



Beyond the Mask: Decoding Children’s Mental Health Patterns Amidst COVID-19 and the Role of Parenting

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Abstract

Background The COVID-19 pandemic has had a substantial impact on children and families worldwide. Children’s mental health has been at the forefront of pandemic research, with several observational studies documenting its decline. Limited person-centred research exists, however, investigating the diverse mental health responses of vulnerable children during COVID-19.

Objective The purpose of this study is to examine the profiles of 289 low-income children’s mental health transitions from pre-COVID-19 to during COVID-19.

Methods Mothers’ reports of children’s mental health using the Strengths and Difficulties Questionnaire from before ($\bar{X}= 2.73$ years, $SD=0.23$) and during ($\bar{X}= 5.31$ years, $SD=0.59$) COVID-19 were used.

Results Three comparable profile solutions were identified pre- and early during the pandemic. Latent transition analysis revealed diverse patterns of children’s mental health trajectory from prior to during COVID-19. Based on transition probabilities, the majority of children in the *Average Levels of Internalizing/Externalizing Problems* and *Externalizing Problems* profiles pre-pandemic showed stability in profile membership. Interestingly, most children in the high levels of *Internalizing/Externalizing Problems* profile pre-pandemic experienced some improvement in their mental health. Pre-pandemic maternal mental health and parenting had significant associations with children’s profile membership at both time points.

Conclusions Our findings reveal the heterogeneity in children’s mental health responses in times of large-scale crises. They also identify how pre-existing maternal risk factors may underlie the diverse experiences of children who underwent declining, stable, or improving mental health profiles during the COVID-19 pandemic.

Keywords COVID-19 · Child mental health · Parenting · Person-centred methodology · Latent transition analysis

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Introduction

On March 11th, 2020, the World Health Organization (WHO, 2020) declared COVID-19 a global pandemic. To control the spread of COVID-19, restrictions in physical distancing and stay-at-home orders were issued worldwide, including in Toronto, Canada, where this study took place (Guan et al., 2020; Hassen, 2022). Families with young children faced unprecedented disruptions in their lives with the government-mandated physical distancing and closures of non-essential businesses and childcare services (Lee, 2020). In the first year of the pandemic, families with school-aged children experienced further disruption in their daily routines when in-person schools abruptly switched to remote delivery several times to contain increasing rates of COVID-19 (Burns et al., 2022). School plays a crucial role in promoting health and well-being for children and enabling them to socialize—both of which are important protective factors for mental health (Cost et al., 2022).

Early childhood is a crucial time for social-emotional and behavioural development. As early as the first few years of life, mental health problems may manifest as internalizing symptoms, such as emotional problems or social withdrawal, or externalizing symptoms, such as irritability, aggression, and defiant behaviour (Hattangadi et al., 2020; McDonald et al., 2016). Consistent with prior research investigating large-scale adversities on children's mental health (CMH), COVID-related research has cited an increase in the prevalence of internalizing and externalizing problems in children (Cost et al., 2022; Ezpeleta et al., 2020; Lee, 2020). From research on previous epidemics and natural disasters (Dyregrov et al., 2018; Esterwood & Saeed, 2020), COVID-19's mental health effects will likely persist well past the pandemic. Studying CMH during and after the pandemic is crucial to comprehend the lasting consequences and implement appropriate interventions.

Many of the observational studies that investigated CMH during the pandemic, however, assume consistent effects of COVID-19 across the population with respect to impacts on child outcomes when, in fact, CMH is a highly heterogeneous construct that can be expressed and experienced very differently. Pre-pandemic developmental research has described distinct individual subgroups (or *profiles*) of CMH within the larger population using exploratory, person-centred methods (Eisenberg et al., 2001; McDonald et al., 2016). For instance, Morales et al. (2021) explored subtypes of children's scores on the Strengths and Difficulties Questionnaire (SDQ)—a validated measure assessing children's internalizing and externalizing problems—using Latent Class Analysis (LCA) and identified 5 CMH subgroups: “High Difficulties”; “Internalizing”; “Externalizing”; “Hyperactive”; and “Well-adjusted.” Similarly, McDonald et al. (2016) employed Latent Profile Analysis (LPA) on different domains of socioemotional functioning, including internalizing and externalizing behaviours, and identified three profiles among children: “Resilient”; “Struggling”; and “Severe Maladjustment.”

The prevailing one-size-fits-all approach to pandemic research neglects to identify homogeneous profiles of children with similar mental health responses within the broader, heterogeneous population. Identifying these profiles enables the investigation of pre-pandemic risk factors associated with profile membership. For instance, McDonald et al. (2016) found that sociodemographic risk factors were associated with which profiles the children belonged to (e.g., non-white children were more likely to be in the Severe Maladjustment group; McDonald et al., 2016). In addition to sociodemographic factors, certain parent-level characteristics may also contribute to the heterogeneity observed in CMH. The parent–child relationship is critical, given that early interactions are often with

the parent(s) (Bolger & Patterson, 2001). From an attachment standpoint (Bowlby, 1973), the valence of this relationship can positively or negatively impact CMH. For instance, positive parent–child interactions are closely associated with the development of emotional competencies in children (Jegatheeswaran et al., 2023; Feldman et al., 2011), whereas dysfunctional parent–child interactions are associated with poor CMH and behavioural issues (Cappa et al., 2011; Feldman et al., 2009; Gershoff et al., 2012). Although father–child relationships are fundamental to child development, traditionally and cross-culturally, mothers assume primary caregiver roles in early childhood. Consequently, children spend a great deal of time with their mothers, who are perceived as a source of comfort and security when their relationships are positive (Bornstein et al., 2011; Hartup, 1989). The literature has consistently established that mental health problems (i.e., anxiety and depression) in mothers are a significant risk factor for mental health problems in children (Racine et al., 2021; Rees et al., 2019). In addition, mothers' parenting has been closely linked to CMH. While positive parenting (e.g., warmth and autonomy-granting) is linked to positive child outcomes, dysfunctional parenting (e.g., hostility and overprotection) contributes to negative child outcomes, including internalizing and externalizing problems (Knox et al., 2011; Pinquart, 2017). Understanding CMH heterogeneity and its modifiable correlates may aid clinicians and policymakers in tailoring preventive interventions for those at risk. Therefore, the present study will further investigate maternal characteristics.

