Risk Factors for Childhood Mental Health Symptoms: National Longitudinal Study of Australian Children

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KEY WORDS
mental health, children, risk factors, internalizing problems, externalizing problems, epidemiological studies, longitudinal studies

ABBREVIATIONS
LSAC—Longitudinal Study of Australian Children
SDQ—Strengths and Difficulties Questionnaire

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WHAT'S KNOWN ON THIS SUBJECT: Mental health is an international public health issue; ~20% of children are affected by externalizing (behavioral) or internalizing (emotional) problems. Infant, preschool, and elementary school developmental periods provide the foundations for brain and self-regulation skill development.

WHAT THIS STUDY ADDS: National longitudinal population data showed that a small pool of risks predicted children's mental health symptoms consistently, situated in the immediate family context and present from a young age. Knowledge of these key risks is informing randomized prevention trials.

abstract

OBJECTIVE: To determine predictors of child externalizing (behavioral) and internalizing (emotional) symptoms in a national population sample.

METHODS: Data were collected in 3 biennial waves (2004, 2006, and 2008) from 2 cohorts in the Longitudinal Study of Australian Children, initially including 5107 children 0 to 1 year of age and 4983 children 4 to 5 years of age. The primary outcomes were child externalizing and internalizing symptoms. Relationships between potential risk factors and child mental health outcomes were described by using linear regression.

RESULTS: In unadjusted analyses, children's mental health symptoms were predicted by a large number of risk factors. In multivariate models, early childhood factors (birth through 5 years) explained 30% and 18% of variations in externalizing and internalizing symptoms, respectively, at 4 to 5 years of age. Middle childhood (5–9 years of age) factors explained 20% and 23% of variations in externalizing and internalizing symptoms, respectively, at 8 to 9 years of age. Harsh discipline was a strong consistent predictor of externalizing symptoms in both age groups, whereas poorer child physical health, maternal emotional distress, harsh discipline, and overinvolved/protective parenting (younger cohort only) predicted internalizing symptoms consistently.

CONCLUSIONS: National data on predictors of child mental health symptoms highlighted a small number of significant risk factors, situated in the family context and present from a very young age. This knowledge is informing population-level, randomized, prevention trials of family support programs. *Pediatrics* 2011;128:e000

Mental health is a public health issue. Whether the prevalence is estimated through diagnostic interviews or through dimensional symptom measures with clinical cutoff points, mental health problems affect ~20% of children, adolescents, and adults in modern societies.[1–4]

Childhood mental health problems mainly include externalizing problems (aggression and oppositional defiance) and internalizing problems (anxiety and depression).[2] Mental health symptoms frequently begin in childhood and then continue into adolescence and adulthood.[5–9] Sequelae include friendship and learning difficulties, school dropout, substance abuse, family violence, and suicide. Societal costs are high, including clinical, remedial educational, and criminal justice services, sick leave, and unemployment.[10,11]

Infant, preschool, and primary school developmental periods are important for brain and self-regulation skill development. These foundations assist or impede the negotiation of adolescent and adult life tasks.[12,13] Identification of strong consistent predictors could highlight how early preventive intervention should begin, what the focus of intervention should be, and how long support should continue.

In the past 30 years, studies with diverse designs have indicated a number of risks common to youth externalizing and internalizing difficulties. Child risks include physical health problems, "difficult" temperament, and insecure-attachment behavioral styles.[6,14–16] Family risks include controlling and less warm/sensitive parenting interactions, parent mental health problems, daily problems, and separation/divorce.[14–21] Additional risks that seem specific to externalizing difficulties include male gender, the presence of siblings, harsh discipline, low parenting efficacy, young and poorly educated parents, poor social support, and substantial use of child care.[14,16,22] Risks that seem specific to internalizing difficulties include inhibited temperament, overprotective parenting, parent anxiety, and illness/death.[15,21]

Only 4 longitudinal population studies beginning very early in childhood, including 3 from separate Australian states, have reported on externalizing and internalizing outcomes simultaneously. In a Queensland prebirth cohort ($N = 8556$), children in the lowest income group were more likely to manifest both externalizing and internalizing problems by 5 and 14 years of age.[23] In a Western Australian prenatal study ($N = 1701$), risks common to both externalizing and internalizing outcomes at 5 years of age were prenatal low income, smoking, and stressful events and postnatal depression.[24] Additional risks specific to externalizing problems were mothers' young age at conception, young gestational age, and male gender, whereas a risk specific to internalizing problems was nonwhite race/ethnicity.

The most comprehensively focused on early childhood, a Victorian study from infancy ($N = 733$) assessed families at child ages 7, 12, 18, 24, and 36 months, with measures of sociodemographic characteristics, difficult infant temperament, parenting interactions, maternal mental health, substance misuse, partner relationship, home violence, and social isolation.[25] Consistent predictors of early externalizing symptoms across child ages were parent stress and harsh discipline, whereas predictors of internalizing symptoms included small family size, parent distress, and parenting. Most recently, a Norwegian study involving 921 toddlers reported that child emotional temperament and family factors at 18 months (particularly low levels of partner support) predicted 43% of the stability and 20% of the linear changes in externalizing symptom trajectories to 4.5 years of age.[26] Inhibited child temperament and family factors at 18 months (particularly family stress) predicted 30% of the stability and 7% of the linear changes in internalizing trajectories to 4.5 years.

Despite the importance of these literature findings, they remain fragmentary. It is not possible to understand the relative importance of these numerous disparate predictors until they are examined concurrently within long-running, contextually rich, longitudinal population studies. Specifically, such studies require (1) a focus on internalizing and externalizing problems, (2) comprehensive assessments of parenting practices, parent mental health, family stress, and sociodemographic risks, (3) measurements at multiple time points in the infancy, preschool, and elementary school years, and (4) extensive measurement of family environments throughout this time.

We report data from the Longitudinal Study of Australian Children (LSAC), a nationally representative population study of 5107 infants (0–1 year of age) who were monitored to preschool age (4–5 years of age) and 4983 preschool-aged children (4–5 years of age) who were monitored to middle childhood (8–9 years of age). We aimed to examine the development of child externalizing and internalizing symptoms at multiple time points, together with the predictive importance of multiple child, parenting, family, community, and demographic risks, measured repeatedly when possible. We hypothesized a central role for parenting interactions and parent stress in the development of children's mental health symptoms.

