Depression symptoms among New Zealand's Asian community in the first 10 months of the COVID-19 pandemic

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Abstract

Background

The COVID-19 pandemic has elevated levels of distress and resulted in anti-Asian discrimination in many countries. We aimed to determine the 10-month prevalence of depression symptoms in Asian adults in New Zealand during the pandemic and to see if this was related to experience of racism.

Methods

Online survey of 1,101 Asians with a 36.5% response rate. A stratified sample of 402 respondents completed the brief Centre for Epidemiological Studies-Depression (CES-D) scale. Analyses included: descriptive statistics, depression scores by age/gender, factor analysis of the 10 item CES-D and partial correlation network analysis of CES-D items together with questions about experience of racism.

Results

Half the sample reported clinically significant symptoms of depression over the past 10 months. Depression was higher among younger participants but there was no gender difference. Internal consistency was high ($\alpha = 0.85$) for the CES-D which revealed a clear two factor structure. Network analysis suggested that sleeping problems might be the bridge between experiences of racism and depression. However, this study was cross-sectional which prevents any definitive inferences about causality.

Conclusions

The prevalence of low mood was high with half the sample scoring above the cut-off point for clinically significant levels of depressive symptoms. Depression was higher in younger people and had a modest positive correlation with personal experience of racism - possibly due to its effect on sleep. Longitudinal studies that examine a broader range of dimensions of distress are needed.

Introduction

The COVID-19 pandemic has increased stress and the prevalence of some mental disorders - at least where this has been examined. A systematic review in 2020, noted high levels of anxiety, depression, post-traumatic stress disorder and stress in studies among the general population in China, Spain, Italy, Iran, the US, Turkey, Nepal, and Denmark, and these were generally higher than pre-pandemic rates (Xiong et al., 2020, DeFrance et al., 2021). There are several risk factors for psychological distress including being female, younger (≤ 40), being unemployed, being a student, a pre-existing psychiatric condition and high exposure to social media and/or COVID-19 news. Shevlin et al. (2020) found a “modest increase” in

the prevalence of mental health symptoms in a stratified sample of 2,025 UK adults during the early days of the pandemic (March 2020) - with increases in anxiety, depression and trauma symptoms compared to three previous general population surveys. They reported a prevalence of 22.1% for depression and 21.6% for anxiety, with higher rates of anxiety in females compared to males, but no sex difference for depression. These rates were higher than their 'closest comparable study' (pre-pandemic) which reported 17% for depression and 13% for anxiety (p.5). Variables which predicted anxiety or depression included: younger age group, female gender, urban dwelling, having other health conditions (i.e., diabetes, heart, lung disease) and higher perceived risk of COVID-19 infection (Shevlin et al., 2020).

A meta-analysis of 66 studies involving 221,970 participants to examine the prevalence of anxiety, depression, distress and insomnia during the pandemic, reported pooled prevalence rates among the general population of 29.8% for anxiety, 31.5% for depression, 31.1% for general distress, and insomnia 18.2%. The authors noted these rates were high for all four symptom clusters, compared with general population prevalence studies from the US, Sweden, Turkey, Panama and China, that were conducted prior to the pandemic (Wu et al., 2021).

Fitzpatrick et al., (2020) completed an online survey of 10,368 US adults in March 2020 and examined stressors, social vulnerability factors and social/psychological resources in relation to the prevalence of depression as measured by the Centre for Epidemiological Studies-Depression (CES-D) scale. They reported high levels of distress with their average respondent scoring above the accepted depressive CES-D cut-off score for clinically significant depression. They also found that social and psychological resources were related to depression levels and symptoms were worse in those with high levels of COVID-19 anxiety and food insecurity. (Zavlis et al., 2021) completed a network analysis of anxiety, depression and trauma symptoms in a large UK sample of adults at two points in time (March, April/May) in 2020, concluding that economic worries largely determined COVID-19 specific anxiety which was correlated with generalised anxiety disorder. (Murata et al., 2021) reported an online survey of 4,909 participants including adolescents, adults and healthcare workers in the US in 2020 and concluded that adolescents were significantly more at risk of anxiety, depression, sleep disorder and suicide than adults during the pandemic. They also found that 55% of those participants who had lost a loved one to COVID-19 experienced 'intense grief' and the best predictor of all negative outcomes was loneliness.

Due to its stringent lockdown measures in the first year of the pandemic and careful management in 2021, up until the ongoing outbreak of Omicron, New Zealand experienced one of the lowest per-capita rates of COVID-19 in the world (Baker et al., 2020), Jefferies et al. (2020). In fact, mortality in New Zealand declined during the first two years of the pandemic Summers et al. (2022). Nevertheless, there is evidence that its adult population is experiencing additional stressors impacting on psychological wellbeing. Every-Palmer et al. (2020) used a commercial survey platform to examine the mental health of a demographically representative sample of 2,010 adult New Zealanders in April 2020. They found 30% of respondents reported moderate or severe psychological distress, 16% moderate or high anxiety, and 39% low wellbeing. Of particular concern 6% reported suicidal ideation, 2% reported suicidal plans and 2% suicide attempts. These authors noted that mental health outcomes were poorer for young adults, those

who had lost a job or had reduced work hours, and people with pre-existing physical or mental health conditions. Gasteiger et al. (2021) used an online survey to investigate mental wellbeing in 681 adults in May-June 2020 in New Zealand. They found that levels of depression and anxiety were significantly higher than population norms, although anxiety and stress were lower than those found in a UK sample using the same measures (Gasteiger et al., 2021). An online survey of 663 Asian New Zealanders in April – May 2021, commissioned by an Asian mental health service provider, reported 44% of participants reported symptoms of depression with younger people more at risk and females only slightly more at risk than males (Asian Family Services, 2021).