The importance of recognizing that there may be profiles of CMH responses to COVID-19 is increasingly recognized (Bruining et al., 2021; Cost et al., 2022; Dvorsky et al., 2021; Li et al., 2020; Saleem et al., 2022). For example, Cost et al. (2022) found that their sample of Canadian children aged 2–5 years experienced either deterioration, no change, or improvements in emotional problems, conduct problems, and hyperactivity levels during COVID-19 (Cost et al., 2022). Similarly, using a subsample of participants from the Child Care Matters (CCM) study, Saleem et al. (2022) applied LCA to SDQ data. CCM study participants are young children and their mothers from low-income families residing in Toronto, Canada. Saleem et al. (2022) found four distinct classes of how children experienced COVID-19, with subgroups of children showing a decline, stability, and improvements in their mental health (Saleem et al., 2022). The current study draws on a larger sample of CCM participants.

An important consideration in elucidating CMH profiles is identifying changes in CMH characterization over time. Previous longitudinal investigations of CMH trajectories have shown stability, improvement, or decline in response to COVID-19. Models of children's membership in mental health profiles can also be developed so that trajectories may be examined that describe or target specific changes in profile membership over time. This phenomenon can be explored using the person-centred approach, Latent Transition Analysis (LTA), on longitudinal data. This method enables researchers to identify latent profiles at multiple time points (e.g., prior to and during COVID-19) and predict initial latent profile membership and the incidence of transitions to different profiles over time (Hancock & Mueller, 2010). To our knowledge, no study has used this analytical approach to examine profiles of transitions in young CMH during COVID-19.

The Present Study

While cross-sectional studies are important, prospective studies allow researchers to investigate the influence of pre-existing vulnerabilities (i.e., sociodemographics and maternal characteristics) that impact children's responses to adversity (i.e., COVID-19),

which in turn informs prevention and intervention measures. When large-scale natural disasters occur amid ongoing longitudinal studies, all participants experience the stressor and the non-random selection issues typically associated with exposure to stressful events are eliminated. This creates naturalistic experiments that allow researchers to make causal inferences (Rutter, 2007). Capitalizing on the natural experiment, this study employed LTA on data from a longitudinal dataset that included assessments prior to and during the COVID-19 pandemic to empirically investigate whether there are profiles of transitions in CMH responses to the COVID-19 pandemic across the two-time points. Specifically, this study aimed to address the following research questions:

1. What were the profiles of CMH prior to and during COVID-19?
2. How did CMH profiles shift from pre-COVID-19 to during COVID-19?
3. Were sociodemographic and maternal characteristics children experienced prior to the pandemic associated with their profile membership prior to and during COVID-19?

Method

Participants

We drew on data from the CCM study: A large, longitudinal study conducted in partnership with the City of Toronto, Children's Services division. The original sample was recruited between 2014 and 2016 and consisted of 895 (70% consent rate) low-income families recruited from the City of Toronto's childcare subsidy waitlist situated in Toronto, Canada. All families on the subsidy waitlist were contacted at that time. The present study analyzed survey data collected before and during COVID-19, with the COVID-19 wave of data collection occurring between May 2020 and May 2021. CMH data were collected before and during COVID-19, and sociodemographic and maternal characteristics were assessed before COVID-19. At the time of the present study, 120 (13.5%) families dropped out of the CCM study, leaving 767 potential participants for the COVID-19 wave of data collection. A comparison of the sample included in this paper versus the original recruitment sample revealed that there were differences on income, education, and home composition (Appendix).

To be eligible for this study, we used the subsample of families that responded to the CCM survey both prior to and during COVID-19 ($N=297$). We removed 8 families from the dataset because fathers completed the survey and our research specifically investigated the relationship between maternal characteristics and heterogeneity in CMH. Thus, the final sample comprised data from $N=289$ children and their mothers.

Approximately half of the children in our sample were females, and slightly less than half of the children came from single-parent households (Table 1). Most mothers identified with a non-White ethnicity. Approximately half of the mothers reported having attained a bachelor's degree or higher, prior to COVID-19. The mean ages of the children prior to and during COVID-19 were $\bar{X}=2.73$ years ($SD=0.23$) and $\bar{X}=5.31$ years ($SD=0.59$), respectively. Families in the present study are low-income (median \$40,000–\$49,999) relative to that of the average-income family in Toronto (\$104,378; City of Toronto, 2018). Thus, our sample consists of low-income, difficult to recruit/retain participants.

Table 1 Demographic characteristics

Demographics	%
<i>Child characteristics</i>	
Child gender	48
Single-parent households	42
<i>Maternal characteristics</i>	
Maternal ethnicity (non-white)	69
Maternal highest education (bachelor's degree or above)	46

Procedure

The CCM study collected data on psychological and environmental risk factors for low-income families from the time the children were 12 months old. Prior to the COVID-19 pandemic, mothers participating in the survey were interviewed by a research assistant either via telephone, where verbal consent was obtained, or in person, where written consent was obtained. During COVID-19, data were collected via telephone interviews. The CCM study received ethics approval through the University of Toronto Research Ethics Board: Social Sciences, Humanities, and Education. Prior to COVID-19, travel fees were reimbursed (i.e., public transport or parking), books were given to children, and they were entered into a draw for a \$200 grocery gift card as incentive to participate. Participants in COVID-19 received a \$25 gift card to Amazon, Tim Hortons, or President's Choice.

