emerg Infect Dis. 27 (1) https://doi.org/10.3201/eid2701.201377.

Russell, D., 1996. UCLA loneliness scale (version 3): reliability, validity, and factor structure. J. Pers. Assess. 66, 20–40. https://doi.org/10.1207/s15327752jpa6601.

Salomon, J.A., Haagsma, J.A., Davis, A., de Noordhout, C.M., Polinder, S., Havelaar, A. H., Cassini, A., Devleesschauwer, B., Kretzschmar, M., Speybroeck, N., Murray, C.J., 2015. Disability weights for the Global Burden of Disease 2013 study. The Lancet Global Health 3 (11), e712–e723.

Shin, Y.-J., Lee, J.-Y, 2020. South Korea's proactive approach to the COVID-19 global crisis. Psychol. Trauma: Theo. Res. Pract. Policy 12 (5), 475–477. https://doi.org/10.1037/tra0000651.

Soulsby, L.K., Bennett, K.M., 2015. Marriage and psychological wellbeing: the role of social support. Psychology 6, 1349–1359. https://doi.org/10.4236/psych.2015.611132.

Tso, I., Park, S., 2020. Alarming levels of psychiatric symptoms and the role of loneliness during the COVID-19 epidemic: a case study of Hong Kong. Psychiatry Res. 293, 113423 https://doi.org/10.31234/osf.io/wv9y2.

Tull, M.T., Edmonds, K.A., Scamaldo, K.M., Richmond, J.R., Rose, J.P., Gratz, K.L., 2020. Psychological outcomes associated with stay-at-home orders and the perceived impact of COVID-19 on daily life. Psychiatry Res. 289, 113098 https://doi.org/10.1016/j.psychres.2020.113098.

Vos, T., the Global Burden of Disease Study 2013 Collaborators, 2015. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet (London, England) 386 (9995), 743–800. https://doi.org/10.1016/S0140-6736(15)60692-4.