The present study reports on the prevalence of symptoms of depression in the New Zealand Asian community during the first ten months of the pandemic and considers variables associated with high symptom levels among the participants. We examine the relationship between demographic variables (age, gender), experience of racial discrimination or stigmatisation and symptoms of depression. We included questions concerning racism after media reports that the pandemic was resulting in an increase in bullying and harassment of Chinese and other Asian people (e.g., https://tinyurl.com/3ez9xyj3). There is a large body of evidence that racism is detrimental to both physical and mental health - but especially mental health (Paradies et al., 2015; Talamaivao et al., 2020). In New Zealand, Asians, represent the second largest, fastest growing non-European ethnic group, and the most diverse ethnic group in the country, but they are sorely under-researched in terms of both mental health and their reactions to the pandemic.

Methods

Data collection

Data were collected by a contracted research company between the 5th and 18th of December 2020. The ethnic Chinese sample was collected through Trace Research's Chinese Immigrants Research Panel. All other Asian ethnic participants were collected from Trace's partner online panel by random email invitations to n = 1,101. The total response rate was 36.5% when all quotas were filled. Only those surveys without any missing answers could be submitted. Each respondent was allowed to submit the questionnaire once only according to the IP address recorded by the research panels. The overall margin of error is ± 4% at the 95% level of confidence. Stratified sampling was used in the online survey to ensure representativeness of all Asian ethnic groups in the country according to the 2018 New Zealand Census Asian adult population distribution by age, ethnicity, gender and location,

Measures

The Centre for Epidemiological Studies – Depression scale short version (CES-D10): The CES-D10 is a ten-item self-report questionnaire developed to detect depressive symptoms in large epidemiological studies. The CES-D10 asks about the frequency of 10 symptoms of depression, with participants responding on a four-point Likert scale from 0 = *rarely or not at all* to 3 = *all the time*. Scores can range from 0 – 30, with

higher scores representing greater levels of depressive symptoms. Scores ≥10 are taken to represent clinically significant levels of depression (Andresen et al., 1994).

Racism and discrimination questions: The CES-D10 was included as part of a broader study on the experiences of the New Zealand Asian community in the first year of the pandemic. This included the following four questions concerning the experience of racism and/or discrimination over this period: 1) Since the COVID-19 outbreak in New Zealand, have you been discriminated against (e.g., making offensive remarks about your race, verbal/physical abuse) because of your ethnicity? 2) Do you know people in your immediate social environment who have encountered racist comments and/or discrimination against your ethnicity during the COVID-19 pandemic? 3) Have you noticed any racist comments against your ethnicity in the media/social media? And 4) Have you noticed any stigmatisation associated with COVID-19 during the pandemic?

Participants

Participants were 402 Asian adults from 17 geographical regions in New Zealand recruited from a New Zealand based Asian research panel. The sample comprised 197 (49%) males, 203 (49.5%) females and two who preferred not to state their gender. Age groups were as follows 18 – 29 (n=134, 33.3%) 30 – 49 (n=141, 35%), 50 – 64 (n=94, 23.4%) and 65+ years (n=33, 8%). Participant's country of origin was as follows: India (33.6%), China (31.3%), Philippines (10.3%), Korea (5%), Malaysia (4.7%), Japan (2.5%), Sri Lanka (2.3%), Singapore (2.1%), Hong Kong (2.0%) and the remaining 6.2% from Taiwan, Vietnam, Cambodia, Thailand, and other Asian countries. Full demographic details of the sample are available in the online Supplementary Material.

Statistical Analyses

All statistical analyses were completed using IBM SPSS Statistics v. 27 except for the network analysis which used JASP version 0.14.1 (Team J, 2020). We completed the following analyses:

1. Descriptive statistics for the 10 CES-D items and total score.
2. Compared age and gender CES-D total scores.
3. Reliability estimated by raw Cronbach's α and construct validity by exploratory factor analysis of CES-D items using principal component analysis and Varimax rotation. In addition we calculated McDonald's Ω (omega) as there has been criticism of α despite its almost universal use (Tavakoli & Dennick, 2011; Hayes & Coutts, 2020).
4. Partial correlation network analysis: We included all the CES-D10 symptoms in the network analysis and the four survey questions concerning experience of racism.

Network analysis of partial correlation relationships among the ten CES-D10 items and four questions concerning experience of racism using EBICglasso was conducted. LASSO with EBIC controls the number of connections through a tuning factor gamma set at 0.5 (Foygel and Drton, 2010). For network visualisation the "Spring" layout was adopted. "Spring" places nodes with more and stronger

associations more centrally in the network (Fruchterman and Reingold, 1991). Centrality measures provide further information on network nodes, such as ‘betweenness’ (how often a node acts as a connecting point based on the number of paths through that node to other nodes), ‘closeness’ (how close a node is to other nodes using the average weight of the paths from that node) and “degree” (the sum of all weights from that node or strength) (Montazeri et al., 2020). We tested the accuracy of the network (edges and centrality indices) using a bootstrapping procedure that measures how the correlation between the original network value and the bootstrapped sample value decreases with smaller samples.