METHODS

Study Design, Setting, Participants, and Sampling

Data were from waves 1 to 3 of the LSAC, collected through questionnaires and interviews with the child's primary caregiver (97% biological mothers). The study design and sample information were described in detail elsewhere.[27] Briefly, a 2-stage, clustered, sample design was used. The primary sampling unit was Australian postal codes (stratified according to state of residence and urban versus rural), with ~10% of postal codes ultimately being included. Children were then selected randomly by using the Medicare (national health insurance) database, in which >90% of Australian infants and 98% of 4-year-old children are enrolled. Two cohorts were recruited in 2004 (wave 1). The birth cohort included 5107 infants 3 to 19 months of age (64% response rate), with 90% (N = 4606) being retained to wave 2 at 2 to 3 years of age and 86% (N = 4386) being retained to wave 3 at 4 to 5 years of age. The kindergarten cohort included 4983 children 51 to 67 months of age (59% response rate), and 90% (N = 4464) were retained to wave 2 at 6 to 7 years of age and 87% (N = 4331) were retained to wave 3 at 8 to 9 years of age.[27]

Sociodemographic characteristics of each cohort in wave 1 are presented in Table 1. The cohorts were broadly representative of the Australian population.[27] More-highly educated parents were overrepresented (by ~10 percentage points). Single and non–English-speaking parents and families in rental properties were slightly underrepresented. Wave 2 retention in both cohorts was slightly lower for the same set of families. Wave 3 retention in both cohorts underrepresented parents with low incomes (less than $1000 [Australian] per week), parents whose main language at home was not English, and indigenous children. Design weights compensated for nonresponses and ensured that weighted estimates achieved population benchmarks for each variable.[27] The study was approved by the Australian Institute of Family Studies ethics committee.

TABLE 1 Sociodemographic Characteristics of LSAC Cohorts at Wave 1

Characteristic	Birth Cohort[a]	Kindergarten Cohort[b]
Family		
Mother's age, mean ± SD, y	31.0 ± 5.5	34.6 ± 5.3
Mother completed high school, %	66.9	58.6
Mother's main language not English, %	12.8	14.4
Sole parent in home, %	9.3	14.0
Stepparent in home, %	0.2	2.2
Child		
Male, %	48.9	50.9
Indigenous, %	4.5	3.8
Has sibling, %	60.5	88.6
Community		
Neighborhood disadvantage score, mean ± SD	1009 ± 60	1011 ± 59

[a] Sample sizes ranged from 5003 to 5107.
[b] Sample sizes ranged from 4867 to 4983.

Child Mental Health (Primary Outcome)

Externalizing and internalizing symptoms at 4 to 5 years of age and above were assessed with the Strengths and Difficulties Questionnaire (SDQ). This screening measure for 3- to 16-year-old subjects is widely used in cohort studies and has concurrent validity against similar measures[28]; parents respond to 25 items regarding their children's functioning over the previous 6 months, with 3-point scales ranging from 0 = not true to 2 = certainly true. We focused on the conduct and emotional scales of the SDQ, which reflect the 2 widely recognized primary dimensions of children's mental health, namely, externalizing and internalizing problems, respectively.[2] The 5-item conduct subscale assesses externalizing symptoms, and the 5-item emotional subscale assesses internalizing symptoms. Subscale scores were the sums of individual items (range: 0–10; a scaled sum was used if 1 or 2 items were missing).

Clinical cutoff points for the SDQ (4–16-year version) were developed in epidemiological studies, to categorize results as normal, borderline (80th to 89th percentile), or abnormal (≥90th percentile).[29] A lack of representative Australian SDQ normative values or clinical cutoff points necessitated comparison with UK normative data.[30] In the LSAC at 6 to 7 and 8 to 9 years of age, the UK version of the SDQ for 4- to 16-year-old subjects was used. At 4 to 5 years of age, the UK preschool version of the SDQ was used (2 conduct items regarding antisocial behavior ["often lies or cheats" and "steals from home, school, or elsewhere"] are replaced by oppositionality items ["often argumentative with adults" and "can be spiteful to others"]). The preschool version has no clinical cutoff points.

Potential Risk Measures

The LSAC used abbreviated measures from various sources, including validated scales from previous cohort studies. Measures used here as potential risk indicators for child mental health problems are presented in Table 2. An extensive number of potential risk measures were selected to assess the range of demographic characteristics and child, parent, family, and community factors identified in previous studies. Risk measures were assessed repeatedly over time when possible.

