

The Unique Impacts of COVID-19 on Low-Income Canadian Mother's Mental Health Profiles: A Latent Transition Analysis

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Abstract

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Introduction

Mothers who experience mental health problems often experience the co-occurrence of stress, anxiety, and depression (Ramakrishna et al., 2019). Symptoms of maternal stress, anxiety, and depression are associated with poor physical health (Slomian et al., 2019), disrupted work performance (Napora et al., 2018), social relationship problems (Jones & Coast, 2013), and dysfunctional parenting (Crosby Budinger et al., 2013).

Furthermore, because mothers are often the primary caregivers for their children, poor maternal mental health can also negatively impact their children’s mental health, resulting in internalizing (emotional) and externalizing (disruptive) problems (Arroyo-Borrell et al., 2017).

While the negative implications of COVID-19 disruptions on maternal mental health have been documented (Babore et al., 2023; Burns et al., 2022), it is widely acknowledged that further investigation is needed to fully understand the unique impacts and identify potential interventions (Wade et al., 2023). Specifically, it is crucial to investigate the potential negative effects of COVID-19 on maternal mental health for at-risk populations, such as low-income and diverse families, who may face additional stressors and barriers to accessing resources for support (Whitehead et al., 2021). Therefore, the current study uses latent transition analysis to investigate how low-income mothers in Canada’s largest city transited in mental health profiles prior to during COVID-19.

Impacts of COVID-19 on Maternal Mental Health

On March 17, 2020, Ontario, Canada, went into a state of emergency in response to COVID-19. Public health measures, including physical and social distancing, quarantining, and closure of communities, were implemented to stop the virus’s spread, forcing families to remain at home for months (Lee, 2020). The pandemic shutdown led to many Canadians losing their jobs or working fewer hours than usual, with many working from home (Lemieux et al., 2020). Early in the pandemic, the percentage of mothers working declined more than fathers due to domestic and child care responsibilities falling more heavily on mothers (Alon et al., 2020). Families with school-aged children were also affected by the transition to remote learning (Courtney et al., 2020; Burns et al., 2022; Wang et al., 2020), with mothers being forced to adopt the role of teachers (Alon et al., 2020; Burns et al., 2022). Recent research has found that stress around parenting practices was significantly correlated with maternal overall stress levels (Babore et al., 2023). Furthermore, the pandemic has disproportionately impacted low-income populations (Gross et al., 2020).

Numerous studies described significant declines in maternal mental health during COVID-19, including an increase in depression (Racine et al., 2021), anxiety (Davenport et al., 2020), and stress (Lee et al., 2020). However, maternal mental health is a highly idiosyncratic construct shaped by the unique combination of mothers’ biological, psychological, and social factors. In turn, maternal mental health onset, characterization, and trajectory vary from person to person, resulting in different mental health patterns and profiles (Campbell et al., 2009; Sun et al., 2019; Wardi-Zonna, K., & Wardi, 2020; Weiss et al., 2021). Prior to the pandemic, research employing a person-centred approach identified unique subgroups of mental health experiences. For instance, using Latent Profile Analysis (LPA), Skipstein and colleagues (2010) found six trajectories’ profiles based on anxiety and depression scores among Norwegian mothers collected when their children were 18 months to 14.5 years old: ‘No symptoms’; ‘Low’; ‘Moderate-low’; ‘Moderate’ ‘High-chronic’; ‘Low-rising.’ Similarly, Campbell et al. (2009) employed a Latent Class Analysis (LCA) to model the trajectories of maternal depressive symptoms over 12 years and identified five classes: “Never depressed,”; “Stable subclinical,”; “Early-decreasing”; “Moderately elevated,”; “Chronic.”

The prevailing one-size fits all approach to pandemic research poses several problems, including masking diverse responses to the pandemic and failing to tailor preventative interventions for those at the highest risk accordingly. In addition, identifying heterogeneous profiles makes it possible to understand the complexities of maternal mental health more accurately and, in turn, determine what the pre-pandemic risk and protective factors (e.g., sociodemographic, and familial characteristics) are related to mothers’ mental health profile membership. For instance, relative to mothers without symptoms of depression, Campbell et al. (2009) found that mothers with elevated symptoms were less likely to be married, educated, and in good physical health. Similarly, the Skipstein (2010) study found that mothers with chronic anxiety and depression were significantly less educated, had less paid work, and were less likely to live with a partner than mothers in the other profiles. In addition, several studies have found a link between maternal mental health and mental health difficulties in children (Curci et al., 2022). For example, Skipstein et al. (2012) found that child-related stressors were among the strongest predictors of mothers in the high-chronic group.