Results

1. Descriptive Statistics for Items and Total CES-D

Table 1
Range, mean, median, mode and standard deviation of CES-D symptoms ranked highest to lowest (i.e., most common to least frequent)

ITEM (n = 402)	Range	Mean	Median	Mode	S.D.
8. I was happy*	0–3	1.34	1	1	0.88
4. I felt that everything I did was an effort	0–3	1.24	1	1	0.99
1. I was bothered by things that usually don't bother me	0–3	1.19	1	1	0.93
6. I felt fearful	0–3	1.09	1	1	0.88
7. My sleep was restless	0–3	1.06	1	1	0.92
2. I had trouble keeping my mind on what I was doing	0–3	1.05	1	1	0.93
9. I felt lonely	0–3	1.04	1	1	0.93
3. I felt depressed	0–3	1.04	1	1	0.91
5. I felt hopeful about the future*	0–3	1.03	1	1	0.89
10. *I could not "get going"*	0–3	0.99	1	1	0.90

Table 1 presents the range, mean, median, mode and standard deviation for the 10 CES-D items. Participants used the full response range (0–3) for all 10 items. The items with higher means reflect those items that are more frequently endorsed (i.e., score higher) and hence the most frequent or common symptoms. As can be seen in Fig. 1, the total CES-D score ranged from 0–29 with a mean = 11.07 and standard deviation = 6.02. The figure presents the distribution of total scores for the sample of 402. Complete percentile frequencies are reported in Appendix 1.

Total CES-D scores ranged from 0 to 29 with a mean of 11.07 (sd.=6.02). median 11, mode 5 and a range of 29. Quartile cut-offs fell at 6 (25%), 11 (50%) and 15.6 (75%).

2. Age and gender CES-D scores

The means for males and females were 11.08 (6.06) and 11.05 (6.01) respectively and this was not significantly different (t = 0.06, df = 398, p = .95). Within the four age groups the only significant gender difference for total CESD-D score was for the 30–49 year olds (Male Mean = 11.91 (6.01), female Mean = 9.70 (5.37) (t = 2.29, df = 139, p < 05, two-tailed). However, the difference for the youngest age group might be described as 'approaching significance' (Male Mean = 12.02 (4.89), Female Mean = 13.7 (5.97) (t = -1.78, df = 130, p = 0.08).

The mean CES-D showed a stepwise decrease over the four age groups with younger participants showing higher scores (i.e., lower mood). This trend was significant according to a one-way ANOVA (F = 10.26, df = 3, p < 0.01). Post-hoc Tukey tests with a Bonferroni correction showed no significant difference between the 30–49 year-olds and the 50–64 year-olds, nor for the 50–64 year-olds and the 65 + age group.

3. Reliability and Factor Structure of CES-D

Internal consistency measured by the raw Cronbach's alpha was high at α = 0.85 and also by McDonald's omega (0.86). Inter-item correlations ranged from − 0.02 to 0.65 and corrected item-total correlations ranged from 0.24 (items 5, I felt hopeful about the future and item 8, I was happy) to 0.74 (Item 3, I felt depressed). The Kaiser-Meyer-Olkin measure of sampling adequacy was high (KMO = .898), and Bartlett's test of sphericity was significant (p < 0.01), indicating the correlation matrix was suitable for factor analysis. We extracted two components based on a parallel analysis. The first two principal components accounted for 59% of total variance (46% and 13% respectively). Item loadings on the first unrotated principal component ranged from 0.275 to 0.819. Inspection of Table 2 shows two factors which can be labelled as *positive* and *negative* mood.

Table 2
Rotated factor loadings of CES-D two-factor principal components with Varimax rotation*

CES-D Item	Factor 1	Factor 2
2. I had trouble keeping my mind on what I was doing	.80	
1. I was bothered by things that usually don't bother me	.79	
3. I felt depressed	.77	
10. I could not get going	.76	
9. I felt lonely	.72	
6. I felt fearful	.70	
4. I felt that everything I did was an effort	.69	
7. My sleep was restless	.69	
5. I was happy		.81
8. I felt hopeful about the future		.79

4. Network analysis of CES-D10 symptoms and four racism questions

Results of the network analysis are presented in Fig. 3. Bootstrapping suggested the edges between nodes were very stable with a correlation of 0.75 between the original network edges and a bootstrapped sample at just 25% of the full sample. Centrality indices were all reasonably stable with a correlation of close to 0.75 or higher at 50% of the full sample.

Blue edges between nodes in Fig. 3 represent a positive relationship and red edges represent negative correlations with thicker lines representing larger partial correlations. Inspection of Figure. 3 shows that the network analysis confirms the two-factor structure of the CES-D10 with the eight negative mood items clustered tightly together and similarly for the two positive mood items. The three most central or influential nodes or items were: *I had trouble keeping my mind on what I was doing*", *I felt depressed* and *I could not "get going"*. Interestingly these three items were among the four highest loadings on Factor 1 Negative Mood. The four items about experience of racism were strongly connected to each other and linked to depression through the bridging item *Have you been discriminated against?* which had a correlation with *My sleep was restless*.