TABLE 2 Potential Risk Factor Measures Used in Present Study

Measure	Age Group, y	Additional Information
Family		
Mother's age	0–1, 4–5	Age at last birthday
Mother completed high school	0–1, 4–5	Completed year 12 or equivalent (yes/no)
Mother's main language not English	0–1, 4–5	Main language spoken at home (not English vs English)
Sole parent in home	0–1, 2–3, 4–5, 6–7, 8–9	Yes/no
Stepparent in home	0–1, 2–3, 4–5, 6–7, 8–9	Yes/no
Family socioeconomic advantage[35]	0–1, 2–3, 4–5, 6–7, 8–9	Composite standardized measure of parents' occupational status, household income, and parents' education; higher scores indicate more advantage
Child		
Male	0–1, 4–5	Child gender
Indigenous	0–1, 4–5	Aboriginal or Torres Strait Islander (yes/no)
Physical health (Pediatric Quality of Life Inventory)[36]	2–3, 4–5, 6–7, 8–9	8 items assessing physical health-related quality of life; higher scores indicate better physical health; birth cohort: $\alpha = .71$ for 2–3 y, $\alpha = .71$ for 4–5 y; kindergarten cohort: $\alpha = .73$ for 4–5 y, $\alpha = .81$ for 6–7 y, $\alpha = .81$ for 8–9 y
Language (Peabody Picture Vocabulary Test III)[37]	4–5, 6–7, 8–9	Direct assessment of receptive vocabulary on short form (40 items); higher scores indicate more competence
Has sibling	0–1, 4–5	Yes/no
Parenting practices		
Warmth[38]	0–1, 2–3, 4–5, 6–7, 8–9	6 items assessing frequency of warm affectionate behaviors toward child; higher scores indicate more warmth; birth cohort: $\alpha = .79$ for 0–1 y, $\alpha = .84$ for 2–3 y, $\alpha = .87$ for 4–5 y; kindergarten cohort: $\alpha = .83$ for 4–5 y, $\alpha = .87$ for 6–7 y, $\alpha = .88$ for 8–9 y
Harsh discipline[39]	0–1, 2–3, 4–5, 6–7, 8–9	2–6 items assessing frequency of yelling and smacking interactions with child; higher scores indicate harsher discipline; birth cohort: $\alpha = .78$ for 0–1 y (3 items), $\alpha = .87$ for 2–3 y (3 items), $\alpha = .76$ for 4–5 y (6 items); kindergarten cohort: $\alpha = .47$ for 4–5 y (2 items), $\alpha = .76$ for 6–7 y (6 items), $\alpha = .78$ for 8–9 y (6 items)
Overinvolved/protective[21]	0–1, 2–3, 4–5, 6–7, 8–9	7-item parental separation anxiety scale used as proxy at 0–1 y; 3-item overprotective parenting scale used at all other ages; higher scores indicate more overprotection; birth cohort: $\alpha = .83$ for 0–1 y, $\alpha = .51$ for 2–3 y, $\alpha = .55$ for 4–5 y; kindergarten cohort: $\alpha = .54$ for 6–7 y, $\alpha = .55$ for 8–9 y
Inductive reasoning[38]	2–3, 4–5, 6–7, 8–9	3–5 items assessing frequency of inductive reasoning use; higher scores indicate more inductive reasoning; birth cohort: $\alpha = .82$ for 2–3 y (3 items), $\alpha = .89$ for 4–5 y (5 items); kindergarten cohort: .66 for 4–5 y (5 items), $\alpha = .82$ for 6–7 y (5 items), $\alpha = .90$ for 8–9 y (5 items)
Inconsistent discipline[40]	4–5, 6–7, 8–9	Single item; makes sure child completes request (one-half of the time or less often vs more than one-half of the time)
Mother's mental health		
Emotional distress (Kessler Short Screen Scale for Psychological Distress)[41]	0–1, 2–3, 4–5, 6–7, 8–9	6 items measuring symptoms of anxiety or depression in past 4 wk; higher scores indicate more distress; birth cohort: $\alpha = .83$ for 0–1 y, $\alpha = .83$ for 2–3 y, $\alpha = .84$ for 4–5 y; kindergarten cohort: $\alpha = .84$ for 4–5 y, $\alpha = .84$ for 6–7 y, $\alpha = .85$ for 8–9 y
Depression	0–1, 2–3, 4–5, 6–7, 8–9	Single item; depression for ≥2 wk in past year (yes/no)
Smoking	0–1, 2–3, 4–5, 6–7, 8–9	Single item; current smoker (yes/no)
Alcohol consumption[42]	0–1, 2–3, 4–5, 6–7, 8–9	Derived from quantity/frequency of current alcohol consumption, ≥2 standard drinks per d, on average (yes/no)
Family life stressors		
Financial hardship[43]	0–1, 2–3, 4–5, 6–7, 8–9	6 items assessing whether family went without meals or was unable to heat/cool home in past 12 mo; higher scores indicate more hardship; birth cohort: $\alpha = .65$ for 0–1 y, $\alpha = .58$ for 2–3 y, $\alpha = .56$ for 4–5 y; kindergarten cohort: $\alpha = .65$ for 4–5 y, $\alpha = .59$ for 6–7 y, $\alpha = .62$ for 8–9 y
Partner conflict[44]	0–1, 2–3, 4–5, 6–7, 8–9	5 items assessing frequency of arguments or hostility in couple relationship; higher scores indicate more conflict; birth cohort: $\alpha = .79$ for 0–1 y, $\alpha = .75$ for 2–3 y, $\alpha = .74$ for 4–5 y; kindergarten cohort: .80 for 4–5 y, $\alpha = .77$ for 6–7 y, $\alpha = .75$ for 8–9 y
Partner relationship satisfaction[45,46]	0–1, 2–3, 4–5, 6–7, 8–9	1–8 items assessing degree of happiness in relationship; higher scores indicate greater satisfaction; birth cohort: $\alpha = .90$ for 0–1 y (7 items), single item for 2–3 y, $\alpha = .91$ for 4–5 y (8 items); kindergarten cohort: $\alpha = .91$ for 4–5 y (7 items), single item for 6–7 y, $\alpha = .92$ for 8–9 y (8 items)
Family grief/illness events[47]	0–1, 2–3, 4–5, 6–7, 8–9	4 items assessing whether family member or close friend died or suffered serious injury, illness, or assault (≥1 event vs no events)
Mother's job quality (Job Quality Index)[48]	0–1, 2–3, 4–5, 6–7, 8–9	4 or 5 items assessing access to paid parental leave, flexible hours, job control, job security (all ages), and workload (birth cohort: ages 2–3 and 4–5 y; kindergarten cohort: ages 6–7 and 8–9 y); higher scores indicate higher job quality
Community		
Type of child care	0–1, 2–3, 4–5	No child care, 1 type, 2 types, or ≥3 types
Time in center-based child care	6–7, 8–9	
Neighborhood disadvantage (Socio-Economic Indexes for Areas)[49]	0–1, 2–3, 4–5, 6–7, 8–9	Index of Relative Disadvantage score according to home address postal code; higher scores indicate greater advantage

All measures were reported by mothers. For continuous measures, α indicates Cronbach's α.

Statistical Analyses

Analyses were conducted by using Stata 11.1 (Stata Corp, College Station, TX). We report estimated mean symptoms on the SDQ externalizing and internalizing scales, and we use the SDQ dichotomized cutoff points to report problem prevalence. Demographic characteristics and potential risk variables were summarized by using proportions for categorical variables and means and SDs for continuous variables. Cronbach's α was calculated at each wave, for internal consistency of items in continuous scales.

The relationships between potential risk factors and each of the externalizing and internalizing outcomes were described by using linear regression. Separate analyses were implemented for each outcome for the birth cohort at 4 to 5 years and the kindergarten cohort at 6 to 7 and 8 to 9 years. All risk measures recorded before or at the wave at which the outcome was measured were used as predictors. Unadjusted analyses were performed in which 1 risk factor at a time was used as a predictor variable. An adjusted (multivariate) regression model was then fitted in which all risk factors significant at the 5% level in the unadjusted analyses were simultaneously used as predictors. Risk factors found to be highly colinear were excluded from the adjusted analyses (even if their *P* values were $<.05$ in unadjusted analyses) if the interpretation in the adjusted model opposed the unadjusted model. All continuous predictors were rescaled (divided by 2 SDs) so that effects could be compared more directly with binary predictors.[31] Effect sizes were calculated for SDQ outcomes by dividing the regression coefficient by the sample SD.

Regression analyses were weighted for the multistage sampling design, with correction for underrepresentation of families at wave 1 and subsequent nonresponses at waves 2 and 3. Longitudinal weights adjusted the sample that responded to all 3 waves to be representative of the population at the time of selection.[27]

RESULTS

Continuity and Prevalence for Child Mental Health

In the kindergarten cohort, SDQ data were available for 4969 children (99.7%) at 4 to 5 years of age, 4341 children (87.1%) at 6 to 7 years of age, and 3802 children (76.3%) at 8 to 9 years of age. Continuity over time was substantial, with Pearson correlation coefficients for externalizing and internalizing symptoms of 0.54 and 0.46, respectively, from 4 to 5 years to 6 to 7 years, 0.63 and 0.55 from 6 to 7 years to 8 to 9 years, and 0.48 and 0.38 from 4 to 5 years to 8 to 9 years. SDQ clinical cutoff points are available for school ages. In the borderline/abnormal range, 19.6% and 24.4% of children at 6 to 7 years and 17.2% and 24.0% at 8 to 9 years had externalizing and internalizing problems, respectively.