Child temperament has also been associated with parental depression (Tolja, Radoš, & Anđelinović, 2020) during COVID-19 (Fiske, Scerif, & Holmboe, 2022). However, there is limited research on the associations between children’s temperament across maternal mental health symptoms (i.e., stress and anxiety) during COVID-19. More research is needed to examine whether these relationships are found in low-income mothers. Interestingly, although research converges on the impacts of parenting practices on maternal mental health (Hetherington et al., 2018; Jones et al., 2021; Lagacé-Seguin & d’Entremont, 2006), limited research has been done to examine the role of parenting on subgroups of maternal mental health experiences prior to and during COVID-19, in low-income mothers. A better understanding of the heterogeneity within maternal mental health and its correlates with their children’s temperament and mental health may assist clinicians and policymakers in providing more effective psychological interventions to help mothers improve their mental health (Sun et al., 2019).

A growing body of research is being conducted on the heterogeneous mental health effects of COVID-19. Pierce et al. (2021), for example, identified five mental health trajectories of a large, representative sample of the UK general population during the first six months of the pandemic: “Consistently poor,”; “Deteriorating,”; “Recovery,”; “Consistently good”; “Consistently very good.” Accounting for pre-pandemic mental health is critical in investigating how COVID-19 affected mothers since life drastically changed for most of the population after onset. Zalewski et al. (2022) employed growth mixture modelling for parental mental health indicators (comprised of stress, anxiety, depression, and loneliness prior to and during COVID-19) and found four trajectories: “Persistently low mental-health symptoms”; “Increasing mental-health symptoms”; “Chronically high mental-health symptoms”; “Decreasing mental-health symptoms.” Similarly, Saleem et al. (2022) used latent profile analysis to descriptively examine the maternal mental health of low-income mothers residing in Canada. They identified patterns of mental health using prior and during COVID-19 mental health scores. The authors found a profile where a small group of mothers had lower (i.e., better) mental health scores during COVID-19 than before. More mothers were identified in profiles where mental health scores tended to be stable or higher during the pandemic than before. While this study aimed to investigate the relationship between children’s mental health, they did not examine the role of children’s temperament (a more stable indicator of children’s behaviour) and their parenting practices on maternal mental health. Furthermore, studies using longitudinal LPA can descriptively report the patterns of outcomes across multiple time points. However, they assume static profile membership and cannot directly model mental health status changes over time (Nylund-Gibson et al., 2022; Wang & Wang, 2020, p. 373). In contrast, latent transition analysis (LTA) directly tests changes over time in the membership of latent profiles (Collins & Lanza, 2010). LTA allows the investigation of initial status and transitions between profiles from earlier to later time points (Hancock & Mueller, 2010). Thus, LTA allows for a more nuanced understanding of stability and change in mental health development over time that more closely aligns with research questions regarding mental health changes prior to and during the pandemic (Nylund-Gibson et al., 2022).

To date, however, no study has identified the transitions of mental health functioning prior to and during COVID-19 and how prior mental health membership predicts the changes in mental health during a pandemic. Once identified, this study will examine the unique profiles of mental health transitions. Furthermore, this study aims to investigate the role of maternal parenting practices, children’s temperament, and child mental health related to low-income mothers’ unique mental health experiences. Specifically, this study aims to address the following research questions:

What are the maternal mental health profiles prior to and during COVID-19?

This research question is exploratory since no studies have investigated the differences in maternal mental health profile membership in a sample of low-income Canadian mothers before and during the COVID-19 pandemic. Nonetheless, we predict that there will be mothers with good mental health and those who will face mental health challenges at both time points (Saleem et al., 2022). Therefore, it is possible that there the number of mental health profiles will vary between the two time periods. However, given the exploratory nature of this work, we did not make directional hypotheses about the number of profiles.

How do low-income mothers' mental health profiles shift from prior to during COVID-19?

This research question is exploratory, as no studies have employed latent transition analysis for low-income Canadian mothers. Nonetheless, we predict 1) marked heterogeneity in mental health transition probabilities (e.g., a variety of stable and shifting latent status latent transitions) and 2) tendencies to transition to profiles with more significant mental health concerns during the pandemic.

Are mothers' demographic and family characteristics (i.e., parenting practices and children's temperament and mental health) associated with mental health profiles prior to and during COVID-19?

We hypothesize that mothers who had negative parenting practices (higher over protection and hostile reactions, and reduced self-efficacy and perceived impact), children with more fearful and angry temperaments, and higher mental health challenges prior to COVID-19 will be at greater risk, increasing the probability of starting and transitioning into worse maternal mental health profiles.

