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Abstract: It is unclear whether delayed access to treatment/health assessment impacted psychological distress for these populations. This study aimed to fill this literature gap by using a cross-sectional survey, which aimed to evaluate the impact of COVID-19 pandemic on Chinese immigrants in North America during the second wave of the pandemic. The study focused on Chinese immigrants aged 16 or older in Canada. Covariates included sociodemographic variables, delayed access to treatment/health assessment, and other COVID-19 related variables. We used logistic LASSO regression for model selection and multivariate logistic regression models to evaluate the association between delayed access to treatment/health assessment and psychological distress outcome. Missing data were handled using multiple imputation. Our study included 746 respondents, with 47.18% normal CPDI group and 36.82% mild to severe CPDI group. Most respondents were originally from Mainland China and residing in Ontario. Over half have stayed in Canada for at least 15 years. The multivariate logistic regression models unveiled a significantly positive association between psychological distress and delayed access to treatment/health assessment (OR=1.362, 95% CI: 1.078–1.720, p= 0.0095), fear of COVID-19 (OR=1.604, 95% CI: 1.293–1.989, p<.0001), social loneliness (OR=1.408, 95%CI: 1.314–1.508, p<.0001). Sociodemographic variables and other COVID-19 related-variates did not significantly impact the study's outcome. Reliable health information, mental health supports, and virtual care tailored to immigrants should be considered to mitigate this impact and optimize overall health and well-being.

Keywords: rescheduling/cancellation; psychological distress; COVID-19; Chinese immigrants; Canada; LASSO regression

1. Introduction

During the global COVID-19 pandemic, the Canadian healthcare system faced challenges with insufficient hospital capacity and resources to respond to increasing hospitalizations and ICU admissions due to SARS-CoV-2 (Canadian Institute for Health Information [CIHI], 2021; Gibney et al., 2022; Canadian Medical Association [CMA], 2021). Many Canadian hospitals faced additional challenges due to shortages of trained healthcare professionals, a lack of upgraded suppliers and systems, and unavailable ICU beds (CIHI, 2021; Gibney et al., 2022; CMA, 2021).

Given the challenges related to staff/resource shortages, the care of non-COVID-19 patients was significantly interrupted during the pandemic (CIHI, 2021; Gibney et al., 2022). Reallocating staff and resources to care for COVID-19 patients led to many elective surgical procedures and diagnostic

services disproportionately postponed or canceled (CIHI, 2021; Gibney et al., 2022). Additionally, restrictions on healthcare services during the pandemic led to many in-person appointments being delayed or canceled (CMA, 2021; Jayati et al., 2023; Statistics Canada, 2022). Although virtual care endorsement significantly increased during the pandemic (CMA, 2021; CIHI, 2022), the services might not be preferred by many patients (CMA, 2021), particularly for "distressed patients", immunocompromised patients, older people, or those who do not access to virtual health services (Jacqueline et al., 2024; CMA, 2021; Statistics Canada, 2022).

In addition to various factors such as fear of contracting COVID-19 (Nicole et al., 2021; Mehrunnisa et al., 2024) and social determinants of health (Yan et al., 2022) that resulted for deteriorating psychological status, delayed access to treatment/health assessment also significantly impacted mental health during the pandemic (Mehrunnisa et al., 2024; Yan et al., 2022). For example, international research showed that the interruption of cancer care delivery resulted in increasing general psychological distress (Nicole et al., 2021; Melissa et al., 2020), posttraumatic stress disorder symptoms (Nicole et al., 2021) and anxiety about negative cancer consequences (Gladys et al., 2023). Some studies also identified psychological factors considerably associated with changes in access to non-cancer care (Mohamad et al., 2023; Angela et al., 2021; Emi et al., 2022).

In Canada, a study revealed that there was a relationship between delayed healthcare services due to some reasons (e.g., fear of COVID-19 virus) and a low self-rated mental well-being, as well as perceived declines in mental health (Mehrunnisa et al., 2024). Statistics Canada (2022) showed that vulnerable populations such as those with multiple chronic comorbidities, women, or immigrants were more likely to delayed medical care due to fear of contracting virus.

To date, although the impact of changes in access to care during the pandemic on psychological factors has been studied by many countries (Mohamad et al., 2023; Angela et al., 2021; Emi et al., 2022; Yingjun et al., 2022), little attention is given to this specific influence on vulnerable populations such as Asian immigrants in Canada. A dramatic increase in anti-Asian discrimination and socio-economic-related risk factors negatively impacted psychological well-being (i.e., increased distress) among Chinese Canadians during the pandemic (Jeanna et al., 2022; Lixia, Linke, Kesaan, et al., 2022; Lixia, Kesaan, Ling, et al., 2022). However, it is unclear to which extent delayed access to treatment/health assessment might have impacted psychological distress among Chinese immigrants in Canada during the global pandemic. Understanding this matter is crucial to inform health authorities and healthcare providers about the negative impacts of compromised or deterred care and treatments on psychological distress among this vulnerable population. Therefore, the study objectives are to (1) describe and compare the characteristics of Chinese immigrants in Canada by the psychological distress index levels and (2) evaluate the association between delayed access to treatment/health assessment and distress levels.

2. Methodology

2.1. Study Design, Setting, and Participants

This study utilized data from a cross-sectional survey collected from January 11 to February 28, 2021. The survey aimed to evaluate the COVID-19 impact on Chinese immigrants and residents in North America during the second wave, including questions on sociodemographic background, perceptions and knowledge of COVID-19, public health practices of COVID-19, multidimension of impacts of the COVID-19 on society and healthcare, and behaviors caused by the psychological distress.

Through a convenient sampling procedure, Chinese immigrants aged 16 or over, living in North America (Canada specifically) for at least 6 months, were recruited to voluntarily complete this survey. Because we aimed to evaluate the impact of delayed access to care on psychological distress on Chinese immigrants in Canada, our sample included Chinese Canadian citizens or permanent residents aged 16 or older while excluded other categories of Chinese residents (including international students, family visit/tour, business, or US citizens). Of the 1253 eligible respondents completing the survey, a total of 888 responses met all the inclusion criteria. Among these valid

responses, 746 responses with complete psychological distress outcome values were included in the final data analysis (see Supplemental Material—S1).