Risk Factors for Child Mental Health Symptoms

Early Childhood (0–1 to 4–5 Years)

At preschool age (4–5 years), 30% and 18% of variations in externalizing and internalizing symptoms, respectively, were explained by the multivariate models (Tables 3 and 4). In the unadjusted analyses, many variables considered individually were statistically significant predictors of externalizing symptoms at preschool age, at the 5% level (child: indigenous and less language; mother: emotional distress, smoking, less warm, less inductive reasoning, and more inconsistent discipline; family: financial hardship, partner conflict, and relationship dissatisfaction; demographic: young mother, mother who did not complete high school, sole parent, socioeconomic disadvantage, and stepparent in the home; community: more center-based child care and neighborhood disadvantage). In the multivariate (adjusted) analysis, however, the only significant predictors in the model were harsh discipline (effect size: 0.76), poorer child physical health (effect size: 0.25), and more family grief/illness events (effect size: 0.11).

Similarly, internalizing symptoms at preschool age were predicted by numerous variables in unadjusted analyses (child: less language; mother: less warmth and more inconsistent discipline; family: financial hardship, grief/illness events, partner conflict, and relationship dissatisfaction; demographic: young mother, mother who did not complete high school, main language at home not English, sole parent, and socioeconomic disadvantage; community: neighborhood disadvantage). Again, far fewer variables were strongly predictive in the multivariate analyses, namely, poorer child physical health (effect size: 0.17–0.47), female gender (effect size: 0.14), no siblings (effect size: 0.15), maternal emotional distress (effect size: 0.25), overinvolved/protective parenting (effect size: 0.15), harsh discipline (effect size: 0.14), and neighborhood disadvantage (effect size: 0.25).

Middle Childhood (4–5 to 8–9 Years)

Predictors of externalizing and internalizing symptoms were essentially the same whether outcomes were analyzed at 6 to 7 or 8 to 9 years of age; therefore, for brevity, we present the findings at 8 to 9 years (Tables 5 and 6). The multivariate models from 4 to 5 through 8 to 9 years explained 20% and 23% of variations in externalizing and internalizing symptoms, respectively.

In the unadjusted analyses, statistically significant predictors of externalizing symptoms were as follows: child: indigenous and less language; mother:

TABLE 3 Prediction of Early Childhood Externalizing Symptoms (Birth to 4–5 Years)

Potential Predictors	Unadjusted Results[a]		Adjusted Results[b] ($N = 2420$)	
	Coefficient (95% CI)	*P*	Coefficient (95% CI)	*P*
Family				
Mother's age	−0.43 (−0.59 to −0.28)	<.001	−0.07 (−0.22 to 0.08)	.34
Mother completed high school	−0.45 (−0.58 to −0.31)	<.001	−0.02 (−0.18 to 0.14)	.79
Mother's main language not English	0.14 (−0.08 to 0.35)	.21		
Sole parent in home at 0–1 y	0.64 (0.33 to 0.94)	<.001	0.14 (−0.27 to 0.54)	.51
Sole parent in home at 2–3 y	0.59 (0.32 to 0.85)	<.001	0.25 (−0.22 to 0.72)	.30
Sole parent in home at 4–5 y	0.44 (0.21 to 0.67)	<.001	−0.20 (−0.61 to 0.21)	.34
Stepparent in home at 0–1 y	0.25 (−0.75 to 1.26)	.62		
Stepparent in home at 2–3 y	1.26 (0.38 to 2.14)	.005	0.53 (−0.51 to 1.58)	.32
Stepparent in home at 4–5 y	0.46 (−0.06 to 0.99)	.08		
Family socioeconomic advantage at 0–1 y	−0.64 (−0.78 to −0.51)	<.001	−0.09 (−0.44 to 0.25)	.60
Family socioeconomic advantage at 2–3 y	−0.74 (−0.89 to −0.60)	<.001	−0.26 (−0.63 to 0.11)	.17
Family socioeconomic advantage at 4–5 y	−0.71 (−0.86 to −0.56)	<.001	0.03 (−0.30 to 0.37)	.85
Child				
Male	0.12 (−0.01 to 0.24)	.08		
Indigenous	0.56 (0.15 to 0.97)	.007	−0.03 (−0.47 to 0.40)	.89
Physical health at 2–3 y	−0.60 (−0.75 to −0.45)	<.001	−0.03 (−0.24 to 0.17)	.76
Physical health at 4–5 y	−0.90 (−1.06 to −0.74)	<.001	−0.45 (−0.65 to −0.25)	<.001
Language at 4–5 y	−0.50 (−0.64 to −0.36)	<.001	−0.15 (−0.30 to 0.00)	.05
Has sibling	0.00 (−0.14 to 0.14)	.98		
Parenting practices				
Warmth at 0–1 y	−0.16 (−0.29 to −0.04)	.01	0.05 (−0.12 to 0.22)	.57
Warmth at 2–3 y	−0.55 (−0.67 to −0.42)	<.001	−0.14 (−0.32 to 0.04)	.14
Warmth at 4–5 y	−0.65 (−0.78 to −0.52)	<.001	−0.17 (−0.35 to 0.01)	.07
Harsh discipline at 0–1 y	0.46 (0.30 to 0.62)	<.001	−0.03 (−0.20 to 0.14)	.69
Harsh discipline at 2–3 y	0.99 (0.84 to 1.13)	<.001	0.15 (−0.02 to 0.32)	.09
Harsh discipline at 4–5 y	1.65 (1.50 to 1.79)	<.001	1.37 (1.19 to 1.55)	<.001
Overinvolved/protective at 0–1 y	0.13 (0.00 to 0.26)	.05		
Overinvolved/protective at 2–3 y	0.04 (−0.10 to 0.17)	.56		
Overinvolved/protective at 4–5 y	0.02 (−0.11 to 0.14)	.80		
Inductive reasoning at 2–3 y	−0.43 (−0.56 to −0.29)	<.001		
Inductive reasoning at 4–5 y	−0.05 (−0.17 to 0.07)	.44		
Inconsistent discipline at 4–5 y	0.42 (0.21 to 0.63)	<.001	0.06 (−0.18 to 0.30)	.61
Mother's mental health				
Emotional distress at 0–1 y	0.62 (0.47 to 0.76)	<.001	0.08 (−0.13 to 0.28)	.45
Emotional distress at 2–3 y	0.67 (0.53 to 0.81)	<.001	−0.03 (−0.23 to 0.16)	.75
Emotional distress at 4–5 y	0.76 (0.61 to 0.92)	<.001	0.12 (−0.11 to 0.35)	.31
Depression at 0–1 y	0.35 (0.20 to 0.49)	<.001	−0.07 (−0.22 to 0.08)	.35
Depression at 2–3 y	0.57 (0.40 to 0.74)	<.001	−0.03 (−0.21 to 0.16)	.78
Depression at 4–5 y	0.58 (0.43 to 0.73)	<.001	0.04 (−0.14 to 0.21)	.69
Mother smokes at 0–1 y	0.61 (0.44 to 0.78)	<.001	0.12 (−0.17 to 0.41)	.40
Mother smokes at 2–3 y	0.56 (0.37 to 0.75)	<.001	−0.02 (−0.30 to 0.26)	.88
Mother smokes at 4–5 y	0.65 (0.47 to 0.84)	<.001	0.21 (−0.08 to 0.50)	.15
Mother consumes ≥2 standard alcoholic drinks per d at 0–1 y	−0.24 (−0.74 to 0.25)	.33		
Mother consumes ≥2 standard alcoholic drinks per d at 2–3 y	−0.23 (−0.62 to 0.17)	.27		
Mother consumes ≥2 standard alcoholic drinks per d at 4–5 y	0.01 (−0.39 to 0.40)	.97		
Family life stressors				
Financial hardship at 0–1 y	0.46 (0.28 to 0.63)	<.001	0.06 (−0.12 to 0.25)	.50
Financial hardship at 2–3 y	0.44 (0.28 to 0.61)	<.001	0.02 (−0.16 to 0.21)	.80
Financial hardship at 4–5 y	0.43 (0.26 to 0.59)	<.001	−0.07 (−0.25 to 0.12)	.48
Partner conflict at 0–1 y	0.25 (0.10 to 0.41)	<.001	−0.01 (−0.26 to 0.25)	.95
Partner conflict at 2–3 y	0.40 (0.26 to 0.53)	<.001	0.14 (−0.07 to 0.35)	.18
Partner conflict at 4–5 y	0.40 (0.26 to 0.54)	<.001	0.08 (−0.18 to 0.34)	.55
Partner relationship satisfaction at 0–1 y	−0.33 (−0.48 to −0.18)	<.001	−0.10 (−0.32 to 0.13)	.41
Partner relationship satisfaction at 2–3 y	−0.36 (−0.50 to −0.22)	<.001	−0.12 (−0.31 to 0.08)	.25
Partner relationship satisfaction at 4–5 y	−0.37 (−0.51 to −0.23)	<.001	0.13 (−0.10 to 0.36)	.27
Family grief/illness events at 0–1 y	0.09 (−0.05 to 0.22)	.20	0.01 (−0.13 to 0.14)	.90
Family grief/illness events at 2–3 y	0.16 (0.01 to 0.31)	.03	0.08 (−0.07 to 0.23)	.32
Family grief/illness events at 4–5 y	0.22 (0.06 to 0.37)	.006	0.20 (0.05 to 0.36)	.01
Mother's job quality at 0–1 y		.15		