Methods

Participants

This study utilized data from a larger research project that examines the effects of having access to subsidized childcare for low-income families. The study was conducted in collaboration with the Child Services division at the City of Toronto. ECEC subsidies in Toronto are allocated to low-income parents who work or study full-time. A total of 297 families had data points from both prior to COVID-19 (when children were 30-42 months) and during COVID-19 waves of data collection, which was collected from May to November 2020 (approximately two years post their prior wave of data collection). Of these, eight were fathers and therefore removed. The final sample size used for analysis was 289 low-income mothers of young children. The mothers in this study were largely low-income, with 41.7% making below \$40,000 a year, significantly less than the average household of families living in the city of Toronto (\$104,378.00; City of Toronto, 2018). Almost half the mothers in the sample were married (58.5%), spoke English as a second language (43.0%) and had the highest education level of below a B.A. (54.0%). Mothers identified as Black (33.7%), White (31.2%), Asian (24.7%) or an 'Other' category (10.4%). The study received approval from the (Removed for Review) ethics board.

Data Collection Materials

Demographic Characteristics

Mothers were asked about their income (low income was defined as a family household income of below \$40,000), educational levels (low education was defined as not obtaining a university degree), their relationship status (whether they were married/common-law or not), whether English was their first language, and their identified race (which was stratified based on the sample size of white, black, Asian, and other).

Maternal Mental Health

Maternal mental health was assessed using the following brief measures (1) The Cohen Perceived Stress Scale (PSS-4; Lee, 2012), (2) Maternal General Anxiety Disorder Scale; (GAD-2, Donker et al., 2011), and (3) The Patient Health Questionnaire (PHQ-2, (Lowe et al., 2005) that measures depression, prior to and during COVID-19 (Table 1). The PSS-4 consists of 4 items on a Likert-type scale ranging from 0 (never) to 4 (fairly often). Summed scores are computed and range from 0 to 16. The GAD-2 and PHQ-2 consist of 2 items assessed on a Likert-type scale ranging from 0 (not at all) to 3 (nearly every day), with summed scores ranging from 0 to 6. Maternal mental health cut-offs were determined for anxiety and depression (GAD-2 and PHQ-2) as a value of three or above, as a probable anxiety disorder and high probability of major depressive disorder, respectively (Donker et al., 2011; Lowe et al., 2005). The cut-off value for maternal stress was also a three or above, as it was found to be the average score in a large-scale study of Canadian families (Muhammad & Gagnon, 2010).

Parenting Practices

The Parental Capacities Inventory (PACOTIS) is a self-report questionnaire that assesses parental perceptions and behaviours toward their infant (Bovin et al., 2015). It comprises 28 items that participants rate on a Likert scale ranging from 0 (not at all what I think) to 10 (exactly what I think). The tool has four dimensions: parental self-efficacy, perceived parental impact, parental hostile-reactive behaviours, and parental overprotection. The higher the score, the stronger the perceptions and behaviours. PACOTIS has been found to have high internal consistency, with a Cronbach's alpha coefficient of 0.75 and has demonstrated strong correlations with other measures of parental perceptions towards infants (Črnčec, Barnett, & Matthey, 2010)

Child Mental Health

Child mental health was measured using the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). The SDQ is a 25-item parental-report measure that captures children's mental health. Mothers rated the items on a 3-point Likert scale as either 'Not true' (0), 'Somewhat true' (1) or 'Certainly true' (2). The SDQ is comprised of 5 subscales: 4 'difficulties' subscales including emotional problems (e.g., "Many worries or often seems worried"), conduct problems (e.g., "Often loses temper"), hyperactivity (e.g., "Restless, overactive, cannot stay still for long"), and peer problems (e.g., "Gets along better with adults than with other children"), and 1 prosocial subscale (e.g., "considerate of other people's feelings"). Each subscale contains five items. Because the SDQ has a multi-dimensional 5-factor factor structure and high discriminant validity across the five subscales (Croft et al., 2015), the summed scores for each of the five subscales (ranging from 0 to 10) were used. Additionally, confirmatory factor analysis has supported this 5-factor measurement model (Croft et al., 2015). Note that the prosocial scale was reverse-coded; therefore, higher values reflect more problems with prosocial behaviour.

Child Temperament

The Early Childhood Behavior Questionnaire Short Form - 107 (ECBQ-107). The ECBQ-107 assesses temperament in toddlers ages one to three (Putnam, Garstein & Rothbart, 2006). Two subscales from the short version of the ECBQ (Putnam, Jacobs, Gartstein, & Rothbart, 2010) that load onto the factors fear (8 items) and frustration (6 items) were employed to assess temperament. Parents reported the frequency of their child's fear and frustration over the past two weeks on a Likert-type scale ranging from 1 (never) to 7 (always). Scores were calculated as mean scores for all items applicable to the child. Examples of ECBQ questions in the fear and frustration subscales used in the study include "During every day activities, how often did your child seem frightened for no apparent reason?" and "When told that it was time for bed or a nap, how often did your child get irritable?" respectively. The ECBQ-107 shows high internal consistency for fear and frustration ($\alpha = .73$ for each) and concurrent validity with the standard ECBQ ($r = .73$ and $.75$, respectively) (Putnam et al., 2010).