2.2. Main Outcome—Psychological Distress

The primary outcome, psychological distress was assessed with the COVID-19 Peritraumatic Distress Index (CPDI) (Jianyin et al., 2020; Roy et al., 2021). It includes 24 items assessing distress symptoms, such as "anxiety", "depression", "specific phobia", "compulsive behavior", as well as "physical and social function symptoms" in the past week (Jianyin et al., 2020; Roy et al., 2021). Each item was evaluated using a Likert scale ranging from "0" for never to "4" for most of the time (Jianyin et al., 2020; Roy et al., 2021). CPDI scores were categorized into normal (<28 points), mild to moderate (28-51 points), and severe (≥ 52 points) (Jianyin et al., 2020; Roy et al., 2021). This study used the cut-off of mild to moderate to create a binary outcome variable: normal (<28) and mild-to-severe (≥28 points) (Jianyin et al., 2020; Roy et al., 2021).

2.3. Covariates

2.3.1. Sociodemographic Variables

The survey includes the following sociodemographic variables: **Age** was categorized as under 35, 35 to 44, 45 to 54, 55 to 64, and 65 or above; **Gender** was reported as men/women or missing (including prefer not answering or non-responses). **Birthplace** comprised of Mainland China and others (including Canada, Hongkong, Macau, Taiwan, and other regions). **Province of residence** was categorized as Ontario and outside Ontario. **Mother language** included Mandarin and others (including Cantonese, English, or other languages). **Length in Canada** was self-reported: under 6 years, 6 to less than 15 years, at least 15 years. Other sociodemographic backgrounds included **marital status** (married/common law or others), **highest educational status** (under university, university, and master/PhD), **employment status** (employed, self-employed, unemployed, or other), **living status** (living with family or others), **financial status** (dissatisfied, neutral, or satisfied), **current health status** (poor, fair, or good), **work in healthcare** (yes or no), **working requiring public contact** (yes or no), and **COVID-19 infectious history** (yes or no).

2.3.2. COVID-19-Related Variables

Perceived/experienced discrimination was measured from two questions: one assessing the perception of COVID-19-related discrimination (i.e., "Do you think the COVID_19 pandemic has caused discrimination against Chinese immigrants/residents in North America?") and one assessing the experience of COVID-19-related discrimination (i.e., "Have you experienced discrimination related to COVID_19? If so, what kind of discrimination?"). This binary variable was categorised as "Yes" when being responded as "strongly agree" or "agree" as perception or any experience within discrimination during the COVID-19, "No" when being responded as "neutral", "disagree", or "strongly disagree".

Two questions were used to evaluate **Fear of COVID-19**: "Are you personally afraid of contracting the COVID_19?" and "Are you afraid that someone in your immediate family will be contracting the COVID_19? Respondents were categorised into two groups: "Yes" for those who were "very" or "somewhat afraid of" COVID-19 versus "No" for those who responded "neutral", "not very afraid", or "not afraid at all of" COVID-19.

Loneliness was measured using the De-Jong Gierveld Loneliness Short Scale (Jenny & Theo., 2006), a valid and reliable 6-items instrument to measure overall, emotional, and social loneliness (Andrea et al., 2022; Jenny & Theo., 2006). The scale has been validated and used in many countries (Jenny & Theo, 2010), including China (Bao-Liang et al., 2023). Respondents rated each item on a 5-point Likert scale ranging from "1" (strongly disagree) to "5" (strongly agree) (Andrea et al., 2022; Bao-Liang et al., 2023). Three items with positive words were reset coded before summing all items to calculate the total score (Andrea et al., 2022; Bao-Liang et al., 2023). A higher total score indicates a greater loneliness level. (Andrea et al., 2022; Bao-Liang et al., 2023).

Delayed access to treatment/health assessment was measured using a question about any experience—whether including rescheduling, postponement, or cancellations of surgery, outpatient surgery, follow-up visits for chronic disease, mental illness or common illness, or other health issues or concerns (such as dental, vision, etc..). The question also queried cancellations or postponements of other medical consultations with healthcare professionals or routine laboratory tests. Participants who responded with any changes in their care were grouped as "Yes", whereas those who did not respond any changes were categorised as "No".

2.4. Missing Data

We assumed that missing data in the study are missing at random. All missing data in this study were multiply imputed using "fully conditional specification (FCS)", which is a valid approach to handle with missing data points of categorical and continuous variables (S.Van et al., 2006; SE et al., 2015). Specifically, item-level imputation was used to handle missing data before calculating CPDI score and social loneliness score. The item-level imputation, which imputes incomplete items prior to calculating a total score, is preferred for their reliable and accurate estimates compared to the scale-level imputation (SE et al., 2015).

With a missing data rate of 3.38% to 14.30%, we generated 20 datasets for imputation (Katrina et al., 2021; Katherine et al., 2016). Although incomplete outcome variable was included in the imputation model, we excluded these missing values from the analysis model (Jammbe et al., 2014; Katrina et al., 2021). This approach allowed us to minimize trivial noise in estimates resulting from these values (Jammbe et al., 2014; Katrina et al., 2021). We excluded 15.99% imputed outcome values from the final analysis model.

2.5. Statistical Analysis

The data analysis was performed using SAS 9.4 and a p-value of < 0.05 was considered to be significant for all analysis. For descriptive analysis, the completed dataset was summarized by mean, standard error, and confidence interval for continuous variable, and frequency and proportions for categorical variables. A difference of each covariate variables between CPDI groups was examined using the Chi-square tests (Fisher's exact test when more than 20% of cells with expected cell counts less than 5) for categorical variables and the ttest for continuous variables.

For logistic regression analysis, univariate logistic regression models were initially used to examine the association between individual covariate variables and CPDI in the completed dataset. Subsequently, for sensitivity analysis, we utilized multivariate regression logistic models for completed dataset (Completed Case Analysis) and imputed dataset. We used logistic LASSO regression to select most significant variables associated with the outcome (Ying et al., 2022; "What is lasso regression?", 2024). LASSO penalty function shrinks some coefficients as 0, which may lead to improve prediction accuracy (Ying et al., 2022; "What is lasso regression?", 2024). Finally, multivariate logistic regression models were conducted to yield odd ratios in presence of most significant variables selected from the LASSO model. Moreover, the Hosmer-Lemeshow test was used to check the goodness of fit of the model (David et al., 2013, p.165). The sensitivity and specificity of the model was assessed using the Area Under the ROC Curve, with a cut-point of ROC over 0.7 considered acceptable (David et al., 2013, p. 174-178).