Materials

Descriptions of the CMH, sociodemographics, and maternal characteristics used in the present study are included below.

Sociodemographics (Pre-COVID-19)

To account for sociodemographic risk factors in the current study, we investigated total family income (“\$39,999 and below” vs. “\$40,000 and above”), maternal education (“below bachelor's” vs. “bachelor's and above”), mothers' relationship status (“not married/common-law” vs. “married/common-law”) and English as a first language (“no” vs. “yes”) as covariates of profile membership.

Child Mental Health (Pre-COVID-19 and During COVID-19)

The SDQ (Goodman, 1997; Youth in Mind 2014) is a 25-item parental self-report measure used to capture CMH. The SDQ uses a 3-point Likert scale of 0 ‘not true’, 1 ‘somewhat true’, or 2 ‘certainly true.’ For the present study, 4 of the SDQ subscales were utilized: 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”). The SDQ has high discriminant validity across the subscales (Croft et al., 2015).

The SDQ for ages 2–4 and 4–17 were used for the pre-COVID-19 and during the COVID-19 waves of data collection, respectively. See Table 2 for sample descriptive for both time points. To examine the factor validity in this sample, confirmatory factor analyses were conducted on the SDQ both pre- and during COVID-19, see Table 3.

As per Goodman et al. (2010), the conduct and hyperactivity subscales combine to form an externalizing problems variable, whereas emotional and peer problems subscales form internalizing. This categorization was used to qualitatively describe the identified latent profiles.

Parenting (Pre-COVID-19)

The Parental Cognitions and Conduct Toward the Infant Scale (PACOTIS) is a 23-item parental self-report measure of parental cognitions and practices (Boivin et al., 2005). PACOTIS employs a scale from 0 ‘not at all what I think’ to 10 ‘exactly what I think,’ and comprises 4 subscales: hostility (e.g., “I have raised my voice with or shouted at my baby when he/she was particularly fussy”); overprotection (e.g., “I insist upon keeping my baby close to me at all times, within my eyesight, and in the same room as I am”); self-efficacy (e.g., “In general, I think I am a good mother/father”); and perceived parental impact (e.g., “My behaviour has an effect on the personal development of my baby”). Mean scores were computed for each PACOTIS subscale and used to create dichotomous variables (e.g., “less than or equal to sample mean” vs. “above mean”) for each PACOTIS subscale. In this sample, mothers had relatively low hostility scores ($M=1.83$, $SD=1.35$, ranging from 0 to 6.71), mid-level overprotection ($M=5.12$, $SD=2.45$, ranging from 0.6 to 10), and high self-efficacy ($M=8.52$, $SD=1.31$, ranging from 0.5 to 10) and perceived impact scores ($M=7.84$, $SD=1.96$, ranging from 0 to 10). PACOTIS demonstrates good psychometric properties, including internal consistency, reliability, and convergent validity (Črnčec et al., 2010).

Maternal Mental Health (Pre-COVID-19)

Maternal anxiety and depression were assessed using the General Anxiety Disorder Scale (GAD-2; Donker et al., 2011) and Patient Health Questionnaire (PHQ-2; Löwe et al., 2005), respectively. In both the GAD-2 and PHQ-2, two items are assessed on a Likert-type scale ranging from 0 ‘not at all’ to 3 ‘nearly every day’, with a summed score of 0–6. A GAD-2 or PHQ-2 score of three or higher indicates probable anxiety disorder or major depressive disorder, respectively (Donker et al., 2011; Löwe et al., 2005). These cut-off

Table 2 Univariate child mental health scores

Child mental health	Pre-COVID-19			During COVID-19		
	M (Variance)	Min	Max	M (Variance)	Min	Max
Emotional problems	1.21 (1.69)	0	7	1.70 (2.93)	0	8
Conduct problems	2.28 (3.80)	0	10	1.80 (2.61)	0	8
Hyperactivity	3.99 (6.06)	0	10	4.20 (6.53)	0	10
Peer problems	2.06 (3.85)	0	8	1.88 (3.93)	0	9

Table 3 Factor loadings and model fit indices for child mental health pre- and during COVID-19