Discussion

The major finding in this study was a relatively high prevalence of symptoms of depression, compared with annual prevalence for the general population (see below), among a sample of 402 Asian participants living in New Zealand during the first ten months of the pandemic. However, these rates were comparable

with samples in Hong Kong during the pandemic (Cheng et al., 2021). To place this finding in context the data were collected over a fortnight in December 2020 when the country was enjoying relative normality due to elimination of the first wave of the pandemic (Jefferies et al., 2020). It was the first month of summer and the entire country was in Level 1 of the New Zealand (level 1–4) alert system which involved few restrictions and New Zealand had been at this level since October 7 (https://covid19.govt.nz/alert-levels-and-updates/history-of-the-covid-19-alert-system/). However, participants were specifically asked about their experience of the 10 symptoms since the outbreak of COVID-19 in March 2020 and so these data should be interpreted as the annual (or 10 months) prevalence of mood symptoms in 2020 rather than the point prevalence in December.

We found a high prevalence of clinically significant depressive symptoms with 51.2% of the sample scoring ≥ 10 (see Appendix 1) which is the generally accepted CES-D10 cut-off score for clinically significant levels of symptoms. A national survey conducted in 2006 found the overall annual prevalence of major depression, as diagnosed by a structured interview, in NZ was 5.7% (Well et al., 2006). However, it is important to note that among our sample the severity of symptoms ranges widely and includes mild, moderate and severe cases. We can compare these results with (Cheng et al., 2021) who surveyed 481 Hong Kong adults from April 20 – May 19 in 2020 during what the authors called Hong Kong's 'second wave' of COVID-19 infections. They reported a mean CES-D10 score of 9.85 (SD = 2.96) and noted that 'slightly more than half (52%) were categorised as having probable depression'. They also found that persons higher in depression had less flexible coping strategies and greater COVID-19 related anxiety - but sex and age cohort or 'generation' (they compared Millennials, Generation X, Baby Boomers, Silent Generation) were not related to depression. In summary, we observed a high annual prevalence of symptoms of depression in our New Zealand Asian sample that was comparable with the point prevalence observed in a Hong Kong sample early in the pandemic.

In the present study there was no significant difference in the levels of depression for males and females - but younger participants reported higher rates of depression. There was a modest, significant positive correlation between depression and experiences of racism with a network analysis suggesting that direct personal experience of racism and disturbed sleep might conceivably act as a bridge or mechanism by which racism effects mood. However, this is based on a cross-sectional, correlation network and must be regarded as a hypothesis arising from our results that requires closer examination with a longitudinal study.

The CES-D10 proved to be a reliable measure for use with an Asian sample in New Zealand as shown by a Cronbach's α of 0.85 which reflects high internal consistency or scale reliability. The two-factor structure (positive and negative symptoms) we observed in the present study was also quite consistent with the structure reported in studies from other countries e.g. South Africa (Baron et al., 2017). The separation into positive and negative dimensions of mood was confirmed by the network analysis which also saw these two sets of symptoms or items forming two distinct albeit connected clusters. The network analysis also identified three symptoms as the most central in the network – 'I had trouble keeping my mind on what I was doing' (concentration), 'I felt depressed' (low mood) and 'I could not *get going'* (low

energy). As the most central symptoms, these three items have the greatest number of connections with other symptoms, the strongest correlations with other symptoms and most often act as the pathway or link between pairs of unconnected symptoms. Interestingly, they formed three of the four highest loading items on the first rotated factor of Negative Mood.

While the precise interpretation of centrality measures in the application of NA to psychological networks remains the focus of some debate and uncertainty there is a good argument that more central symptoms could be the focus of assessment and intervention (Bringmann et al., 2019). Recently, Cheung and colleagues used NA to examine depressive symptoms among 11,072 Hong Kong residents during the early stages of the COVID-19 pandemic (March – April 2020) (Cheung et al., 2021). Their study used the PH9 to measure symptoms of depression and found the three most central symptoms were Guilt, Sad Mood and Energy. As the CES-D10 and the PHQ9 have quite different sets of items it is not possible to make direct comparisons. For example, the PHQ9 has items about guilt and suicide which the CES-D10 does not while the CES-D10 alone has positive mood items. Nonetheless the Sad Mood (*Feeling down, depressed or hopeless*) and Energy (*Feeling tired or having little energy*) items are similar in content to the two CES-D10 items *I felt depressed* and *I could not get going* suggesting some degree of similarity across results. Interestingly, a systematic review of network analyses of major depression that included 254 studies of general and clinical samples and compared 58 cross-sectional networks concluded that fatigue and depressed mood were the two most central symptoms playing a critical role in or understanding of this disorder (Malgaroli et al., 2021).

Limitations

The present study had several limitations which need to be acknowledged. First, it is a cross-sectional study which limits the conclusions which can be drawn from it. For example, it is not clear to what extent the prevalence of depressive symptoms was unusually high due to the pandemic, or if these rates might actually be typical of the New Zealand Asian community. Moreover, we could not find cut-off values to distinguish mild, moderate and severe depression using the CES-10. A longitudinal study is necessary to demonstrate that the pandemic actually produced an increase in low mood among the Asian community. Second, we asked about symptoms since the pandemic started, similar to annual prevalence, whereas most studies using the CES-D10 ask about the *past few weeks* meaning point prevalence. Hence caution needs to be exercised when comparing our prevalence rates with other studies. Third, for practical reasons of minimising participant burden, we only focused on one dimension or category of psychological distress, namely depression or low mood. It would have been informative to ask about a more diverse range of forms of distress including anxiety, alcohol/drug abuse and loneliness. It would also have added balance to inquire about more positive aspects of wellbeing such as coping and resilience. Certainly, it would be worth exploring these avenues in the future using longitudinal studies with our Asian community. Future studies might also want to make a special effort to recruit older Asian participants as our sample of 402 only included 33 people aged 65+.