TABLE 3 Continued

Potential Predictors	Unadjusted Results[a]		Adjusted Results[b] ($N = 2420$)	
	Coefficient (95% CI)	*P*	Coefficient (95% CI)	*P*
1	Reference			
2	0.08 (−0.28 to 0.45)			
3	−0.10 (−0.43 to 0.24)			
4	0.12 (−0.23 to 0.46)			
Mother's job quality at 2–3 y		.77		
1	Reference			
2	−0.33 (−1.07 to 0.41)			
3	−0.24 (−0.91 to 0.43)			
4	−0.32 (−0.98 to 0.33)			
5	−0.38 (−1.06 to 0.29)			
Mother's job quality at 4–5 y		.55		
1	Reference			
2	0.02 (−0.54 to 0.58)			
3	−0.23 (−0.76 to 0.29)			
4	−0.21 (−0.75 to 0.32)			
5	−0.24 (−0.75 to 0.28)			
Community				
No. of types of child care at 0–1 y		.85		
0	Reference			
1	−0.04 (−0.18 to 0.11)			
2	−0.04 (−0.30 to 0.22)			
3–5	0.18 (−0.35 to 0.71)			
No. of types of child care at 2–3 y		.66		
0	Reference			
1	0.07 (−0.09 to 0.23)			
2	−0.02 (−0.22 to 0.19)			
3–5	−0.03 (−0.39 to 0.34)			
No. of types of child care at 4–5 y		.23		
0	Reference			
1	−0.36 (−0.75 to 0.03)			
2	−0.26 (−0.64 to 0.12)			
3–5	−0.36 (−0.78 to 0.07)			
Time in center-based child care at 0–1 y	0.06 (−0.08 to 0.20)	.39		
Time in center-based child care at 2–3 y	0.22 (0.08 to 0.36)	<.001		
Time in center-based child care at 4–5 y	0.00 (−0.11 to 0.12)	.96		
Neighborhood disadvantage at 0–1 y	−0.25 (−0.40 to −0.10)	<.001	0.07 (−0.17 to 0.31)	.56
Neighborhood disadvantage at 2–3 y	−0.37 (−0.49 to −0.25)	<.001	0.10 (−0.21 to 0.42)	.52
Neighborhood disadvantage at 4–5 y	−0.38 (−0.51 to −0.25)	<.001	−0.28 (−0.57 to 0.02)	.07

CI indicates confidence interval. $R^2 = 29.9\%$.

[a] Sample sizes ranged from 1385 to 3734.

[b] Inductive reasoning at 2 to 3 years was omitted from the adjusted model because it was strongly colinear with the warmth and harsh discipline variables.

emotional distress, depression, less warmth, less inductive reasoning, more inconsistent discipline, and over-involved/protective parenting; family: grief/illness events, partner conflict, and relationship dissatisfaction; demographic: younger mother and sole parent; community: more hours in nonparental child care and neighborhood disadvantage. The significant predictors in the multivariate analysis were harsh discipline (effect size: 0.25–0.70), male gender (effect size: 0.20), poorer physical health (effect size: 0.17), mother smokes (effect size: 0.18), mother did not complete high school (effect size: 0.12), and family financial hardship (effect size: 0.21).

Several factors were statistically significant predictors of internalizing symptoms in middle childhood in the unadjusted analyses (child: indigenous; mother: smoking and depression; family: grief/illness events, financial hardship, partner conflict, and relationship dissatisfaction; demographic: young mother, mother who did not complete high school, main language at home not English, sole parent, and socioeconomic disadvantage; community: more nonparental child care and neighborhood disadvantage). In the multivariate analysis, the significant predictors were poorer child physical health (effect size: 0.46), fewer child language skills (effect size: 0.17), no siblings (effect size: 0.15), harsh discipline (effect size: 0.22), and mother's emotional distress (effect size: 0.16–0.22).