Child mental health	Pre-COVID-19 estimates		During COVID-19 estimates	
	All Items (S.E.)	Revised (S.E.)	All Items (S.E.)	Revised (S.E.)
	Conduct problems			
Often has temper tantrums	0.69 (0.06)	0.69 (0.06)	0.68 (0.06)	0.68 (0.06)
Generally obedient	0.47 (0.07)	0.47 (0.07)	0.57 (0.07)	0.57 (0.07)
Often fights with other children	0.48 (0.09)	0.47 (0.09)	0.55 (0.09)	0.54 (0.09)
Often argumentative with adults/lies or cheats	0.73 (0.06)	0.73 (0.06)	0.55 (0.09)	0.56 (0.09)
Can be spiteful to others/steals from home, school or elsewhere	0.57 (0.07)	0.57 (.07)	0.36 (0.12)	0.36 (0.12)
Hyperactivity				
Restless, overactive	0.70 (0.05)	0.70 (0.05)	0.79 (0.04)	0.79 (0.04)
Constantly fidgeting or squirming	0.80 (0.06)	0.80 (0.06)	0.70 (0.06)	0.68 (0.06)
Easily distracted, concentration wanders	0.74 (0.05)	0.75 (0.05)	0.70 (0.05)	0.70 (0.05)
Thinks things out before acting	0.26 (0.08)	0.26 (0.08)	0.37 (0.07)	0.37 (0.07)
Sees tasks through to the end	0.49 (0.06)	0.49 (0.06)	0.63 (0.05)	0.63 (0.05)
Emotional problems				
Often complains of headaches	0.57 (0.10)	0.57 (0.10)	0.47 (0.12)	0.48 (0.12)
Many worries	0.73 (0.12)	0.72 (0.11)	0.52 (09)	0.52 (09)
Often unhappy, downhearted	0.33 (0.04)	0.33 (0.04)	0.70 (0.10)	0.71 (0.10)
Nervous or clingy in new situations	0.47 (0.08)	0.47 (0.08)	0.57 (0.07)	0.55 (0.07)
Many fears, easily scared	0.50 (0.09)	0.50 (0.09)	0.76 (0.07)	0.77 (0.07)
Peer problems				
Rather solitary, tends to play alone	0.56 (0.11)	0.59 (0.12)	0.36 (0.09)	0.38 (0.10)
Has at least one good friend	0.42 (0.10)	0.41 (0.11)	0.49 (0.11)	0.49 (0.13)
Generally liked by other children	0.41 (0.18)	Removed	0.95 (0.14)	Removed
Picked on or bullied	0.45 (0.13)	0.45 (0.13)	0.49 (0.11)	0.59 (0.12)
Gets on better with adults than with other children	0.45 (0.10)	0.43 (0.10)	0.45 (0.08)	0.51 (0.09)

Table 3 (continued)

Child mental health	Pre-COVID-19 estimates		During COVID-19 estimates	
	All Items (S.E.)	Revised (S.E.)	All Items (S.E.)	Revised (S.E.)
	Model fit indices			
RMSEA	0.03	0.03	0.33	0.03
CFI	0.94	0.94	0.94	0.94
TLI	0.93	0.92	0.93	0.93
SRMR	0.09	0.08	0.09	0.08

scores were used to create dichotomous indicators using both measures (e.g., “not clinical” vs. “clinical”).

Data Analysis

Analyses were conducted in Mplus 8.8 (Muthén & Muthén, 2000) using Mplus Automation (Hallquist & Wiley, 2018). Full information maximum likelihood was used to address missing data, using Mplus’ MLR estimator. The data analyses for this study followed the guidelines proposed by Ryoo et al., (2018). First, confirmatory factor analyses were conducted to examine the factor structure of child mental health measures (see Table 3 for more information). Specifically, confirmatory factor analyses were conducted to examine the properties of child mental health assessments in one model (i.e., emotional, conduct, peer problems, and hyperactivity; Table 3). The model did not fit the data during COVID-19. A review of individual items revealed that this was because including the item “generally liked by other children” resulted in a negative residual covariance matrix. Therefore, this item was removed from the measure. As can be seen from Table 3, the model fit slightly improved once the item was removed, and the residual covariance matrix was no longer negative. Therefore, the subsequent analyses that used the SDQ did not include that item.

Subsequently, LPA testing 2–5 profiles (see Table 4) was conducted on the mental health scores (i.e., the 4 SDQ subscales) both prior to and during COVID-19 to investigate configural measurement invariance. To determine the best measurement model, the following model fit indices were utilized, as recommended by Muthén and Muthén (2000), and Nylund (2007): Lower Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC) and sample-adjusted Bayesian Information Criterion (SABIC) values; significant Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR), Lo-Mendell-Rubin likelihood ratio test (LMR) and bootstrap likelihood ratio test (BLRT); and higher entropy values.

In addition, the size, parsimony, and interpretability of the latent profiles were taken into consideration when selecting the best measurement model. Cut-off points for SDQ subscale scores (i.e., “average,” “slightly raised,” and “high”) were used to characterize the profiles in the results section (“Scoring the Strengths & Difficulties Questionnaire,” 2015) and can be found in Table 5.

Third, LTA without covariates were conducted, separately testing measurement invariance and measurement non-invariance across (Table 6). Upon finalization of the LTA model, the relationship between trajectory profiles and the key variables of interest (i.e., parenting, maternal mental health, and sociodemographic characteristics) were explored through a series of chi-squared tests of independence.

Results

LPA

LPAs were executed to identify and describe the latent profiles (i.e., the homogeneous CMH profiles) within our larger, heterogeneous sample. Using SDQ subscales as observed indicators, a series of LPAs were run with the specification of 1–5 profile models separately

Table 4 Child mental health latent profile model comparison

Profiles	df	LogLik	AIC	BIC	SABIC	Entropy	Smallest profile N	VLMR <i>p</i>	LMR <i>p</i>	BLRT <i>p</i>
<i>Pre-COVID-19</i>										
2-Profile	13	-2270.156	4566.313	4613.886	4572.662	0.94	18	0.05	0.05	<0.001
3-Profile	18	-2239.820	4515.639	4581.510	4524.430	0.77	16	0.03	0.03	<0.001
4-Profile	23	-2223.394	4492.787	4576.956	4504.020	0.92	9	0.51	0.52	<0.001
5-Profile	28	-2191.334	4438.668	4541.133	4452.342	0.93	3	0.39	0.39	<0.001
<i>During COVID-19</i>										
2-Profile	13	-2300.267	4626.533	4674.016	4632.792	0.81	65	<.01	<.01	<0.001
3-Profile	18	-2280.172	4596.343	4662.088	4605.009	0.84	21	0.43	0.44	<0.001
4-Profile	23	-2236.286	4518.572	4602.579	4529.645	0.93	12	0.06	0.07	<0.001
5-Profile	28	-2199.620	4455.241	4557.510	4468.721	0.94	6	0.02	0.03	<0.001