Conclusion

The annual prevalence of low mood was quite high with half the sample scoring above the cut-off point for clinically significant levels of depressive symptoms and this rate was comparable with a Hong Kong sample collected early in the pandemic. However, this figure aggregates mild, moderate and severe depression. Depression was higher in younger people and had a modest positive correlation with personal experience of racism - possibly due to its effect on sleep. There was no difference in severity of depression observed between males and females. The CES-D10 proved a robust tool for the measurement of mood in an Asian New Zealand sample. Longitudinal studies that examine a broader range of dimensions of distress and employ a longitudinal design are now needed.

Declarations

Ethics Approval and consent to participate

This research was approved by Massey University's Human Ethics Committee and judged to be low risk (Ethics Notification Number 4000022629). Informed consent was obtained online from all participants prior to data collection.

Consent for publication

Not applicable.

Availability of data and materials

The data were collected under New Zealand's privacy act and cannot be made available in public repositories. However, the Principal Investigator (LSL) may share specific de-identified and anonymised data from the full data set with established researchers on request.

Competing interests

The authors are not aware of any conflicts of interest.

Authors' contributions

RJS contributed to study design, completed statistical analyses and wrote the first draft; GJR contributed to the design of the study and provided feedback on manuscript drafts; AZ conducted the online survey, managed the dataset and provided feedback on manuscript drafts; NF contributed to study design, advised on scientific aspects of COVID-19 and provided feedback on draft manuscripts; DJ contributed to the design of the study, provided logistical advice and support and provided feedback on manuscript drafts; LSL led the team which won the grant, oversaw project management and provided feedback on manuscript drafts.

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References

1. Andresen, M., Malmgren, J. A., Carter, W. B. & Patrick, D. L. 1994. Screening for depression in well older adults: Evaluation of a short form of the CES-D. *Am J Prev Med,* 10**,** 77-84.
2. Asian Familty Services. (2021). New Zealand Asian Wellbeing and Mental Health Report. Commisioned Report by Trace Resarch Ltd. Asian Family Services New Zealand, June, 2021
3. Baker, M. G., Wilson, N. & Anglemyer, A. 2020. Successful Elimination of Covid-19 Transmission in New Zealand. *New Engl J Med,* 383.
4. Baron, E. C., Daviies T. & Lund, C. 2017. Validation of the 10-item Centre for Epidemiological Studies Depression Scale (CES-D-10) in Zulu, Xhosa and Afrikaans populations in South Africa. *BMC Psychiatry,* 17.
5. Bringmann, L. F., Elmer, T., Epskamp, S., Krause, R. W., Schoch, D., Wichers, M., Wigman, J. T. W. & Snippe, E. 2019. What do centrality measures measure in psychological networks?. *J Abnorm Psychol,* 128**,** 892-903.
6. Cheng, C., Wang, H. & Ebrahimi, O. V. 2021. Adjustment to a "new normal"; Coping flexibility and mental health issues during the COVID-19 pandemic. *Front Psychol,* 12.
7. Cheung, T., Jin, Y., Lam, S., Su, Z., Hall, B. J.,, Xiang, Y.-T. & International Research Collaboration On Covid-19 2021. Network analysis of depressive symptoms in Hong Kong residents during the COVID-19 pandemic. *Transl Psychiat,* 11.
8. Defrance, K., Hancock, G. R., Stack, D. M., Serbin, L. A. & Hollenstein, T. 2021. The Mental Health Implications of COVID-19 for Adolescents: Follow-Up of aFour-Wave Longitudinal Study During the Pandemic. *Am Psychol***,** Advance online publication.
9. Every-Palmer, S., Jenkins, M., Gendall, P., Hoek, J., Beaglehole, B., Bell, J., Rapsey, C. & Stanley, J. 2020. Psychological distress, anxiety, family violence, suicidality, and wellbeing in New Zealand during the COVID-19 lockdown: A cross-sectional study. *PloS one,* 15**,** e0241658. .
10. Fitzpatrick, K. M., Harris, C. & Drawve, G. 2020. Living in the midst of fear: Depressive symptomatology among US adults during the COVID-19 pandemic. *Depress Anxiety,* 37**,** 957-964.