TABLE 4 Prediction of Early Childhood Internalizing Symptoms (Birth to 4–5 Years)

Potential Predictors	Unadjusted Results[a]		Adjusted Results ($N = 2006$)[b]	
	Coefficient (95% CI)	*P*	Coefficient (95% CI)	*P*
Family				
Mother's age	−0.24 (−0.37 to −0.11)	<.001	−0.06 (−0.24 to 0.11)	.47
Mother completed high school	−0.19 (−0.30 to −0.07)	<.001	−0.13 (−0.29 to 0.04)	.15
Mother's main language not English	0.21 (0.01 to 0.41)	.04		
Sole parent in home at 0–1 y	0.35 (0.10 to 0.60)	.006	−0.12 (−0.48 to 0.23)	.50
Sole parent in home at 2–3 y	0.40 (0.17 to 0.62)	<.001	0.04 (−0.42 to 0.51)	.86
Sole parent in home at 4–5 y	0.35 (0.15 to 0.55)	<.001	0.09 (−0.32 to 0.50)	.66
Stepparent in home at 0–1 y	0.57 (−0.68 to 1.83)	.37		
Stepparent in home at 2–3 y	0.27 (−0.52 to 1.06)	.50		
Stepparent in home at 4–5 y	−0.02 (−0.38 to 0.34)	.92		
Family socioeconomic advantage at 0–1 y	−0.31 (−0.43 to −0.20)	<.001	−0.12 (−0.45 to 0.21)	.48
Family socioeconomic advantage at 2–3 y	−0.30 (−0.42 to −0.19)	<.001	0.36 (−0.02 to 0.74)	.07
Family socioeconomic advantage at 4–5 y	−0.34 (−0.47 to −0.22)	<.001	−0.29 (−0.65 to 0.06)	.11
Child				
Male	−0.18 (−0.29 to −0.08)	<.001	−0.21 (−0.35 to −0.08)	<.001
Indigenous	0.24 (−0.10 to 0.58)	.17		
Physical health at 2–3 y	−0.58 (−0.72 to −0.44)	<.001	−0.18 (−0.35 to −0.02)	.03
Physical health at 4–5 y	−0.84 (−0.98 to −0.70)	<.001	−0.70 (−0.88 to −0.53)	<.001
Language at 4–5 y	−0.33 (−0.46 to −0.19)	<.001	−0.14 (−0.29 to 0.00)	.05
Has sibling	−0.25 (−0.37 to −0.13)	<.001	−0.22 (−0.37 to −0.08)	<.001
Parenting practices				
Warmth at 0–1 y	−0.06 (−0.18 to 0.06)	.31		
Warmth at 2–3 y	−0.15 (−0.28 to −0.02)	.02	−0.04 (−0.22 to 0.13)	.64
Warmth at 4–5 y	−0.23 (−0.36 to −0.11)	<.001	−0.04 (−0.21 to 0.13)	.66
Harsh discipline at 0–1 y	0.17 (0.05 to 0.30)	<.001	0.08 (−0.07 to 0.23)	.31
Harsh discipline at 2–3 y	0.41 (0.28 to 0.53)	<.001	0.06 (−0.10 to 0.22)	.46
Harsh discipline at 4–5 y	0.61 (0.48 to 0.73)	<.001	0.21 (0.04 to 0.38)	.02
Overinvolved/protective at 0–1 y	0.25 (0.14 to 0.36)	<.001	−0.02 (−0.16 to 0.12)	.73
Overinvolved/protective at 2–3 y	0.22 (0.11 to 0.34)	<.001	0.05 (−0.12 to 0.21)	.58
Overinvolved/protective at 4–5 y	0.33 (0.21 to 0.44)	<.001	0.23 (0.05 to 0.42)	.02
Inductive reasoning at 2–3 y	−0.03 (−0.15 to 0.09)	.64		
Inductive reasoning at 4–5 y	0.00 (−0.13 to 0.12)	.95		
Inconsistent discipline at 4–5 y	0.31 (0.12 to 0.49)	<.001	−0.03 (−0.24 to 0.18)	.75
Mother's mental health				
Emotional distress at 0–1 y	0.43 (0.29 to 0.57)	<.001	0.00 (−0.20 to 0.20)	.98
Emotional distress at 2–3 y	0.60 (0.46 to 0.74)	<.001	0.05 (−0.15 to 0.25)	.62
Emotional distress at 4–5 y	0.76 (0.62 to 0.89)	<.001	0.38 (0.18 to 0.59)	<.001
Depression at 0–1 y	0.31 (0.18 to 0.44)	<.001	0.06 (−0.10 to 0.22)	.44
Depression at 2–3 y	0.47 (0.31 to 0.62)	<.001	−0.04 (−0.22 to 0.13)	.63
Depression at 4–5 y	0.51 (0.38 to 0.65)	<.001	0.01 (−0.18 to 0.20)	.94
Mother smokes at 0–1 y	0.03 (−0.13 to 0.19)	.73		
Mother smokes at 2–3 y	0.08 (−0.09 to 0.24)	.36		
Mother smokes at 4–5 y	0.06 (−0.11 to 0.23)	.46		
Mother consumes ≥2 standard alcoholic drinks per d at 0–1 y	−0.49 (−0.75 to −0.23)	<.001	−0.13 (−0.45 to 0.18)	.40
Mother consumes ≥2 standard alcoholic drinks per d at 2–3 y	−0.45 (−0.74 to −0.15)	<.001	−0.46 (−0.82 to −0.10)	.01
Mother consumes ≥2 standard alcoholic drinks per d at 4–5 y	−0.46 (−0.66 to −0.25)	<.001	−0.26 (−0.55 to 0.03)	.08
Family life stressors				
Financial hardship at 0–1 y	0.27 (0.13 to 0.41)	<.001	0.11 (−0.09 to 0.31)	.26
Financial hardship at 2–3 y	0.25 (0.10 to 0.39)	<.001	−0.09 (−0.29 to 0.11)	.38
Financial hardship at 4–5 y	0.15 (0.03 to 0.28)	.02	−0.09 (−0.25 to 0.08)	.30
Partner conflict at 0–1 y	−0.03 (−0.16 to 0.11)	.70		
Partner conflict at 2–3 y	0.20 (0.07 to 0.33)	<.001	−0.03 (−0.24 to 0.19)	.81
Partner conflict at 4–5 y	0.20 (0.07 to 0.33)	<.001	0.05 (−0.22 to 0.32)	.73
Partner relationship satisfaction at 0–1 y	−0.02 (−0.15 to 0.10)	.72		
Partner relationship satisfaction at 2–3 y	−0.09 (−0.22 to 0.04)	.19		
Partner relationship satisfaction at 4–5 y	−0.15 (−0.27 to −0.03)	.01	0.08 (−0.13 to 0.28)	.46
Family grief/illness events at 0–1 y	0.13 (0.02 to 0.24)	.02	0.12 (−0.01 to 0.25)	.06
Family grief/illness events at 2–3 y	0.12 (−0.01 to 0.25)	.08		
Family grief/illness events at 4–5 y	0.19 (0.05 to 0.32)	.006	0.01 (−0.13 to 0.15)	.89
Mother's job quality at 0–1 y		.63		