Bold represents the LPA models selected. df = Degrees of Freedom. LogLik = LogLikelihood. AIC = Akaike Information Criterion. BIC = Bayesian Information Criterion. SABIC = sample-adjusted BIC. VLMR *p* = Vuong-Lo-Mendell-Rubin likelihood ratio test *p*-value. LMR *p* = Lo-Mendell-Rubin likelihood ratio test *p*-value. BLRT *p* = Bootstrap likelihood ratio test approximate *p*-value

Table 5 Cut-off points for SDQ scores

	Emotional problems	Conduct problems	Hyperactivity	Peer problems
<i>Pre-COVID-19</i>				
Close to average	0–2	0–3	0–5	0–2
Slightly raised	3	4	6	3
High	4 and up	5 and up	7 and up	4 and up
<i>During COVID-19</i>				
Close to average	0–3	0–2	0–5	0–2
Slightly raised	4	3	6–7	3
High	5 and up	4 and up	8 and up	4 and up

at two time points: Pre-COVID-19 and during COVID-19. A 3-profile non-invariance latent model was selected (Fig. 1).

Profiles Identified Pre-COVID-19

Average Levels of Internalizing/Externalizing Problems Prior to the pandemic, most children (69.3%, $N=200$) in this study were in a profile characterized by average scores on all SDQ subscales (i.e., emotional problems, conduct problems, hyperactivity, and peer problems), consistent with the cut-off points for SDQ scores (see Fig. 1).

Externalizing Problems Based on SDQ cut-off points, a quarter of children (25.1%, $N=73$) in this study had average levels of emotional and peer problems but slightly raised levels of hyperactivity and conduct problems prior to the pandemic, as can be seen from Fig. 1. This profile had the highest rate of hyperactivity across all three profiles.

Internalizing/Externalizing Problems Prior to the pandemic, a non-trivial number of children (5.6%, $N=16$) in this study had high rates of mental health challenges. Most notably, this group of children experienced the highest rates of emotional challenges across all the pre-pandemic profiles. They also experienced slightly raised levels of peer problems and the highest rate of conduct problems of all profiles. However, this group had lower hyperactivity scores than the *Externalizing* profile (see Fig. 1).

Profiles Identified During COVID-19

Given the pattern of results, it was possible to use the same name for all three identified profiles in COVID-19. However, due to the measurement non-invariance model, the mean scores on the SDQ subscales used to characterize each COVID-19 profile slightly differ. For ease of interpretation, the names of the profiles were kept the same since they have the same patterns in terms of clinical cut-offs.

Average Levels of Internalizing/Externalizing Problems During the pandemic, a comparable number of children (69.0%, $N=199$), as seen prior to COVID-19, had lower rates of mental health challenges. Like the *Average Levels of Internalizing/Externalizing Problems* profile pre-COVID-19, this profile was also characterized by average levels of emotional, conduct, and peer problems, and hyperactivity (see Fig. 1).

Externalizing Problems During the pandemic, almost a quarter of children (22.1%, $N=64$) in this study experienced slightly raised levels of hyperactivity and conduct problems. Similar to the pre-pandemic *Externalizing* profile, children in this group had the

Table 6 Child mental health latent transition model comparison

Profiles	Free parameters	LogLik	AIC	BIC	SABIC	Entropy		
						Full-model	Pre-COVID-19	
<i>Non-Invariance</i>								
2-Profile	27	-4552.875	9159.750	9258.743	9173.122	0.783	0.723	0.824
3-Profile	40	-4498.000	9076.001	9222.658	9095.812	0.823	0.801	0.802
4-Profile	55	-4436.624	8983.248	9184.901	9010.487	0.850	0.737	0.942
5-Profile	104	-4273.053	8754.106	9135.414	8805.614	0.880	0.887	0.844
<i>Invariance</i>								
2-Profile	19	-4569.609	9177.217	9246.879	9186.627	0.780	0.710	0.830
3-Profile	28	-4516.488	9088.976	9191.636	9102.843	0.805	0.779	0.790
4-Profile	39	-4467.361	9012.722	9155.713	9032.037	0.922	0.906	0.923
5-Profile	88	-4312.585	8801.170	9123.816	8844.754	0.907	0.895	0.887

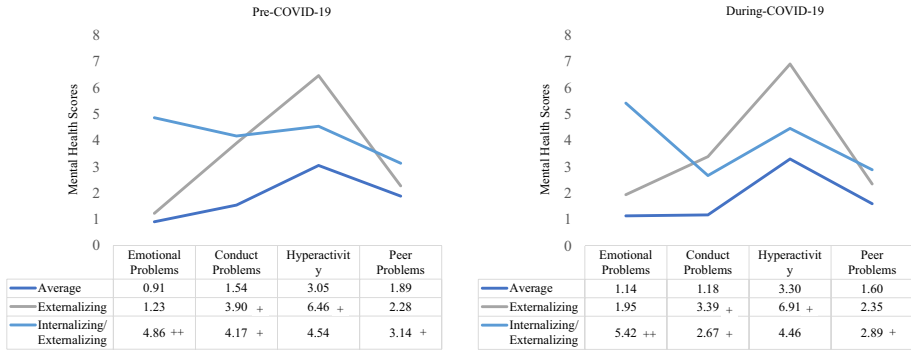


Fig. 1 Children’s mental health latent profiles prior to and during COVID-19. *Note.* + indicated slightly raised, and ++ indicates high scores in accordance with SDQ cut-off points

highest hyperactivity scores. Unlike the pre-pandemic *Externalizing* profile, this profile also had the highest rate of conduct problems relative to the other two COVID-19 profiles (see Fig. 1).