The Child Behavior Questionnaire – Short Form (CBQ Short Form). CBQ is a parent-report questionnaire that measures temperament in young children (Rothbart, Ahadi, Hersey & Fisher, 2001). The CBQ Short Form contains 94 items across 15 subscales (Putnam & Rothbart, 2006). Parents are asked to rate their observations of their children in the past six months on a 7-point Likert scale ranging from 1 ("extremely untrue of your child") to 7 ("extremely true of your child"); they are also provided with a "not applicable" response for situations they have not observed their child in. The current study used the Anger/Frustration and Fear subscales of the CBQ Short Form, containing six items each. Examples of items from both scales respectively include, "Gets angry when s/he can't find something s/he wants to play with" and "Is afraid of loud noises.". The subscales presented adequate internal consistency ($\alpha = .69 - .78$ & $\alpha = .54 - .60$ respectively; Putnam & Rothbart, 2006). Both subscales showed high correlations with the standard form CBQ ($r = .75$ & $.69$ respectively; Putnam & Rothbart, 2006) and were found to be valid and reliable measures of temperament in pre-school years (de la Osa, Granero, Penelo, Domènech, & Ezpeleta, 2013).

Data Analysis

Analyses were conducted in Mplus 8.8 (Muthén & Muthén, 2017) using Mplus Automation (Hallquist & Wiley, 2018). Mplus' MLR estimator was used with full information maximum likelihood of handling missing

data for unconditional models. The data analyses were conducted in four steps, following guidelines by Ryoo and colleagues (2018). First, Confirmatory Factor Analyses were conducted to examine the properties of maternal mental health assessments in one model (i.e., stress, anxiety, and depression; Appendix A). CFA model fit was assessed using absolute and relative indices. A Root Mean Square Error of Approximation (RMSEA; Steiger & Lind, 1980) of less than .05 to .08, a Tucker-Lewis Index (TLI; 1973) of above .95 and a Comparative Fit Index (CFI; Bender, 1990) above .95 was considered evidence of adequate model fit (see Appendix A for more information).

Then Latent Profile Analyses (LPA; 2-5 models) were estimated separately at each timepoint to investigate configural measurement invariance LPA enumeration was completed using statistical criteria such as Bayesian Information Criteria (BIC), sample-size adjusted BIC (aBIC), bootstrapped likelihood ratio test (BLRT), adjusted Lo-Mendell-Rubin likelihood ratio test (aLMR), standardized entropy, and successful model estimation; substantive considerations such as interpretability and number of students in each latent profile were also considered (Wang & Wang, 2020). Third, unconditional Latent Transition Analyses (LTA) were conducted, testing measurement invariance across time points. Then, conditional LTAs were conducted, incorporating the main effects. Further, longitudinal LPA with formal tests of measurement invariance using corrected likelihood ratio tests comparing the constrained and unconstrained models; BIC was also used to compare these two sets of models (Wang & Wang, 2020). Finally, to avoid local maximum, all LTA start values were increased to 10,000, 2000, and 400 for the longitudinal models (Gillet et al., 2017). Model specification of the LPA and LTA models followed traditional LPA modelling with the assumption of local independence (i.e., a diagonal residual covariance matrix) and item variances constrained equal across profiles.

Finally, we tested differences in family and child characteristics (e.g., children's temperament and mental health measured) across our different profiles within the wave. Due to limited sample sizes within profiles, we did this using a series of ANOVAs. Post-hoc analyses were conducted using Tukey's B or Dunnett's C (based on homogeneity of variance) and chi-square tests. In cases where the homogeneity of variance was met, to account for the unequal sample sizes across the maternal mental health profiles, the harmonic mean was used to measure the central tendency for the ANOVAs (Bortz, 2005; Rankin, 1974). Parenting information was only collected prior to the pandemic and is therefore only included in the comparison across profiles in our earlier wave.

Result

LPA results demonstrated that comparative fit indices continued to improve as additional profiles were added, though aLMR suggested 3-profile prior to Covid-19 and 4-profile post-Covid-19 measurement models (Table 2).