3. Results

3.1. Participants' Sociodemographic Characteristics

Table 1. presents respondents' sociodemographic characteristics. Among 746 respondents, there were 419 (47.18%) individuals with normal CPDI and 327 (36.82%) with mild-to-severe CPDI.Participants with mild-to-severe CPDI were more often women (70.59% vs. 62.14%, p=0.0165), individuals from Mainland China (97.55% vs. 93.32%, p=0.0074), respondents with neutral (41.90% vs. 40.19%) or dissatisfied (31.19% vs. 16.99%) financial status (p<.0001), and those who reported current fair (44.48% vs. 36.84%) to poor (7.06% vs. 2.15%) health status (p=0.0001) compared to those

with normal CPDI group.]Most respondents in both groups were married (87.77% in normal CPDI group vs. 84.97% in mild-to-severe CPDI group), speaking Mandarin (93.29% vs. 93.8%), residing in Ontario (89.45% vs. 88.62%), and living with their family (91.87% vs. 90.21%). More than half have stayed in Canada for at least 15 years (60.38% in normal CPDI vs. 53.82% in mild-to-severe CPDI). Participants holding a university degree (42.48% in normal CPDI group vs. 44.04% in mild-to-severe CPDI group) or Master/PhD degree (37.47% vs. 31.19%) are common. There was a high proportion of employed participants in two groups (43.68% normal CPDI group vs. 39.45% mild-to-severe CPDI group), with a small percentage of respondents were working in healthcare sector (9.64% vs. 8.31%) and in workplaces requiring public contacts (15.87% vs. 20.25%).

Table 1. Participants' characteristics by CPDI levels.

Variables	N	CPDI		p-value
		Normal (<28) (n=419)	Mild-to-severe (≥28) (n=327)	
Age				0.7799
Under 35	51 (6.84)	26 (6.21)	25 (7.65)	
35-44	96 (12.87)	52 (12.41)	44 (13.46)	
45-54	265 (35.52)	146 (34.84)	119 (36.39)	
55-64	194 (26.01)	111 (26.49)	83 (25.38)	
65 or above	140 (18.77)	84 (20.05)	56 (17.13)	
Gender				0.0165
Men	251 (34.15)	156 (37.86)	95 (29.41)	
Women	484 (65.85)	256 (62.14)	228 (70.59)	
Birthplace				0.0074
Mainland China	710 (95.17)	391 (93.32)	319 (97.55)	
Other	36 (4.83)	28 (6.68)	8 (2.45)	
Mother language				0.7580
Mandarin	694 (93.53)	389 (93.29)	305 (93.85)	
Other	48 (6.47)	28 (6.71)	20 (6.15)	
Province				0.7181
Ontario	661 (89.08)	373 (89.45)	288 (88.62)	
Other	81 (10.92)	44 (10.55)	37 (11.38)	
Length in Canada				0.1976
Under 6 years	79 (10.59)	41 (9.79)	38 (11.62)	
6 to less than 15 years	238 (31.90)	125 (29.83)	113 (34.56)	
At least 15 years	429 (57.51)	253 (60.38)	176 (53.82)	
Marital status				0.2670
Married/Common law	643 (86.54)	366 (87.77)	277 (84.97)	
Other	100 (13.46)	51 (12.23)	49 (15.03)	
Living status				0.4310
With family	679 (91.14)	384 (91.87)	295 (90.21)	
Other	66 (8.86)	34 (8.13)	32 (9.79)	
Highest educational status				0.1327
Under university	165 (22.12)	84 (20.05)	81 (24.77)	
University	322 (43.16)	178 (42.48)	144 (44.04)	
Master/PhD	259 (34.72)	157 (37.47)	102 (31.19)	
Employment status				0.2767
Employed	312 (41.82)	183 (43.68)	129 (39.45)	
Self-employed	141 (18.90)	74 (17.66)	67 (20.49)	
Unemployed	105 (14.08)	52 (12.41)	53 (16.21)	
Other	188 (25.20)	110 (26.25)	78 (23.85)	
Work in healthcare				0.5312

Yes	67 (9.05)	40 (9.64)	27 (8.31)	
No	673 (90.95)	375 (90.36)	298 (91.69)	
Work requiring public contact				0.1215
Yes	132 (17.79)	66 (15.87)	66 (20.25)	
No	610 (82.21)	350 (84.13)	260 (79.75)	
Financial status				<.0001
Dissatisfied	173 (23.22)	71 (16.99)	102 (31.19)	
Neutral	305 (40.94)	168 (40.19)	137 (41.90)	
Satisfied	267 (35.84)	179 (42.82)	88 (26.91)	
Current health status				0.0001
Poor	32 (4.30)	9 (2.15)	23 (7.06)	
Fair	299 (40.19)	154 (36.84)	145 (44.48)	
Good	413 (55.51)	255 (61.00)	158 (48.47)	
COVID-19 infectious history				1.0000[a]
Yes	4 (0.54)	2 (0.48)	2 (0.61)	
No	742 (99.46)	417 (99.52)	325 (99.39)	
Fear of COVID-19				<.0001
Yes	537 (71.98)	254 (60.62)	283 (86.54)	
No	209 (28.02)	165 (39.38)	44 (13.46)	
Discriminate				0.0774
Perceived/experienced	286 (38.34)	149 (35.56)	137 (41.90)	
Other	460 (61.66)	270 (64.44)	190 (58.10)	
Delay				<.0001
Yes	600 (80.43)	314 (74.94)	286 (87.46)	
Non-response about delay	146 (19.57)	105 (25.06)	41 (12.54)	
Social Loneliness Score				
N	713	411	302	
Mean		16.21 ± 2.73	19.18 ± 2.98	<.0001

Note. Distribution of categorical covariate variables between CPDI groups was compared using the Chi-square tests or ([a] Fisher's exact test when more than 20% of cells with expected cell counts less than 5). Mean scores of social loneliness in both groups were compared using the t-test. Abbreviations: Delay. Delayed access to treatment/health assessment; CPDI. COVID-19 Peritraumatic Distress Index

3.2. COVID-19-Related Participants' Characteristics

As outlined in Table 1, a small percentage of participants were infected with COVID-19 (0.48% in normal CPDI vs. 0.61% in mild-to-severe CPDI). A significantly higher prevalence of fear of COVID-19 was observed in those with mild-to-severe CPDI (86.54%) than that in respondents with normal CPDI (60.62%) (p<.0001). The mild-to-severe CPDI group showed a higher prevalence of delayed access to treatment/health assessment (87.46%) than the normal CPDI group (74.94%) (p<.0001). Moreover, participants with mild-to-severe CPDI (19.18 ± 2.98) had a higher mean score of social loneliness than their counterparts (16.21 ± 2.73) (p<.0001). Although the prevalence of perceived or experienced discrimination in the mild-to-severe CPDI group was higher than that in the normal CPDI group (41.90% vs. 35.56%), this difference was insignificant (p=0.0774).