11. Foygel, R. & Drton, M. 2010. Information Criteria for Gaussian Graphical Models. *Adv Neur In,* 23**,** 2020-2028.
12. Fruchterman, T. M. J. & Reingold, E. M. 1991. Graph drawing by force-directed placement. *Software: Practice and Experience,* 21**,** 1129-1164.
13. Gasteiger, N., Vedhara, K., Massey, A., Jia, R., Ayling, K., Chalder, T., . . . & Broadbent, E. 2021. Depression, anxiety and stress during the COVID-19 pandemic: results from a New Zealand cohort study on mental well-being. *BMJ Open,* 11.
14. Hayes, A. F. & Coutts, J. J. (2020). Use omega rather than Cronbach's alpha for estimating reliability. But… *Communication Methods and Measures*, 14 (1), 1 – 24.
15. Jefferies, S., French, N., Gilkinson, C., Graham, G., Hope, V., Marshall, J., McElnay, C., McNeill, A., Muellner, P., Paine, S., Prasad, N., Scott, J., Sherwood, J., & Priest, P. (2020). COVID-19 in New Zealand and the impact of the national response: a descriptive epidemiological studyLancet Pub Health, pub online October 2020, https://www.thelancet.com/pdfs/journals/lanpub/PIIS2468-2667(20)30225-5.pdf
16. Malgaroli, M., Calderon, A. & Bonanno, G. A. 2021. Networks of major depressive disorder: A systematic review. *Clin Psychol Rev,* 85.
17. Montazeri, F., De Bildt, A., Dekker, V. & Anderson, G. M. 2020. Network Analysis of Behaviors in the Depression and Autism Realms: Inter-Relationships and Clinical Implications. *J Autism Dev Disord,* 50**,** 1580-1595.
18. Murata, S., Rezeppa, T., Thoma, B., Marengo, L., Krancevich, K., Chiyka, E., Hayes, B., Goodfriend, E., Deal, M., Zhong, Y., Brummit, B., Coury, T., Riston, S., Brent, D. A. & Melhem, N. M. 2021. The psychiatric sequelae of the COVID-19 pandemic in adolescents, adults, and health care workers. *Anx Depress,* 38**,** 233-246.
19. Paradies, Y., Ben, J., Denson, N., Elias, A., Priest, N., Pieterse, A., Gupta, A., Kelaher, M., & Gee, G. (2015). Racism as a determinant of health: A systematic review and meta-analysis. *PLoS ONE* 10(9): e0138511.doi:10.1371/journal.pone.0138511
20. Shevlin, M., Mcbride, O., Murphy, J., Gibson Miller, J., Hartman, T. K., Levita, L., Mason, L., Martinez, A. P., Mckay, R., Stocks, T. V. A., Bennett, K. M., Hyland, P., Karatzias, T. & Bentall, R. P. 2020. Anxiety, depression, traumatic stress and COVID-19-related anxiety in the UK general population during the COVID-19 pandemic. *BJPsych Open,* 6**,** e125, 1–9.
21. Summers, J., Baker, M., & Wilson, N. Mortality declines in Aotearoa NZ during the first two years of the Covid-19 pandemic. *Public Health Expert* - blog. Mortality declines in Aotearoa NZ during the first two years of the Covid-19 pandemic – Public Health Expert, University of Otago, New Zealand. Posted 23.02.2022.
22. Talamaivao, N., Harris, R., Cormack, D., Paine, S-J., & King, P. (2020). Racism and health in Aotearoa New Zealand: a systematic review of qualitative studies. *NZ Med J*, 133, 55 – 68.
23. Tavakoli, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *Int J Med Ed*, 2, 53-55.
24. Team, J. 2020. (Version 0.14.1)[Computer software].

25. Wells, J. E., Oakley Browne, M. A., Scott, K. M., McGee, M. A. Baxter, J., Kokaua, J. for New Zealand Mental Health Survey (2006). Prevalence, interference with life and severity of 12 month DSM-IV disorders in Te Rau Hinengaro: The New Zealand Mental Health Survey. *Aust NZ J Psychiat,* 40, 845 – 854.
26. Wu, T., Jia, X., Shi, H., Niu, J., Yin, X., Xie, J. & Wang, X. 2021. Prevalence of mental health problems during the COVID-19 pandemic: A systematic review and meta-analysis *J Affect Disorders,* 281**,** 91-98.
27. Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M. W., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M., Ho, R., Majeed, A. & Mcintyre, R. S. 2020. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *J Affect Disorders,* 277**,** 55-64.
28. Zavlis, O., Butter, S., Bennett, K., Hartman, T. K., Hyland, P., Mason, L., Mcbride, O., Murphy, J., Gibson-Miller, J., Levita, L., Martinez, A. P., Shevlin, M., Stocks, T. V. A., Vallières, F. & Bentall, R. P. 2021. How does the COVID-19 pandemic impact on population mental health? A network analysis of COVID influences on depression, anxiety and traumatic stress in the UK population. *Psychol Med***,** 1 - 9.

Supplementary Material

The online Supplementary Material and Appendix 1 are not available with this version.