Interpretability of the models support the utilization of 3-profiles prior to Covid-19: the 4-profile prior to Covid-19 results simply break up the below clinical concern profile into two similar below clinical concern profiles. Comparing interpretability of the during Covid-19 3-profile and during Covid-19 4-profile results supports the 4-profile solution given the qualitatively different profiles. Therefore, a 3-profile prior to COVID-19 and 4-profile during COVID-19 model without configural invariance (i.e., LPA profiles without the same number of profiles across timepoints) was selected as the final measurement model (Figure 1).

Pre-COVID-19 Profiles

A total of three maternal mental health profiles were identified prior to COVID-19: (1) Below Clinical Concern, (2) Stressed, Approaching Clinical Concern, and (3) Clinically Depressed and Highly Stressed (Figure 1).

Below Clinical Concern (Profile One). The largest percentage of mothers were in the mental health profile identified as below clinical concern prior to COVID (77.7%). These mothers have been identified as having the lowest anxiety, depression, and stress scores across all other profiles.

Stressed, Approaching Clinical Concern (Profile Two). This profile was comprised of 16.2% of the

mothers in this study. Mothers in this profile were below the clinical cut offs of anxiety and depression, although they had higher scores than the below clinical concern profile. Notably, the stress scores of mothers in this profile were slightly higher than the average Canadian mother's stress scores, prior to COVID-19.

Clinically Depressed and Highly Stressed (Profile Three). There were the fewest mothers identified in this profile (6.5%). The mothers identified in this profile were clinically depressed and had stress scores double the average Canadian mother.

During COVID-19 Profiles

A total of four maternal mental health profiles were identified during COVID-19: (1) Below Clinical Concern, (2) Clinically Depressed and Highly Stressed, (3) Stressed, Approaching Clinical Concern, and (4) Highest Clinical Concern (Figure 1).

Below Clinical Concern (Profile One). The largest percentage of mothers were in the mental health profile identified as below clinical concern during the pandemic (49.4%). Like the Below Clinical Concern Profile prior to COVID-19 mothers in this profile had the lowest anxiety, depression, and stress scores across all other profiles. However, this group has slightly lower anxiety and stress, with slightly higher depression scores than the similar profile prior to COVID-19.

Clinically Depressed and Highly Stressed (Profile Two). The mothers identified in this profile (10.7%) had clinical depression and double that average stress rates of Canadian mothers. This profile is similar to the clinically depressed and highly stressed profile prior to COVID-19, has slightly lower depression scores.

Stressed, Approaching Clinical Concern (Profile Three). Over a quarter (27.9%) of mothers in this study during COVID-19 were identified as stressed and approaching clinical concern. This profile is comparable to the stressed, approaching clinical concern prior to COVID-19 but has slightly lower depression scores.

Highest Clinical Concern (Profile Four). During COVID-19, a new profile was identified consisting of mothers who were of high clinical concern (12.0%). This profile of mothers has anxiety scores that were well above the clinical cut off, clinical depression, and more than double the average stress scores of Canadian mothers.

Latent Transition Analyses

The LTA demonstrated a lack of measurement invariance found for all timepoints, which is theoretically justifiable given COVID-19 disruption. A 3-4 configural non-invariance model was considered the best model given interpretability and sample size (Table 3).

Below Clinical Concern Mothers Pre-COVID-19

Mothers who had low mental health challenges prior to COVID-19 had the most stable mental health during COVID-19 (i.e., 55.4% of mothers in this profile remained in the low clinical concern profile; Figure 2). A total of 30.7% of mothers with a good mental health profile prior to COVID-19 transitioned from below clinical concern and low stress prior to COVID-19 to a profile with similar clinical scores but higher average stress scores during COVID-19). Only a small proportion of mothers who were of low clinical concern prior to COVID-19 were identified as transitioning to the clinical depression and highly stressed profile and the clinical concern profile.

Stressed, Approaching Clinical Concern **Pre-COVID-19**

Mothers who were stressed prior to COVID-19 and approaching clinical cut off scores had the most variation in the profiles they were identified in during COVID-19 (Figure 2). Only 19.3% of mothers remained in a comparable profile. Interestingly, almost equal percentages of mothers transitioned into a profile that was below clinical concern and in the profile of highest clinical concern (30.4% versus 30.6%, respectively).

Clinically Depressed and Highly Stressed **Pre-COVID-19**

Many mothers who were clinically depressed and highly stressed prior to the pandemic remained in a clinically depressed and highly stressed profile during COVID-19 (38.8%; Figure 2). Interestingly, 42.3% of the mothers originally in the clinically depressed and highly stressed profile experienced improvements in their mental health, with 18.9% still stressed but no longer clinically depressed and 26.7% identified in the below clinical concern altogether. However, 18.9% of mothers who had clinical depression and high levels of stress prior to COVID-19 were identified in the profile of highest clinical concern.