3.3. Risk Factors Associated with Mild to Severe COVID-19 Peritraumatic Distress Index (CPDI)

Table 2 displayed risk factors associated with mild to severe CPDI from univariate logistic regression model. The odds of mild-to-severe CPDI in men were 31.6% lower than that in women (OR = 0.684, 95% CI: 0.501–0.933, p = 0.0167). In contrast, the odds of mild-to-severe CPDI were positively associated with dissatisfied financial status (OR = 2.922, 95% CI: 1.966–4.342, p <. 0001), poor current health status (OR = 4.123, 95% CI: 1.860–9.135, p = 0.0026), fear of COVID-19 (OR = 4.178, 95% CI: 2.877–6.068, p < .0001), delayed access to treatment/health assessment (OR = 2.333, 95% CI: 1.572–3.462, p < .0001), and social loneliness score (OR = 1.447, 95% CI: 1.354–1.545, p <. 0001).

Table 2. Risk factors associated with mild to severe CPDI level from the Univariate logistic regression model.

Variables	CPDI		p-value
	OR	95% CI	
Age			
Under 35	1.442	0.757–2.748	0.4354
35-44	1.269	0.751–2.145	0.7636
45-54	1.223	0.807–1.853	0.8957
55-64	1.122	0.721–1.745	0.6249
65 or above	ref		
Gender			
Men	0.684	0.501–0.933	0.0167
Women	ref		
Birthplace			
Mainland China	2.855	1.284–6.352	0.0101
Other	ref		
Mother language			
Mandarin	1.097	0.606–1.985	0.7594
Other	ref		
Province			
Ontario	0.918	0.577–1.459	0.7171
Other	ref		
Length in Canada			
Under 6 years	1.332	0.823–2.156	0.5149
6 to less than 15 years	1.299	0.945–1.788	0.5072
At least 15 years	ref		
Marital status			
Married/Common law	0.788	0.517–1.201	0.2678
Other	ref		
Living status			0.4316
With family	0.816	0.492–1.354	
Other	ref		
Highest educational status			
Under university	1.484	1.001–2.201	0.1076
University	1.245	0.893–1.736	0.8846
Master/PhD	ref		
Employment status			
Employed	0.994	0.688–1.435	0.1700
Self-employed	1.277	0.823–1.982	0.5119
Unemployed	1.437	0.889–2.232	0.1825
Other	ref		
Work in healthcare			0.5316
Yes	0.849	0.509–1.416	
No	ref		
Work requiring public contact			0.1223
Yes	1.346	0.923–1.963	
No	ref		
Financial status			
Dissatisfied	2.922	1.966–4.342	<.0001
Neutral	1.659	1.180–2.332	0.8440
Satisfied	ref		
Current health status			

Poor	4.123	1.860–9.135	0.0026
Fair	1.520	1.124–2.054	0.2149
Good	ref		
COVID-19 infectious history			
Yes	1.283	0.180–9.158	0.8037
No	ref		
Fear of COVID-19			
Yes	4.178	2.877–6.068	<.0001
No	ref		
Discriminate			
Perceived/experienced	1.307	0.971–1.759	0.0777
No	ref		
Delay			
Yes	2.333	1.572–3.462	<.0001
Non-response about delay	ref		
Social Loneliness Score	1.447	1.354–1.545	<.0001

Abbreviations: Delay. Delayed access to treatment/health assessment; CPDI. COVID-19 Peritraumatic Distress Index; 95% CI. 95% Confidence interval; OR, Odd ratios.

Next, we utilized multiple imputed datasets to estimate parameter coefficients in multivariable logistic regression analysis. Table 3 presents risk factors associated with mild-to-severe CPDI from multivariate logistic regression model. Selected risk factors were derived from the LASSO logistic regression model, and multivariate logistic regression models were used to yield odd ratios, as detailed in Supplemental Material—S2. In multivariate regression analysis, fear of COVID-19 was positively associated with the odds of mild-to-severe CPDI (OR = 1.604, 95% CI: 1.293–1.989, $p <$ .0001), indicating that there was a 60.4% increase in the odds of mild-to-severe CPDI if individuals feared contracting COVID-19 compared to their counterparts. The odds of mild-to-severe CPDI in participants who experienced delayed access to treatment/health assessment were 1.362 times higher than that in those without reporting these experiences (OR = 1.362, 95% CI: 1.078–1.720, $p = 0.0095$).

Table 3. Risk factors associated with mild-to-severe CPDI level from the multivariate logistic regression model.

Variables	Completed cases analysis			Imputed cases analysis		
	OR	95% CI	p-value	OR	95% CI	p-value
Age						
Under 35	1.946	0.858–4.411	0.3016	1.317	0.734–2.363	0.3551
35-44	1.534	0.802–2.934	0.7602	1.111	0.723–1.706	0.6307
45-54	1.510	0.897–2.540	0.7458	1.065	0.780–1.455	0.6899
55-64	1.343	0.771–2.339	0.7201	0.952	0.666–1.361	0.7867
65 or above	ref			ref		
Length in Canada						
Under 6 years	1.339	0.771–2.339	0.6733	1.108	0.759–1.616	0.5961
6 to less than 15 years	1.403	0.924–2.129	0.3770	1.120	0.844–1.486	0.4307
At least 15 years	ref			ref		
Highest educational status						
Under university	1.303	0.793–2.143	0.2299	1.170	0.880–1.556	0.2797
University	0.999	0.661–1.510	0.4690	0.943	0.743–1.196	0.6263
Master/PhD	ref			ref		
Financial status						
Dissatisfied	1.314	0.803–2.150	0.3736	1.133	0.852–1.507	0.3910
Neutral	1.168	0.776–1.758	0.9176	1.004	0.792–1.272	0.9757
Satisfied	ref			ref		

Fear of COVID-19						
Yes	2.617	1.694–4.041	<.0001	1.604	1.293–1.989	<.0001
No	ref			ref		
Delay						
Yes	1.900	1.184–3.048	0.0078	1.362	1.078–1.720	0.0095
Non-response about delay	ref			ref		
Social Loneliness Score	1.384	1.291–1.483	<.0001	1.408	1.314–1.508	<.0001
Work requiring public contact						
Yes	1.245	0.782–1.982	0.3563	-	-	-
No	ref			-	-	-
Current health status						
Poor	-	-	-	1.529	0.815–2.869	0.1860
Fair	-	-	-	0.782	0.544–1.124	0.1838
Good	-	-	-	ref		

Abbreviations: Delay. Delayed access to treatment/health assessment; CPDI. COVID-19 Peritraumatic Distress Index; 95% CI. 95% Confidence interval; OR, Odd ratios.