Figures

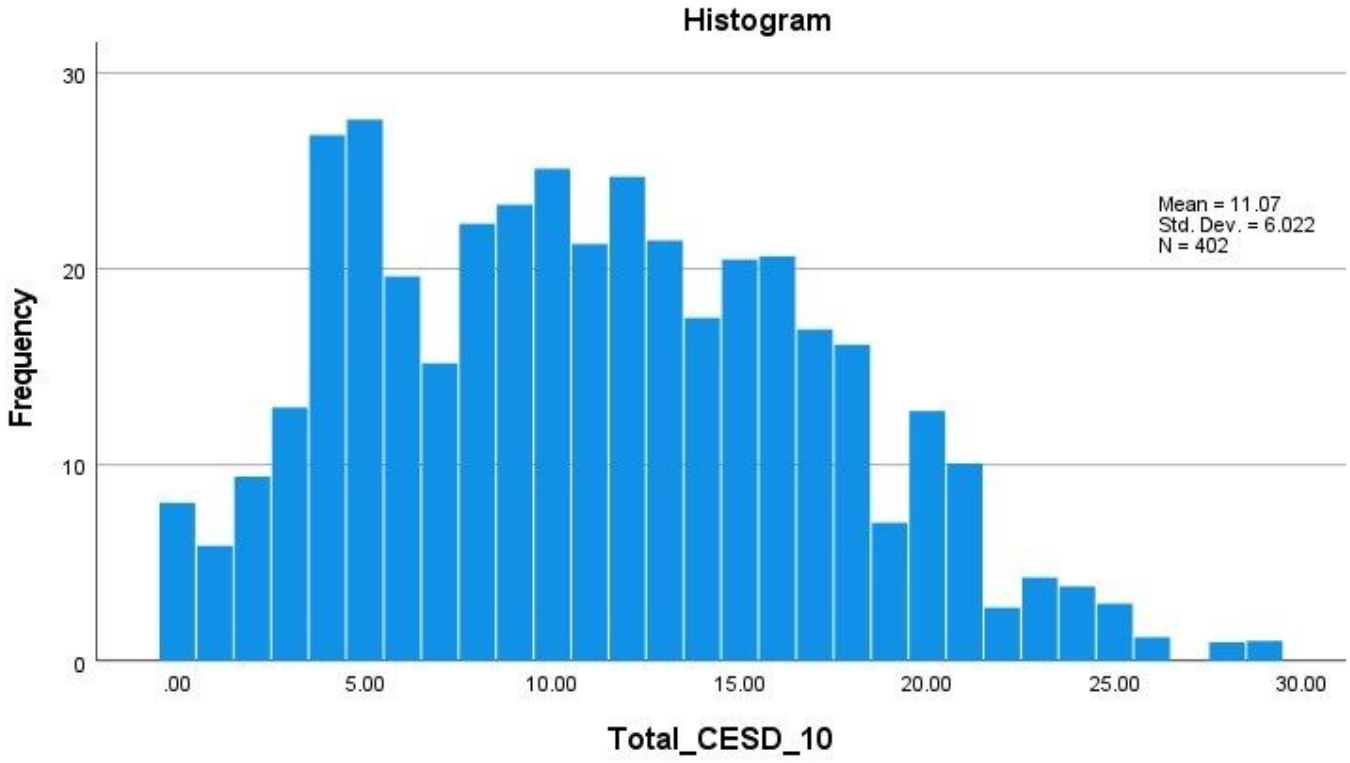

Figure 1

Distribution of CES-D10 Total Score (n=402)