Demographic, Familial Characteristics and Maternal Mental Health Profiles

Associations between mother's whether a mother had lower income, lower education, was married or in a common law partnership or spoke English as her first language and profile membership was tested using a series of chi-squared tests (Table 4). Across both time points, only ethnicity had a significant relationship with maternal mental health profiles, with a higher percentage of white mothers identified in the Stressed, Approaching Clinical Concern compared to mothers in the Clinically Depressed and Highly Stressed profile. The relationship between maternal parenting prior to COVID-19 (i.e., hostile reactions, overprotection, self-efficacy, and perceived impact) and mental health profiles (prior to and during COVID-19) was examined. Overprotection was the only parenting practice that was associated with maternal mental health profile membership prior to and during COVID-19. Specifically, prior to COVID-19 mothers who were Clinically Depressed and Highly Stressed had, rated themselves higher on overprotection than mothers identified as below clinical concern. Similarly, mothers identified in the profile of Highest Clinical Concern rated themselves significantly higher on their levels of overprotection, compared to mothers identified in the Below Clinical Concern and the Clinically Depressed and Highly Stressed.

The relationship between children's temperament and maternal mental health profiles were examined (Table 4). Prior to the pandemic, higher levels of both children's anger and fear were significantly related to clinical maternal membership in profiles with poorer mental health. Mothers who belonged to the profiles Stressed, Approaching Clinical Concern and Clinically Depressed and Highly Stressed had children who were significantly more fearful than mothers in the Below Clinical Concern Mothers profile. During COVID-19 mothers in the Highest Clinical Concern profiles reported that their children were significantly angrier than mothers in the Below Clinical Concern. There were no significant differences between the maternal mental health profiles membership and mother's reporting of their children's fearfulness.

The relationship between child's mental health prior to the pandemic and maternal mental health profiles prior to and during COVID-19 was examined (Table 4). Prior to COVID-19 there was a significant relationship between maternal mental health profile membership and children's emotional problems. Specifically, mothers who were identified in the Stressed, Approaching Clinical Concern reported that their children had higher emotional problems than mothers who were identified in the Below Clinical Concern profile. During COVID-19 mothers in the Highest Clinical Concern profile reported that their children had higher emotional problems than mothers across the other mental health profiles. Similarly, mothers in the Highest Clinical Concern profile reported that their children had significantly higher conduct and peer problems than mothers in the Below Clinical Concern profile. Mothers identified in the Highest Clinical Concern profile and the Stressed, Approaching Clinical Concern reported their children to be more hyperactive than mothers in the other profiles. Finally, there was no relationship identified between maternal mental health profile and mother's reports of their children's prosocial behaviours.

Discussion

In this study, we build on prior research that investigated the mental health profiles of low-income mothers in Toronto both before and during COVID-19 (Saleem et al., 2022) by using a larger sample size, a more nuanced analytic approach, with additional variables. We also tested stability/transitions in their profile membership after the onset of the pandemic. We did this to better understand stability in maternal mental health during a crisis like COVID-19 and to investigate what role demographic characteristics and children's mental health play in these transitions in profiles.

Heterogeneity in Maternal Mental Health

The results of this study have several implications for policy and practice. There first is the continuous need to recognize that maternal mental health should be viewed and examined as a heterogeneous construct, including mothers from diverse and low-income households (Saleem et al., 2021; Sun et al., 2019; Weiss et al., 2021). It is important for practitioners to recognize this heterogeneity and avoid making assumptions or generalizations about mothers' mental health based on simplistic categories. Practitioners should also tailor interventions based on the specific profiles of mental health. The identification of different mental health profiles, such as those with above-average stress but below clinical concern or those with clinical levels of depression and high stress, suggest the need for tailored interventions that address the specific needs of mothers with different profiles. One-size-fits-all approaches may not be effective, and interventions should be customized to address mothers' unique challenges and experiences based on their mental health profiles.

The findings from this study also highlight the importance of considering the impact of external events, such as pandemics: The study's findings indicate that the onset of COVID-19 had significant impacts on maternal mental health profiles, with notable changes in the frequency and distribution of different profiles identified during COVID-19, compared to before. Interestingly, a new profile was identified during COVID-19, with mothers above clinical cut-off levels in depression and anxiety with extremely high-stress scores. In addition to maternal mental health changes clinically and descriptively with the onset of COVID-19, there were large shifts in the frequency or distribution of mothers across the clinical mental health profiles. First, we see a large decrease (from 77.7% to 49.4%) in the frequency of mothers in the below clinical concerns profile prior to COVID-19. In the same direction, there was increased frequency in the stressed approaching clinical concern profile and clinically depressed and highly stressed profiles. Finally, of greatest clinical concern were mothers with clinical levels of anxiety and depression, and over double stress average stress levels of Canadian mothers. This highlights the importance of acknowledging and addressing the potential effects of external events on mental health outcomes and tailoring interventions accordingly.