Internalizing/Externalizing Problems During the pandemic, a non-trivial number of children (8.9%, N = 26) experienced emotional dysregulation in addition to externalizing problems. Like the *Internalizing/Externalizing Problems* pre-pandemic profile, this profile was identified with the highest scores in emotional problems and raised levels of conduct and peer problems (see Fig. 1). Notably, children in this profile had the highest peer problems in comparison to the *Average* and *Externalizing* profiles (see Fig. 1).

LTA

Below, the various transition profiles (using the pre-pandemic profile as a starting point) are discussed.

Average Levels of Internalizing/Externalizing Problems Pre-COVID-19

Children who had *Average Levels of Internalizing/Externalizing Problems* prior to the pandemic had the most stable transitions during COVID-19, with 88% (N = 176) of the children transitioning to the *Average Levels of Internalizing/Externalizing Problems* profile during the pandemic (Fig. 2). However, a non-trivial number of children who had the lowest mental health challenges prior to the pandemic transitioned to a profile characterized by higher levels of *Externalizing* problems (3.4%, N = 7) or both *Internalizing/Externalizing* problems (8.6%, N = 17).

Externalizing Problems Pre-COVID-19

Many of the children that identified with the *Externalizing* profile pre-COVID-19 had similar hyperactivity and conduct scores during COVID-19 (74.4%, N = 54), meaning the challenges that these children faced prior to the pandemic remained during COVID-19 (Fig. 2). Approximately one-fifth (20.7%, N = 15) of children in this group had improved mental health during COVID-19. Finally, 4.9% (N = 4) of the children transitioned to the

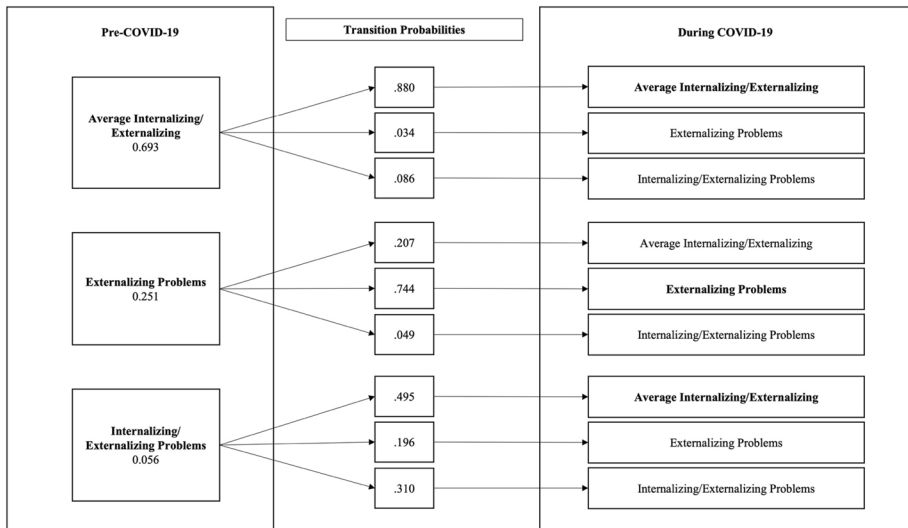


Fig. 2 Latent transition probabilities of CMH prior to and during COVID-19

Internalizing/Externalizing Problems profile, experiencing higher levels of emotional problems during the pandemic (Fig. 2).

Internalizing/Externalizing Problems Pre-COVID-19

Lastly, children who experienced both *Internalizing/Externalizing Problems* prior to COVID-19 had the widest distribution in mental health outcomes during COVID-19 (Fig. 2), although it is important to note that the sample sizes in these transition patterns are small. Interestingly, almost 50% ($N=8$) of this group were identified in the profile with the lowest mental health challenges during COVID-19. Almost a third of these children (31.0%, $N=5$) transitioned to the similar *Internalizing/Externalizing* profile during COVID-19. Further, a nontrivial number of children (19.6%, $N=3$) identified with the *Externalizing* profile during the pandemic, experiencing notably lower levels of emotional problems but higher levels of hyperactivity during the pandemic (Fig. 2).

Correlates of CMH Profile Membership Pre- and During COVID-19

The relationship between CMH profile identification and sociodemographic characteristics was examined (See Table 7). Across both time points, there was only one association found between sociodemographics and CMH profile membership. Specifically, children who were identified in the *Internalizing/Externalizing* profile during COVID-19 had mothers who indicated that English was not their first language, compared to children identified in the *Externalizing* profile ($p < 0.01$, $d = 0.35$).