There was a positive association between the odds of mild-to-severe CPDI and social loneliness score (OR = 1.408, 95%CI: 1.314–1.508, p < .0001). This means that an increase in social loneliness score of 1 point was associated with 40.8% increase in the odds of mild-to-severe psychological distress. However, there was an insignificant association between the odds of mild-to-severe CPDI and sociodemographic covariates (including age, length in Canada, highest educational status, financial status, and current health status).

3.4. Sensitivity Analysis

We also conducted Completed Case Analysis (CCA) using completed datasets for a multivariate logistic regression model (Table 3 and Supplemental material—S2), which allows us to identify influences of missing data on estimates. Findings from the CCA in Table 3 showed that fear of COVID-19 (OR = 2.617, 95% CI: 1.694–4.041, p < .0001), delayed access to treatment/health assessment (OR = 1.900, 95% CI: 1.184–3.048, p = 0.0078) and social loneliness score (OR = 1.384, 95% CI: 1.291–1.483, p < .0001) were positively associated with the odds of mild-to-severe CPDI.

The CCA produced greater odd ratios and 95% confidence intervals for fear of COVID-19 (OR = 2.617, 95% CI: 1.694–4.041) and delayed access to treatment/health assessment (OR = 1.900, 95% CI: 1.184–3.048) compared to multiple imputation approach (OR = 1.604, 95% CI: 1.293–1.989) and (OR = 1.362, 95% CI: 1.078–1.720), respectively (see Table 3). This discrepancy might be attributed to potential biases and reduced power in the CCA, which resulted from an exclusion of cases with missing data (Jonathan et al., 2009). Jonathan et al. (2009) noted that multiple imputation along with an assumption of missing at random can correct biases that cause by the CCA. As a result, findings from multiple imputation are more likely to be close to true values than those obtained from the CCA.

4. Discussion

In this study, we found that fear of COVID-19, delayed access to treatment/health assessment, and social loneliness score were positively associated with mild-to-severe CPDI in Chinese immigrants in Canada during the second wave of the pandemic.

The high prevalence of COVID-19 phobia was reported around the world. Kennedy el al. (2020) revealed that high level of COVID-19 phobia was experienced among cancer patients (66%), caregivers (72.8%), and healthcare workers (41.6%) in Singapore. Cuiyan et al. (2020) showed that about 75.2% of general population in China feared that their family members would be infected by COVID-19. A 2020 Canadian poll demonstrated a high proportion of fear of contracting COVID-19, with 66% of Canadians concerned about themselves and 76% of Canadians worrying about their family members contracting the virus (Laura, 2020). We revealed that worries about personally or

their family members contracting COVID-19 are a risk of psychological distress among Chinese individuals in Canada. This finding is aligned with many previous studies' results (Linke et al., 2022; Sek et al., 2023; Nicole et al., 2021; Mabel et al., 2022; Orhan et al., 2021), which indicated a strong relationship between fear of COVID-19 virus and psychological consequences. Proliferation of negative and unreliable news (Mabel et al., 2021; Nina et al., 2020), COVID-19-related uncertainties (Mabel et al., 2021; Nina et al., 2020; Sek et al., 2023), having friends or family members infected by virus or deceased from COVID-19 (Orhan et al., 2021) might exacerbate fear of COVID-19. Some studies found that adaptive coping approaches, reliable and updated health information, and preventive health measures might mitigate fear of COVID-19 and psychological distress (Sek et al., 2023; Mable et al., 2021; Wang et al., 2020). Hence, public health agencies play an important role in providing accurate COVID-19-related information to general population. COVID-19 information from credible sources may enhance understanding of COVID-19 and well-planned preparations to prevent infection, thus ultimately alleviate COVID-19 phobia.

Loneliness is a well-known predictor of psychological distress both pre-pandemic (Constanca et al., 2006) and during the pandemic (Nick et al., 2022; Rita et al., 2022; Lisa A et al., 2021). Lixia, Linke, Kesaan, et al. (2022) found a negative relationship between loneliness and mental well-being among Chinese immigrants in Canada during the pandemic. Consistent with their findings, the current study has identified a significant impact of social loneliness on psychological distress among this population in Canada during the second wave of the pandemic. Moreover, while unmet mental health needs and seeking mental health support significantly escalated among those experiencing loneliness since the lockdown (Shen, 2023; Bao et al., 2021), evidence suggested a low rate of mental health services utilization among immigrants due to language barriers, stigma, cultural difference, inadequate health information, and difficulties in navigating the health care system (Weam et al., 2020; Ruo et al., 2023). It is necessary to promote or develop psychological programs or mental health supports tailored to specific immigrant populations.

In our study, delayed access to treatment/health assessment due to COVID-19 was a predictor of psychological distress among Chinese immigrants in Canada. Mehrunnisa et al. (2024) found that delayed access to care during the pandemic resulted in poor mental health among Canadian residents, but specific impact on Chinese immigrants was not clear. Our findings help demonstrate extend to what delayed access to health services on Chinese immigrants' psychological distress in Canada amidst the COVID-19 pandemic. Future studies are required to explore barriers to care at multiple levels for this population. Virtual care was adopted quickly to prevent interruptions in access to care due to the pandemic. However, Patrick et al. (2022) revealed that infrastructure, regulatory, and coverage policies for these virtual health services were barriers of implementing virtual care. Additionally, older people, those with challenges in online usage, concerns around personal health privacy and security, and coverage for virtual services were common barriers for Canadian residents when attempting to use virtual care (Patrick et al., 2022). Janette et al. (2023) also found that virtual care use was lower among older immigrants in Ontario, Canada during the pandemic, particularly those from "family class immigrants" and those with lower competency in English. Policymakers and healthcare providers should consider these factors to improve virtual care services for targeted populations.