Stability or Changes in Maternal Mental Health During COVID-19

An LTA was utilized to examine the changes in maternal mental health profiles following the onset of the COVID-19 pandemic. First, in the largest group that was below clinical concern, over half of these mothers remained in the below clinical concern. This group, consisting of mothers who had good mental health both before and during the pandemic had the highest frequency. The second largest group to transition also did not move into a clinical profile but did transition into a profile with elevated stress levels during the onset of the pandemic. Still, over 10% of mothers who had good mental health prior to the pandemic were identified being in a profile that consisted of having clinical depression or both clinical depression and anxiety after the onset of the pandemic. Thus, good mental health under normal circumstances does not guarantee continued good mental health in the face of a major stressor such as the COVID-19 pandemic.

The mothers who were identified as being stressed but approaching clinical concern, compared to those who were below clinical concern, experienced a much wider range of transitions to different mental health profiles. Interestingly, mothers who were already stressed and approaching clinical concern prior to COVID-19 were equally likely to be identified as below clinical concern (i.e., improvements across mental health indicators) or in the highest clinical concern profile after the onset of the pandemic. More research is needed to understand the environmental influences that contribute to such different responses to better provide individualized supports.

The study's findings emphasize the importance of exploratory approaches in understanding mental health among mothers. Different contexts, such as the onset of a pandemic, may reveal different profiles of mental health, and assumptions based on prior literature or preconceived notions may not capture the complexity of mental health experiences. Practitioners should approach investigations of mental health using exploratory approaches better to understand the diverse profiles of mental health among mothers. Furthermore, this study found that there were changes in the profiles of maternal mental health, indicating that latent transition analyses should be employed to examine how maternal mental health profiles can change over time, particularly in response to external events. Practitioners should regularly monitor and assess mothers' mental health and be prepared to adapt interventions accordingly. Flexibility and adaptability in interventions can

help ensure that mothers receive appropriate and effective support based on their changing mental health needs.

Demographic characteristics, Child Mental Health, and Maternal Mental Health

We found few associations between demographic factors with maternal mental health profiles. This is surprising given past findings that disadvantaged individuals may face more mental health challenges (Campbell et al., 2009; Gross et al., 2020). However, it is important to note that the sample used in this study consists of low-income mothers, many of whom are immigrants to Canada and/or head single-parent households. Furthermore, during COVID-19, the Canadian government made several social and financial supports available (Petit & Tedds, 2020). These financial supports might have disproportionately benefitted low-income families (e.g., Canada Emergency Response Benefit, also referred to as CERB, might have been greater than or equal to the amount of income lost during COVID-19). However, they may not have been sufficient for those who had higher salaries.

Only parental overprotection was associated with poorer maternal mental health before and during COVID-19. This highlights the need to identify which types of parenting behaviours and thoughts require support. In addition, assessing the degree of overprotection could assist practitioners in identifying mothers who require greater support, particularly during times of heightened stress.

Consistent with existing literature, we found a significant association between maternal mental health and children's temperament (Tolja, Radoš, & Anđelinović, 2020). Prior to the pandemic, mothers with poorer mental health rated their children as more fearful. However, these findings were not replicated during the pandemic, suggesting that the pandemic had a unique influence on the role of children's temperament. Mothers reported increased fearfulness in their children during COVID-19. This increased fearfulness may have resulted from children coping with the pandemic, rather than being linked to maternal mental health. Notably, however, children's anger significantly predicted maternal mental health during the pandemic. These results suggest that in situations with high stress and limited resources (such as school and childcare closures), mothers with more difficult children may experience declines in mental health. Alternatively, declining maternal mental health may lead to increased perceptions of children's anger or a heightened experience of angry behaviour in children.

Mothers who were below clinical concern prior to COVID-19 were least likely to report that their children had high emotional challenges, highlighting associations between family dynamics and mental health. This finding is consistent with prior research showing the relationship between children's internalizing problems and maternal mental health. However, during COVID-19, other indicators of children's mental health, such as conduct problems, hyperactivity, and peer problems, were related to maternal mental health profiles. Mothers whose children had higher levels of problems in these areas prior to the pandemic were more likely to be in profiles characterized by clinically depressed and highly stressed mental health during COVID-19.