The relationship between CMH prior to the pandemic and parenting was also examined (Table 7). CMH profile membership, both prior to and during COVID-19, was found to be significantly associated with mothers' pre-pandemic hostility and self-efficacy scores. Children who had mothers with above sample mean hostility scores were more likely to be

Table 7 Demographics, parenting practices, maternal mental health and CMH profiles

Demographic characteristics (%)	Pre-COVID-19 profiles				During COVID-19 profiles				χ^2	p
	Average	Externalizing	Internalizing/ Externalizing	p	Average	Externalizing	Internalizing/ Externalizing	χ^2		
Low income	41.4	43.9	35.7	0.32	41.6	43.4	38.1	0.18	0.92	
Low education	51.0	61.2	62.5	2.62	52.5	62.3	45.8	2.53	0.28	
Single	39.3	49.2	37.5	2.11	41.2	48.3	26.1	3.41	0.18	
English 1st	44.8	37.3	46.7	1.22	44.2 ^{ab}	29.5 ^b	69.6 ^a	11.27	<0.01	
<i>Parenting</i>										
Hostility	38.5 ^a	64.2 ^b	68.8 ^{ab}	16.83	42.4 ^a	62.3 ^b	37.5 ^{ab}	8.29	0.02	
Overprotection	49.3	50.7	62.5	1.05	50.2	45.9	62.5	1.90	0.39	
Self-efficacy	60.3 ^a	35.8 ^b	50.0 ^{ab}	12.27	60.1 ^a	34.4 ^b	52.2 ^{ab}	12.48	<0.01	
Perceived impact	61.3	53.7	43.8	2.71	57.1	59.0	69.6	1.32	0.52	
<i>Maternal mental health</i>										
Anxiety	9.3 ^a	20.0 ^{ab}	31.3 ^b	9.90	8.9 ^a	25.4 ^b	16.7 ^{ab}	11.34	<0.01	
Depression	6.9 ^a	18.2 ^b	25.0 ^b	10.51	7.5 ^a	18.3 ^b	16.7 ^{ab}	6.85	0.03	

identified in the *Externalizing Problems* profile than the *Average Levels of Internalizing/Externalizing Problems* profile pre-pandemic ($p < 0.001$, $d = 0.40$). The same relationship was found during COVID-19 ($p = 0.02$, $d = 0.29$). Regarding maternal self-efficacy, children whose mothers scored above the sample mean on self-efficacy were more likely to be identified in the *Average Levels of Internalizing/Externalizing Problems* profile prior to ($p < 0.01$, $d = 0.37$) and during COVID-19 ($p < 0.01$, $d = 0.37$) compared to the children identified in the *Externalizing Problems* profile.

Lastly, the relationship between CMH profile membership and their mothers' mental health prior to COVID-19 was examined (Table 7). Children whose mothers had clinical levels of anxiety prior to the pandemic were more likely to be identified in the *Internalizing/Externalizing Problems* profile pre-pandemic ($p < 0.01$, $d = 0.32$) and *Externalizing Problems* profile during the pandemic ($p < 0.01$, $d = 0.36$) compared to the children who had *Average Levels of Internalizing/Externalizing Problems*. Children whose mothers had clinical levels of depression prior to the pandemic were more likely to be identified in the *Externalizing* profile compared to the children who had *Average Levels of Internalizing/Externalizing Problems*, both prior to ($p < 0.01$, $d = 0.34$) and during COVID-19 ($p = 0.03$, $d = 0.25$).

Discussion

The purpose of this study was to better understand how COVID-19 impacted the mental health of young children. The importance of exploratory and person-centred approaches when investigating heterogeneity in CMH responses to COVID-19 is reflected in the present study's findings.

Heterogeneity in CMH

In line with previous research, the LPA found heterogeneity in CMH prior to and during COVID-19. As with the "Resilient" (McDonald et al., 2016) and "Well-Adjusted" (Morales et al., 2021) profiles, an *Average Levels of Internalizing/Externalizing Problems* CMH profile was identified, both prior to and during COVID-19. Interestingly, this was the largest profile at both time periods, suggesting that not all children experienced declines in mental health following the onset of the pandemic. Additionally, as in the Morales et al. (2021) paper, we identified an *Externalizing* profile with high hyperactivity and slightly elevated levels of conduct problems at both time points. Externalizing behaviours (e.g., hyperactivity, tantrums, aggression, and destructive behaviours) are common in children, especially at a young age when cognitive abilities and emotion regulation are still developing (Fanti & Henrich, 2010). It is noteworthy, however, that children identified by such profiles tend to exhibit such behaviours more frequently.

Lastly, we identified a high levels of *Internalizing/Externalizing Problems* profile characterized by high levels of emotional problems and slightly raised levels of conduct and peer problems. This profile corresponds to previously identified high-risk CMH profiles such as "High Difficulties" (Morales et al., 2021) and "Struggling" (McDonald et al., 2016).

The relationship between these CMH profiles (both prior to and during COVID-19) and sociodemographic and maternal characteristics were examined. Surprisingly, virtually no sociodemographic characteristics (apart from English being the mothers' first language)

were related to children's profile membership at either time point. This may be due to the homogeneity of the families in our sample, which is largely low-income, immigrant-led and/or headed by single parents living in the Greater Toronto Area. In addition, several social and financial supports were made available by the Canadian government during COVID-19 (Petit & Tedds, 2020). Low-income families may have benefitted more from these financial supports (for example, Canada Emergency Response Benefits may have exceeded or equalled the loss of income during COVID-19). This may have potentially overshadowed or mitigated the influence of other sociodemographic variables on CMH during the pandemic.

We did, however, find significant relationships between maternal characteristics, with CMH profiles. Firstly, negative parenting styles (i.e., hostility and low self-efficacy) were associated with children experiencing mental health problems (particularly externalizing problems) prior to and during COVID-19. This coincides with the well-established relationship in developmental research that suboptimal parenting contributes to negative CMH outcomes (Knox et al., 2011; Pinquart, 2017). In addition, clinical levels of anxiety and depression in mothers were linked to CMH profiles characterized by higher levels of internalizing and/or externalizing problems both prior to and during COVID-19. This finding is not surprising, given poor maternal mental health is a significant risk factor for mental health problems in children (Racine et al., 2021; Rees et al., 2019).