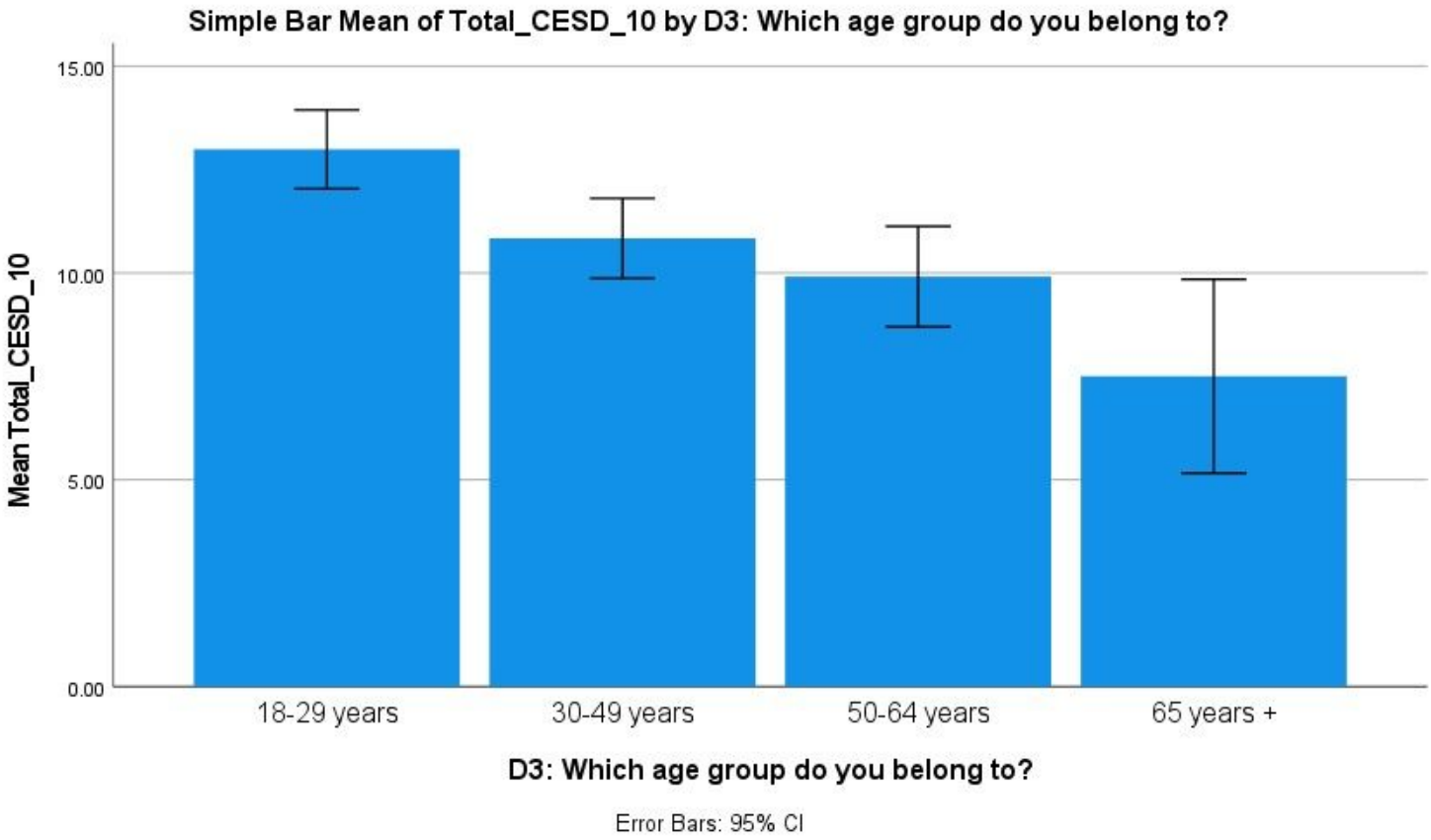

Figure 2

Means for 10 item CES-D total score by Age Group

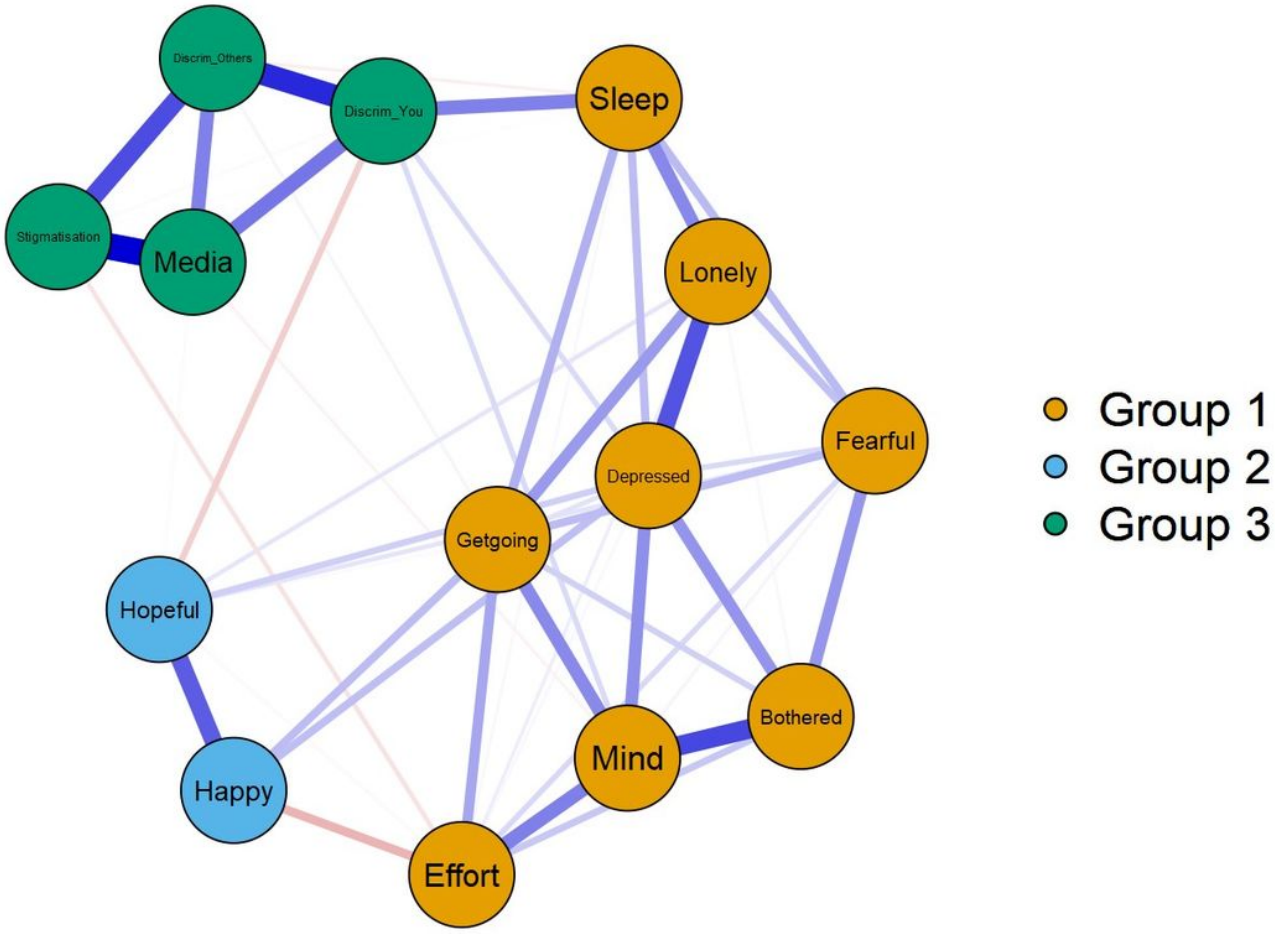

Figure 3

Network of 10 CES-D Items and 4 Survey Questions About Recent Experience of Racism*

***** Blue edges between nodes in Figure 3 represent a positive relationship and red edges represent negative correlations with thicker lines representing larger partial correlations.