TABLE 4 Continued

Potential Predictors	Unadjusted Results[a]		Adjusted Results ($N = 2006$)[b]	
	Coefficient (95% CI)	*P*	Coefficient (95% CI)	*P*
1	Reference			
2	−0.11 (−0.47 to 0.24)			
3	−0.19 (−0.51 to 0.12)			
4	−0.16 (−0.48 to 0.16)			
Mother's job quality at 2–3 y		.001		.04
1	Reference		Reference	
2	0.38 (−0.28 to 1.03)		−0.19 (−0.83 to 0.46)	
3	0.53 (−0.05 to 1.10)		0.22 (−0.37 to 0.80)	
4	0.25 (−0.32 to 0.81)		−0.03 (−0.60 to 0.53)	
5	0.02 (−0.54 to 0.58)		−0.20 (−0.77 to 0.38)	
Mother's job quality at 4–5 y		.60		
1	Reference			
2	0.01 (−0.47 to 0.49)			
3	−0.21 (−0.64 to 0.21)			
4	−0.20 (−0.63 to 0.24)			
5	−0.13 (−0.57 to 0.31)			
Community				
No. of types of child care at 0–1 y		.95		
0	Reference			
1	−0.03 (−0.17 to 0.10)			
2	−0.01 (−0.20 to 0.18)			
3–5	0.05 (−0.51 to 0.62)			
No. of types of child care at 2–3 y		.10		
0	Reference			
1	−0.14 (−0.27 to −0.01)			
2	−0.19 (−0.35 to −0.03)			
3–5	−0.17 (−0.47 to 0.14)			
No. of types of child care at 4–5 y		.65		
0	Reference			
1	−0.19 (−0.51 to 0.13)			
2	−0.21 (−0.54 to 0.11)			
3–5	−0.17 (−0.52 to 0.17)			
Time in center-based child care at 0–1 y	−0.10 (−0.20 to 0.00)	.05		
Time in center-based child care at 2–3 y	−0.08 (−0.19 to 0.04)	.21		
Time in center-based child care at 4–5 y	0.01 (−0.11 to 0.13)	.83		
Neighborhood disadvantage at 0–1 y	−0.13 (−0.25 to 0.00)	.04	0.17 (−0.01 to 0.36)	.06
Neighborhood disadvantage at 2–3 y	−0.29 (−0.43 to −0.16)	<.001	−0.37 (−0.68 to −0.05)	.02
Neighborhood disadvantage at 4–5 y	−0.28 (−0.42 to −0.13)	<.001	0.17 (−0.13 to 0.47)	.27

CI indicates confidence interval. $R^2 = 18.2\%$.

[a] Sample sizes ranged from 1385 to 3733.

[b] Mother's main language not English was omitted from the adjusted model because it was strongly colinear with several other predictors.

Taken together, these findings indicated that "proximal" risks (most immediate in time and close in context to the child) demonstrated the strongest effects on mental health in adjusted analyses. All significant bivariate associations were consistent with expectations, with 1 exception; maternal alcohol consumption (≥2 drinks per day, on average) predicted fewer child externalizing and internalizing problems. In posthoc analyses, this subgroup of mothers did not show a pattern of minimizing problems across other family variables, reporting poorer parenting, more emotional distress, more depression, more partner conflict, and more relationship dissatisfaction, compared with mothers who drank less alcohol. Application of a range of other cutoff points for maternal alcohol consumption did not change this unexpected association with better child mental health.

DISCUSSION

This longitudinal population study of children's mental health is unique in considering exposure to parenting practices, family stressors, and the wider community context from early life to school age. In combination, these risks explained up to 30% and 23% of the variations in child externalizing and internalizing symptoms, respectively.

Importantly, the risks for children's mental health were consistent across development. These were evident from the earliest ages of measurement, and were largely stable as predictors

TABLE 5 Prediction of Child Externalizing Symptoms at School Age (4–5 to 8–9 Years)

Potential Predictors	Unadjusted Results[a]		Adjusted Results ($N = 2202$)[b]	
	Coefficient (95% CI)	*P*	Coefficient (95% CI)	*P*
Family				
Mother's age	−0.29 (−0.41 to −0.17)	<.001	0.03 (−0.11 to 0.16)	.71
Mother completed high school	−0.38 (−0.49 to −0.26)	<.001	−0.18 (−0.31 to −0.06)	<.001
Mother's main language not English	−0.01 (−0.18 to 0.16)	0.91		
Sole parent in home at 4–5 y	0.58 (0.38 to 0.77)	<.001		
Sole parent in home at 6–7 y	0.60 (0.41 to 0.79)	<.001		
Sole parent in home at 8–9 y	0.42 (0.22 to 0.61)	<.001	0.09 (−0.11 to 0.30)	.37
Stepparent in home at 4–5 y	0.17 (−0.24 to 0.58)	.42		
Stepparent in home at 6–7 y	0.04 (−0.32 to 0.40)	.84		
Stepparent in home at 8–9 y	0.28 (−0.07 to 0.64)	.12		
Family socioeconomic advantage at 4–5 y	−0.58 (−0.71 to −0.45)	<.001	0.19 (−0.09 to 0.47)	.19
Family socioeconomic advantage at 6–7 y	−0.62 (−0.75 to −0.50)	<.001	−0.29 (−0.60 to 0.02)	.07
Family socioeconomic advantage at 8–9 y	−0.57 (−0.70 to −0.44)	<.001	0.07 (−0.23 to 0.37)	.63
Child				
Male	0.45 (0.34 to 0.56)	<.001	0.30 (0.20 to 0.40)	<.001
Indigenous	0.58 (0.18 to 0.99)	.005	0.30 (−0.08 to 0.69)	.12
Physical health at 4–5 y	−0.48 (−0.59 to −0.36)	<.001	−0.07 (−0.22 to 0.08)	.33
Physical health at 6–7 y	−0.55 (−0.69 to −0.41)	<.001	−0.05 (−0.18 to 0.08)	.45
Physical health at 8–9 y	−0.69 (−0.83 to −0.56)	<.001	−0.26 (−0.40 to −0.11)	<.001
Language at 4–5 y	−0.46 (−0.63 to −0.29)	<.001	−0.16 (−0.32 to 0.00)	.05
Language at 6–7 y	−0.29 (−0.40 to −0.17)	<.001	0.07 (−0.05 to 0.20)	.23
Language at 8–9 y	−0.39 (−0.51 to −0.28)	<.001	−0.12 (−0.27 to 0.03)	.11
Has sibling	0.07 (−0.08 to 0.22)	.38		
Parenting practices				
Warmth at 4–5 y	−0.27 (−0.40 to −0.15)	<.001		
Warmth at 6–7 y	−0.41 (−0.54 to −0.28)	<.001	−0.11 (−0.24 to 0.02)	.09
Warmth at 8–9 y	−0.58 (−0.72 to −0.44)	<.001	0.01 (−0.13 to 0.15)	.93
Harsh discipline at 4–5 y	0.71 (0.60 to 0.82)	<.001	−0.10 (−0.23 to 0.03)	.12
Harsh discipline at 6–7 y	1.23 (1.10 to 1.35)	<.001	0.38 (0.22 to 0.54)	<.001
Harsh discipline at 8–9 y	1.47 (1.35 to 1.59)	<.001	1.05 (0.91 to 1.19)	<.001
Overinvolved/protective at 6–7 y	0.05 (−0.08 to 0.17)	.45		
Overinvolved/protective at 8–9 y	0.14 (0.02 to 0.26)	.02	−0.03 (−0.15 to 0.09)	.66
Inductive reasoning at 4–5 y	−0.19 (−0.31 to −0.08)	<.001	0.08 (−0.03 to 0.20)	.16
Inductive reasoning at 6–7 y	0.00 (−0.10 to 0.09)	.95		
Inductive reasoning at 8–9 y	0.00 (−0.12 to 0.12)	.96		
Inconsistent discipline at 4–5 y	0.27 (0.11 to 0.44)	<.001	−0.03 (−0.22 to 0.16)	.73
Inconsistent discipline at 6–7 y	0.31 (0.13 to 0.48)	<.001	−0.04 (−0.22 to 0.13)	.65
Inconsistent discipline at 8–9 y	0.28 (0.11 to 0.45)	<.001	0.03 (−0.13 to 0.19)	.68
Mother's mental health				
Emotional distress at 4–5 y	0.62 (0.49 to 0.75)	<.001	0.01 (−0.15 to 0.16)	.94
Emotional distress at 6–7 y	0.65 (0.50 to 0.80)	<.001	−0.06 (−0.24 to 0.11)	.48
Emotional distress at 8–9 y	0.72 (0.60 to 0.85)	<.001	−0.09 (−0.29 to 0.10)	.34
Depression at 4–5 y	0.52 (0.40 to 0.64)	<.001	0.06 (−0.07 to 0.19)	.34
Depression at 6–7 y	0.60 (0.47 to 0.73)	<.001	0.08 (−0.08 to 0.24)	.31
Depression at 8–9 y	0.64 (0.51 to 0.78)	<.001	0.13 (−0.03 to 0.30)	.12
Mother smokes at 4–5 y	0.49 (0.33 to 0.64)	<.001	0.08 (−0.15 to 0.30)	.51
Mother smokes at 6–7 y	0.38 (0.20 to 0.56)	<.001	−0.09 (−0.34 to 0.17)	.51
Mother smokes at 8–9 y	0.54 (0.38 to 0.69)	<.001	0.27 (0.01 to 0.53)	.04
Mother consumes ≥2 standard alcoholic drinks per d at 4–5 y	−0.05 (−0.32 to 0.23)	.74		
Mother consumes ≥2 standard alcoholic drinks per d at 6–7 y	0.14 (−0.17 to 0.45)	.38		
Mother consumes ≥2 standard alcoholic drinks per d at 8–9 y	0.26 (−0.02 to 0.55)	.07		
Family life stressors				
Financial hardship at 4–5 y	0.63 (0.47 to 0.78)	<.001	0.31 (0.11 to 0.51)	<.001
Financial hardship at 6–7 y	0.40 (0.27 to 0.52)	<.001	−0.08 (−0.26 to 0.09)	.35
Financial hardship at 8–9 y	0.48 (0.34 to 0.63)	<.001	0.07 (−0.13 to 0.27)	.47
Partner conflict at 4–5 y	0.04 (−0.09 to 0.16)	.54		
Partner conflict at 6–7 y	0.39 (0.27 to 0.52)	<.001		
Partner conflict at 8–9 y	0.26 (0.13 to 0.40)	<.001		
Partner relationship satisfaction at 4–5 y	−0.11 (−0.22 to 0.01)	.07		
Partner relationship satisfaction at 6–7 y	−0.28 (−0.39 to −0.18)	<.001	−0.09 (−0.22 to 0.05)	.19
Partner relationship satisfaction at 8–9 y	−0.25 (−0.38 to −0.12)	<.001	−0.08 (−0.23 to 0.06)	.27
Family grief/illness events by 4–5 y	0.14 (0.02 to 0.25)	.02	0.04 (−0.06 to 0.13)	.44