Although birthplace, gender, financial status, and current health status were not significantly associated with mild-to-severe CPDI in multivariate logistic regression analysis, they significantly impacted psychological distress in univariate logistic regression analysis. Additionally, we did not find an association between perceived/experienced discrimination and psychological distress among Chinese immigrants in Canada during the second wave of the pandemic. This finding contrasts with previous studies (Lixia, Linke, Kesaan, et al., 2022; Lixia, Kesaan, Ling et al., 2022), which found a strong influence of discrimination on psychological distress. Hence, these factors should not be negligible when assessing psychological distress among Chinese immigrants in Canada.

5. Strengths and Limitations

Our study provided important evidence how delayed access to treatment/health assessment on psychological distress in Chinese immigrants in Canada during the pandemic. Our study also confirms the strong negative impact of COVID-19 phobia and social loneliness on mental well-being in this population.

Literature showed that there are relationships among discrimination, sociodemographic backgrounds, delayed access to care, and loneliness (Linke et al., 2022; Lixia, Linke, Kesaan, et al., 2022; Lixia, Kesaan, Ling et al., 2022), which might lead to a potential multicollinearity among covariates in the logistic regression model, logistic LASSO regression could address this issue in our model building.

The current study has some limitations. First, most participants were from Ontario, which might not represent for the total Chinese population in Canada. Second, data collection through online survey might pose selection bias when individuals who could not have internet connection or do not use electronic gadgets under-represented in this sample study. However, online survey was the appropriate approach for us to collect data during the pandemic. Third, this study can suffer information bias (e.g., social desirability or recall bias) as the nature of self-report measures. Convenient sampling procedure also limits the representation of the target population. Therefore, the study's findings should be interpreted cautiously when attempting to generalize the results for the total Chinese immigrant in Canada.

6. Conclusion

Fear of COVID-19, social loneliness, delayed access to treatment/health assessment are risks of psychological distress among Chinese immigrants in Canada amidst COVID-19 pandemic.

Public health agencies and policy makers need to handle these detrimental effects on mental well-being in vulnerable immigrants. Efforts can include reliable health information from credible sources, mental health supports and psychological programs, virtual care tailored to immigrants that are available and accessible for these populations.

References

Bao, L., Li, W.-T., & Zhong, B.-L. (2021). Feelings of loneliness and mental health needs and services utilization among Chinese residents during the COVID-19 epidemic. *Globalization and Health*, *17*(1). https://doi.org/10.1186/s12992-021-00704-5

Bender, J. L., Scruton, S., Wong, G., Abdelmutti, N., Berlin, A., Easley, J., Liu, Z. A., McGee, S., Rodin, D., Sussman, J., & Urquhart, R. (2024). Virtual follow-up care among breast and prostate cancer patients during and beyond the COVID-19 pandemic: Association with distress. *Cancer Medicine*, *13*(4), e6948. https://doi.org/10.1002/cam4.6948

Best, L. A., Law, M. A., Roach, S., & Wilbiks, J. M. P. (2021). The psychological impact of COVID-19 in Canada: Effects of social isolation during the initial response. *Canadian Psychology / Psychologie canadienne*, *62*(1), 143–154. https://doi.org/10.1037/cap0000254

Blazek, K., van Zwieten, A., Saglimbene, V., & Teixeira-Pinto, A. (2021). A practical guide to multiple imputation of missing data in nephrology. *Kidney International*, *99*(1), 68–74. https://doi.org/10.1016/j.kint.2020.07.035

Brual, J., Chu, C., Fang, J., Fleury, C., Stamenova, V., Bhattacharyya, O., & Tadrous, M. (2023). Virtual care use among older immigrant adults in Ontario, Canada during the COVID-19 pandemic: A repeated cross-sectional analysis. *PLOS Digital Health*, *2*(8), e0000092. https://doi.org/10.1371/journal.pdig.0000092

Canadian Institute for Health Information. (2021, December 9*). COVID-19's impact on hospital services | CIHI.* Www.cihi.ca. https://www.cihi.ca/en/covid-19-resources/impact-of-covid-19-on-canadas-health-care-systems/hospital-services

Canadian Institute for Health Information. (2022, March 24). *Virtual care: A major shift for physicians in Canada | CIHI. (n.d.).* Www.cihi.ca. https://www.cihi.ca/en/virtual-care-a-major-shift-for-physicians-in-canada

Canadian Medical Association. (2021, November). A struggling system Understanding the health care impacts of the pandemic. Deloitte. https://digitallibrary.cma.ca/viewer?file=%2Fmedia%2FDigital_Library_PDF%2F2021%2520A%2520struggling%2520system%2520EN.pdf#page=1

Caston, E. N., Lawhon, V. M., Smith, K. L., Gallagher, K., Angove, R., Anderson, E., Balch, A., Azuero, A., Huang, C. S., & Rocque, G. B. (2021). Examining the association among fear of COVID-19, psychological distress, and delays in cancer care. *Cancer Medicine*, *10*(24), 8854–8865. https://doi.org/10.1002/cam4.4391

Chair, Y. S., Chien, W. T., Liu, T., Lam, L., Cross, W., Banik, B., & Rahman, M. A. (2021). Psychological Distress, Fear and Coping Strategies among Hong Kong People During the COVID-19 Pandemic. *Current Psychology*. https://doi.org/10.1007/s12144-021-02338-7

Feng YR., Krygsman, A., Vaillancourt, T., & Vitoroulis, I. (2023). Experiences of racial microaggression among immigrant and Canadian-born young adults: Effects of double stigma on mental health and service use. *International Journal of Social Psychiatry.* https://doi.org/10.1177/00207640231174374

Fofana, N. K., Latif, F., Sarfraz, S., Bilal, Bashir, M. F., & Komal, B. (2020). Fear and agony of the pandemic leading to stress and mental illness: An emerging crisis in the novel coronavirus (COVID-19) outbreak. *Psychiatry Research*, *291*(291), 113230. https://doi.org/10.1016/j.psychres.2020.113230

Frey, K. M., Ellis, A. E., Zeligs, K., Chapman-Davis, E., Thomas, C., Christos, P. J., Kolev, V., Prasad-Hayes, M., Cohen, S., Holcomb, K., & Blank, S. V. (2020). Impact of the coronavirus disease 2019 pandemic on the quality of life for women with ovarian cancer. *American Journal of Obstetrics and Gynecology*, *223*(5), 725.e1–725.e9. https://doi.org/10.1016/j.ajog.2020.06.049