Heterogeneity in CMH Responses During COVID-19

Having low levels of internalizing and externalizing problems can be seen as a buffer to environmental disruptions (such as COVID-19), given that most children in the *Average* pre-pandemic profile were in a similar profile during COVID-19. Nonetheless, studies conducted during the early stages of the pandemic (Ezpeleta et al., 2020; Loades et al., 2020) demonstrated a notable deterioration in many children's mental well-being. In line with these previous studies, our findings indicate that a subset of children with average mental health levels pre-pandemic experienced a decline in their mental health, with some of these children transitioning to a profile characterized by both internalizing and externalizing problems. To determine what aspects of the COVID-19 pandemic predict this trajectory profile, further exploration is required. We can speculate that this may be due to the sudden shift to remote learning, a lack of socialization opportunities, and prolonged stay-at-home orders (Furrer & Marchand, 2020; Stark et al., 2020). School and other social opportunities may provide at-risk children with positive experiences (Cost et al., 2022) and these opportunities were reduced due to pandemic restrictions, which were quite extensive in Toronto.

Children previously identified as having only externalizing problems either improved (i.e., had average levels of internalizing and externalizing problems), stayed stable (i.e., identified with a similar profile), or declined (identified with a CMH profile characterized by higher levels of internalizing problems in addition to externalizing problems) during the pandemic. In line with the *Average* profile described above and previous literature citing stability in CMH (Stone et al., 2015), 74% of children in the *Externalizing* profile pre-pandemic experienced similar levels of externalizing issues during the pandemic. Despite this, a significant portion of those in the pre-pandemic *Externalizing* profile also experienced a drop in their externalizing problems from high to average levels. This can be attributed to the exponential development in children's vocabulary and cognitive skillset that take place from toddlerhood to preschool, thus enabling better communication in place of maladaptive externalizing behaviours (i.e.,

aggression and lack of self-control; Fanti & Henrich, 2010; Morgan et al., 2015). In contrast, a few children identified in the *Externalizing* profile prior to the pandemic transitioned to a profile characterized by internalizing problems in addition to externalizing problems. This can be attributed to a phenomenon known as the failure model (Patterson & Capaldi, 1990), which suggests that conduct problems lead to failures in social situations that lead to internalizing problems (i.e., emotional problems).

Finally, we observe that approximately half of the children with the most clinically concerning mental health profile (i.e., those with high levels of internalizing and externalizing problems) transitioned to the profile characterized by average levels of internalizing and externalizing problems. Despite the fact that this is a small group, it is crucial that future research investigates what about these children's lives changed during the pandemic that triggered this drastic improvement in their mental health. In view of the significant amount of time children spend outside of their homes (i.e., at child care or school), it is possible that home quarantine and remote learning may have been beneficial for these children (particularly those experiencing social anxiety or agoraphobia) by alleviating their mental health symptoms (Courtney et al., 2020). Investigations should be conducted in the future.

Limitations and Future Directions

Our study had several limitations. The sample included in this study was somewhat higher on socioeconomic status than the original recruited sample. The characteristics of our sample may, therefore, underrepresent patterns of deteriorating CMH associated with COVID-19, as well as the associations between profile membership and sociodemographics. However, it is important to note that the sample of this study is still considered substantially more vulnerable than the general Canadian population (City of Toronto, 2018). Secondly, there were a small number of children in some of the profiles. Thus, we were not able to run analyses such as logistic regression of covariates on profile membership, limiting our ability to investigate causal relationships of sociodemographic and maternal risk factors on CMH profile membership. Future studies with larger samples should be conducted to test whether parenting or maternal mental health *predicts* children's latent transition profiles. Thirdly, CMH was reported by mothers. This may lead to inaccurate and/or inflated scores, as mothers can have distorted perceptions of their CMH (Gartstein et al., 2009). A multi-method and multi-informant approach to measurement, including direct assessments of children, would benefit future research. In addition, COVID-19 data collection occurred mainly during the first six months following the pandemic's onset. The effects of the pandemic on CMH may become more pronounced or manifest differently over time. Thus, it would be beneficial to follow up over a longer period. Moreover, future researchers should investigate the mechanisms through which maternal characteristics may influence children's profile membership. Finally, latent profiles should be explored in conjunction with qualitative information about challenges that children face (e.g., with remote learning).

Conclusion

The present study findings elucidate the drawbacks of the prevailing one-size-fits-all approach to CMH pandemic research. The unique trajectory patterns identified underscore the importance for clinicians and policymakers to tailor preventive interventions to those at risk. In addition, a better understanding of modifiable correlates of profile membership

also provides a point of intervention, with this study recognizing the impact mothers have on CMH. Specifically, the parenting mom endorses, in addition to her mental health, can significantly influence her child's mental health responses to stressful events such as the COVID-19 pandemic. Supporting children should, therefore, be based on a family systems approach, with parenting and mothers' mental health being especially important.

Appendix

Demographics of those who participated in the present study relative to the recruitment sample

Demographics	Recruitment sample (%)	Present study sample (%)	X^2	p
Bachelors or above	35.00	45.20	8.37	<0.01
English 1st	70.60	65.70	2.12	0.15
Two-parent home	47.20	56.60	6.87	<0.01

Demographics	Recruitment sample (M, SD)	Present study sample (M, SD)	t	p
Income	\$22,935.01 (18,010.07)	\$27,525.21 (17,885.68)	-3.48	<0.001

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Declarations

Conflict of Interest The authors have no competing interests to declare that are relevant to the content of this article.

Ethical Approval Ethics was approved by the University of Toronto, Research Ethics Board. Protocol Reference #: 30104.

Informed Consent Verbal consent was obtained from all study participants in this study.

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