Our findings highlight that families are complex social systems in which individuals are influenced by one another (Kerr & Bowen, 1988). Our findings were consistent with prior research highlighting the relationship between children's internalizing problems and maternal mental health (Arroyo-Borrell et al., 2017; Burns et al., 2022). Interestingly, no associations were found between the other child mental health subscales and maternal mental health profiles. The findings align with important theories such as, family systems theory (Kerr & Bowen, 1988; Minuchin, 1974) that emphasize that family members influence one another's behaviour, or in this instance, their mental health. The significant associations between children's mental health and COVID-19 profile membership are not surprising since mothers assumed the majority of the child care responsibilities during the pandemic and were significantly more involved with their children's learning at home during the pandemic (Alon et al., 2020). Therefore, to support low-income mothers with young children, it is imperative to ensure their children are doing okay.

Limitations and Future Directions

A limitation of this study is the small sample size. As some of the profiles had a small number of mothers,

it was not possible to run rigorous analyses (e.g., logistic regressions of demographic and child mental health in the latent transition analyses). Understanding the unique experiences of maternal mental health based on ethnicity is of critical importance. However, the sample size of mothers was small. The fact that participants were recruited from one city is another limitation. In addition, the COVID-19 data collection occurred mainly during the first six months after the pandemic began. In the long run, the effects of the pandemic may be more pronounced on maternal mental health. Furthermore, all assessments of mental health were self-reported and completed by mothers. There may be reporter effect with spillover between how mothers report feeling and how they rate their children are doing. In the future, it would be valuable to look at maternal mental health using a larger sample size across multiple time points during COVID-19, using multiple methods and multiple informants.

Conclusions

Our person-centred approaches to understanding maternal mental health during times of crisis like COVID-19 provides a more precise description of how mothers are functioning. We found that maternal mental health is not stable as most of the mothers in our sample experienced a shift in mental health profile prior to and after the onset of the COVID-19 pandemic. Furthermore, in times of crisis, the unique mental health subgroups identified in low-income mothers are subject to change and should therefore continue to be examined over time. Overall, the findings of this study underscore the need for a nuanced and tailored approach to understanding and addressing mental health among mothers. Practitioners should recognize the heterogeneity of mental health, consider the impact of external events, and use exploratory approaches better to understand the diverse profiles of mental health among mothers. By tailoring interventions and regularly monitoring mental health, practitioners can effectively support mothers' mental health, particularly those who are low-income, and promote positive mental health outcomes. Finally, it provides important information that might assist in triaging resources to support mothers who are in the most need of support.

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Appendix A: Factor Loadings and Model Fit Indices for Maternal Mental Health Pre and During COVID-19

The model did not fit the data during COVID-19 when the stress indicator ‘Feeling confident in handling personal problems’ was included. Model fit was acceptable once it was removed. Given the study objectives of comparing maternal mental health pre – to during covid-19, the item was also removed from the stress measure prior to COVID-19. As can be seen from Appendix A, the model significantly improved once the item was removed. Therefore, the subsequent analyses using maternal mental health did not include the ‘Feeling confident in handling personal problems.’

	Pre-COVID-19 Estimates	Pre-COVID-19 Estimates	COVID-19 Estimates	COVID-19 Estimates
Mental Health	All Items (S.E.)	Revised (S.E.)	All Items (S.E.)	Revised (S.E.)
Stress				
Feeling unable to control important things in life	0.634 (.048)	0.635 (.049)	0.779 (.036)	0.810 (.035)
Feeling confident in handling personal problems	0.434 (.058)	Removed	0.363 (.061)	Removed
Feeling things were going your way	0.732 (.044)	0.743 (.046)	0.694 (.041)	0.706 (.040)
Feeling difficulties piling so high that they could not be overcome	0.484 (.057)	0.449 (.059)	0.427 (.058)	0.380 (.059)
Anxiety				
Feeling nervous, anxious or on edge	0.631 (.054)	0.638 (.054)	0.657 (.043)	0.653 (.044)

	Pre-COVID-19 Estimates	Pre-COVID-19 Estimates	COVID-19 Estimates	COVID-19 Estimates
Not being able to stop or control worrying	0.648 (.054)	0.641 (.054)	0.783 (.039)	0.787 (.039)
Depression				
Feeling down, depressed, or hopeless	0.840 (.045)	0.841 (.045)	0.745 (.048)	0.744 (.048)
Little interest or pleasure in doing things	0.641 (.047)	0.640 (.047)	0.599 (.050)	0.600 (.05)
Model Fit				
Indices				
RMSEA	0.058	0.035	0.112	0.025
CFI	0.967	0.991	0.905	0.997
TLI	0.946	0.983	0.844	0.993
SRMR	0.035	0.026	0.060	0.023

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