Gierveld, J. D. J., & Tilburg, T. V. (2006). A 6-Item Scale for Overall, Emotional, and Social Loneliness: Confirmatory Tests on Survey Data. *Research on Aging*, *28*(5), 582–598. https://doi.org/10.1177/0164027506289723

Gierveld, J.D. & Tilburg, T.V. (2010). The De Jong Gierveld short scales for emotional and social loneliness: tested on data from 7 countries in the UN generations and gender surveys. *European Journal of Ageing*, *7*(2), 121–130. https://doi.org/10.1007/s10433-010-0144-6

Hosmer D.W., Lemeshow S., & Sturdivant R.X. (2013, April). *Applied Logistic Regression*. John Wiley & Sons. ISBN: 978-0-470-58247-3

Khattar, J., Anderson, L. N., De Rubeis, V., de Groh, M., Jiang, Y., Jones, A., Basta, N. E., Kirkland, S., Wolfson, C., Griffith, L. E., Raina, P., & Canadian Longitudinal Study on Aging (CLSA) Team (2023). Unmet health care needs during the COVID-19 pandemic among adults: a prospective cohort study in the Canadian Longitudinal Study on Aging. *CMAJ open*, *11*(1), E140–E151. https://doi.org/10.9778/cmajo.20210320

Koçak, O., Koçak, Ö. E., & Younis, M. Z. (2021). The Psychological Consequences of COVID-19 Fear and the Moderator Effects of Individuals' Underlying Illness and Witnessing Infected Friends and Family. *International Journal of Environmental Research and Public Health*, *18*(4). https://doi.org/10.3390/ijerph18041836

Latikka, R., Koivula, A., Oksa, R., Savela, N., & Oksanen, A. (2021). Loneliness and psychological distress before and during the COVID-19 pandemic: Relationships with social media identity bubbles. *Social Science & Medicine*, 293, 114674. https://doi.org/10.1016/j.socscimed.2021.114674

Lawson, A. K., McQueen, D. B., Swanson, A. C., Confino, R., Feinberg, E. C., & Pavone, M. E. (2021). Psychological distress and postponed fertility care during the COVID-19 pandemic. *Journal of Assisted Reproduction and Genetics*, *38*(2), 333–341. https://doi.org/10.1007/s10815-020-02023-x

Lee, A.D.Y., Wang, P.P., Zhang, W., & Yang, L. (2022). COVID-19 Peritraumatic Distress and Loneliness in Chinese Residents in North America: The Role of Contraction Worry. *International Journal of Environmental Research and Public Health*, *19*(13), 7639–7639. https://doi.org/10.3390/ijerph19137639

Lee, K. J., Roberts, G., Doyle, L. W., Anderson, P. J., & Carlin, J. B. (2016). Multiple imputation for missing data in a longitudinal cohort study: a tutorial based on a detailed case study involving imputation of missing outcome data. *International Journal of Social Research Methodology*, *19*(5), 575–591. https://doi.org/10.1080/13645579.2015.1126486

Leigh, J. P., Moss, S. J., Tiifu, F., FitzGerald, E., Brundin-Mathers, R., Dodds, A., Brar, A., de Grood, C. M., Stelfox, H. T., Fiest, K. M., & Ng-Kamstra, J. (2022). Lived experiences of Asian Canadians encountering discrimination during the COVID-19 pandemic: a qualitative interview study. *CMAJ Open*, *10*(2), E539–E545. https://doi.org/10.9778/cmajo.20220019

Li, Y., Lu, F., & Yin, Y. (2022). Applying logistic LASSO regression for the diagnosis of atypical Crohn's disease. Scientific Reports, *12*(1). https://doi.org/10.1038/s41598-022-15609-5

Lin, S. (2023). The "loneliness epidemic", intersecting risk factors and relations to mental health help-seeking: A population-based study during COVID-19 lockdown in Canada. *Journal of Affective Disorders*, 320. https://doi.org/10.1016/j.jad.2022.08.131

Luo, Y., Li, Q., Jeong, H., & Cheatham, L. (2022). The association between social determinants of health and psychological distress during the COVID-19 pandemic: a secondary analysis among four racial/ethnic groups. *BMC Public Health*, *22*(1). https://doi.org/10.1186/s12889-022-14486-x

Marzo, R. R., Ismail, Z., Nu Htay, M. N., Bahari, R., Ismail, R., Villanueva, E. Q., Singh, A., Lotfizadeh, M., Respati, T., Irasanti, S. N., Sartika, D., Mong, P., Lekamwasam, S., Thapa, B. B., Kucuk Bicer, B., Aye, S. S., Songwathana, K., El-Abasiri, R. A., Ahmad, A., & Nikmat, A. (2021). Psychological distress during pandemic COVID-19 among adult general population: Result across 13 countries. *Clinical Epidemiology and Global Health*, 10, 100708. https://doi.org/10.1016/j.cegh.2021.100708

Musoro, J. Z., Zwinderman, A. H., Puhan, M. A., ter Riet, G., & Geskus, R. B. (2014). Validation of prediction models based on lasso regression with multiply imputed data. *BMC Medical Research Methodology, 14*(1). https://doi.org/10.1186/1471-2288-14-116

Ng, K. Y. Y., Zhou, S., Tan, S. H., Ishak, N. D. B., Goh, Z. Z. S., Chua, Z. Y., Chia, J. M. X., Chew, E. L., Shwe, T., Mok, J. K. Y., Leong, S. S., Lo, J. S. Y., Ang, Z. L. T., Leow, J. L., Lam, C. W. J., Kwek, J. W., Dent, R., Tuan, J., Lim, S. T., & Hwang, W. Y. K. (2020). Understanding the Psychological Impact of COVID-19 Pandemic on Patients With Cancer, Their Caregivers, and Health Care Workers in Singapore. *JCO Global Oncology*, 6, 1494–1509. https://doi.org/10.1200/go.20.00374

Osman, L. (2020, April 7). *Fear of COVID-19 is growing, suggests new poll of Canadians*. CP24. https://www.cp24.com/news/fear-of-covid-19-is-growing-suggests-new-poll-of-canadians-1.4885867?cache=xsfskdnkckf

Oti-Boadi, M., Malm, E., Dey, N. E. Y., & Oppong, S. (2021). Fear of COVID-19: Psychological distress and coping among university students in Ghana. *Current Psychology*. https://doi.org/10.1007/s12144-021-02267-5

Patterson, P. B., Roddick, J., Pollack, C. A., & Dutton, D. J. (2022). Virtual care and the influence of a pandemic: Necessary policy shifts to drive digital innovation in healthcare. *Healthcare Management Forum*, 35(5), 084047042211100. https://doi.org/10.1177/08404704221110084

Paul, C., Ayis, S., & Ebrahim, S. (2006). Psychological distress, loneliness and disability in old age. *Psychology, Health & Medicine*, *11*(2), 221–232. https://doi.org/10.1080/13548500500262945

Qiu, J., Shen, B., Zhao, M., Wang, Z., Xie, B., & Xu, Y. (2020). A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *General Psychiatry*, *33*(2), e100213. https://doi.org/10.1136/gpsych-2020-100213

R.T.N, G., Cynthia, B., Eddy, F., Robert, F., Melanie, G., Curtis, J., R. Jeremy, K., Samuel, M., Kusum, M., Tracey, M., Bojan, P., Teddie, T. (2022). *COVID-19 pandemic: the impact on Canada's intensive care units.* Royal Society of Canada. https://rsc-src.ca/sites/default/files/ICU%20PB_EN_0.pdf

Rodriguez, M. G., Kumar, D., & Patel, M. I. (2023). "I Have Constant Fear": A National Qualitative Study on the Impact of COVID-19 on Cancer Care and Potential Solutions to Improve the Cancer Care Experience During the COVID-19 Pandemic. *JCO Oncology Practice*, *19*(7), 427–434. https://doi.org/10.1200/op.22.00550

Shiraz, M., Capaldi, C. A., Ooi, L. L., & Roberts, K. C. (2024). Health care barriers and perceived mental health among adults in Canada during the COVID-19 pandemic: a population-based cross-sectional study. *Health Promotion and Chronic Disease Prevention in Canada*, *44*(1), 21–33. https://doi.org/10.24095/hpcdp.44.1.03

Sieffien, W., Law, S., & Andermann, L. (2021). Immigrant and refugee mental health during the COVID-19 pandemic: Additional key considerations. *Canadian Family Physician*. https://www.cfp.ca/news/2020/06/23/06-23-1

Simpson, J. N., Oliffe, J. L., Rice, S. M., Kealy, D., Seidler, Z. E., & Ogrodniczuk, J. S. (2022). Social Disconnection and Psychological Distress in Canadian Men During the COVID-19 Pandemic. American Journal of Men's Health, *16*(1), 155798832210781. https://doi.org/10.1177/15579883221078145

Statistics Canada. (2022, November 16). *Difficulties accessing health care in Canada during the COVID-19 pandemic: Comparing individuals with and without chronic conditions.* Www150.Statcan.gc.ca. https://www150.statcan.gc.ca/n1/pub/82-003-x/2022011/article/00002-eng.htm

Sterne, J. A. C., White, I. R., Carlin, J. B., Spratt, M., Royston, P., Kenward, M. G., Wood, A. M., & Carpenter, J. R. (2009). Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. *BMJ*, *338*, b2393–b2393. https://doi.org/10.1136/bmj.b2393

Takeuchi, E., Kota Katanoda, Cheli, S., Goldzweig, G., & Tabuchi, T. (2022). Restrictions on healthcare utilization and psychological distress among patients with diseases potentially vulnerable to COVID-19; *the JACSIS 2020 study*. *10*(1), 229–240. https://doi.org/10.1080/21642850.2022.2037429

Van Buuren, S., Brand, J. P. L., Groothuis-Oudshoorn, C. G. M., & Rubin, D. B. (2006). Fully conditional specification in multivariate imputation. *Journal of Statistical Computation and Simulation*, *76*(12), 1049–1064. https://doi.org/10.1080/10629360600810434

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China. *International Journal of Environmental Research and Public Health*, *17*(5), 1729. https://doi.org/10.3390/ijerph17051729

What is lasso regression? | IBM. (2024, January 18). Www.ibm.com. https://www.ibm.com/topics/lasso-regression

Wright, S. E., Walmsley, E., Harvey, S. E., Robinson, E., Ferrando-Vivas, P., Harrison, D. A., Canter, R. R., McColl, E., Richardson, A., Richardson, M., Hinton, L., Heyland, D. K., & Rowan, K. M. (2015, December 1). *Missing data and imputation.* Www.ncbi.nlm.nih.gov; NIHR Journals Library. https://www.ncbi.nlm.nih.gov/books/NBK333183/

Yang, L., Kandasamy, K., Na, L., Zhang, W., & Wang, P. (2024). Perceived and experienced anti-Chinese discrimination and its associated psychological impacts among Chinese Canadians during the wave 2 of the COVID-19 pandemic. *Psychology, Health & Medicine*, *29*(1), 108–125. https://doi.org/10.1080/13548506.2022.2142947

Yang, L., Yu, L., Kandasamy, K., Wang, Y., Shi, F., Zhang, W., & Wang, P. P. (2022). Non-Pathological Psychological Distress among Mainland Chinese in Canada and Its Sociodemographic Risk Factors amidst the Pandemic. *Healthcare*, *10*(11), 2326. https://doi.org/10.3390/healthcare10112326

Ye, Y., Wang, J., Cai, S., Fu, X., & Ji, Y. (2022). Psychological distress of cancer patients caused by treatment delay during the COVID-19 pandemic in China: A cross-sectional study. *Psycho-Oncology*, *31*(9), 1607–1615. https://doi.org/10.1002/pon.5946

Yu, L., Lecompte, M., Zhang, W., Wang, P., & Yang, L. (2021). Sociodemographic and COVID-Related Predictors for Mental Health Condition of Mainland Chinese in Canada Amidst the Pandemic. *International Journal of Environmental Research and Public Health*, *19*(1), 171. https://doi.org/10.3390/ijerph19010171

Zaini, A. M., Mohd Zain, A., Din, N. M., Mustapha, M., & Sidi, H. (2023). The psychological status of patients with delayed intravitreal injection for treatment of diabetic macular edema due to the COVID-19 pandemic. *PloS One*, *18*(8), e0290260. https://doi.org/10.1371/journal.pone.0290260

Zhong, B.-L., Yuan, M.-D., Li, F., & Sun, P. (2023). The Psychological Network of Loneliness Symptoms Among Chinese Residents During the COVID-19 Outbreak. *Psychology Research and Behavior Management*, *16*, 3767–3776. https://doi.org/10.2147/PRBM.S424565