TABLE 5 Continued

Potential Predictors	Unadjusted Results[a]		Adjusted Results ($N = 2202$)[b]	
	Coefficient (95% CI)	*P*	Coefficient (95% CI)	*P*
Family grief/illness events between 4–5 y and 6–7 y	0.12 (0.01 to 0.23)	.03	0.04 (−0.07 to 0.14)	.49
Family grief/illness events between 6–7 y and 8–9 y	0.09 (−0.03 to 0.21)	.15		
Mother's job quality at 4–5 y		.68		
1	Reference			
2	−0.01 (−0.33 to 0.32)			
3	−0.04 (−0.34 to 0.26)			
4	−0.12 (−0.44 to 0.20)			
Mother's job quality at 6–7 y		.70		
1	Reference			
2	0.04 (−0.41 to 0.49)			
3	0.05 (−0.37 to 0.46)			
4	0.13 (−0.28 to 0.54)			
5	0.02 (−0.39 to 0.43)			
Mother's job quality at 8–9 y		.38		
1	Reference			
2	−0.15 (−0.78 to 0.48)			
3	−0.30 (−0.85 to 0.25)			
4	−0.38 (−0.91 to 0.16)			
5	−0.32 (−0.86 to 0.22)			
Community				
No. of types of child care at 4–5 y		.22		
0	Reference			
1	0.18 (−0.12 to 0.49)			
2	0.12 (−0.18 to 0.43)			
3–5	0.35 (−0.03 to 0.74)			
Time in center-based child care at 4–5 y	0.08 (−0.04 to 0.20)	.20		
Time in nonparental child care at 6–7 y	0.06 (−0.06 to 0.18)	.34		
Time in nonparental child care at 8–9 y	0.12 (0.01 to 0.24)	.03	0.01 (−0.14 to 0.15)	.94
Neighborhood disadvantage at 4–5 y	−0.40 (−0.52 to −0.29)	<.001	−0.12 (−0.28 to 0.05)	.17
Neighborhood disadvantage at 6–7 y	−0.41 (−0.54 to −0.27)	<.001	−0.02 (−0.34 to 0.31)	.92
Neighborhood disadvantage at 8–9 y	−0.38 (−0.51 to −0.25)	<.001	−0.09 (−0.37 to 0.19)	.53

CI indicates confidence interval. $R^2 = 19.7\%$.

[a] Sample sizes ranged from 1761 to 3698.

[b] Sole parent in the home at 4 to 5 years, sole parent in the home at 6 to 7 years, and warmth at 4 to 5 years were omitted from the adjusted model because they were strongly colinear with their corresponding measures from later waves. Partner conflict at 6 to 7 years and partner conflict at 8 to 9 years were omitted from the adjusted model because they were strongly colinear with the partner relationship satisfaction variables.

across early/middle childhood. The strongest consistent predictor of children's externalizing (conduct) symptoms was harsh discipline (smacking or yelling), whereas internalizing (emotional) symptoms were strongly and consistently predicted by poorer child physical health, maternal emotional distress, and harsh discipline, with overinvolved/protective parenting also being important at preschool age. These novel data highlight the importance of early negative parenting interactions, whether authoritarian or overinvolved/protective, in predicting adverse outcomes.

The study had several strengths. It was the first at a national population level to examine predictors of both major domains of mental health (externalizing and internalizing symptoms) longitudinally from birth to late primary school age, by using an internationally validated measure (SDQ), with multiple potential risk domains measured repeatedly. The study also had the following limitations. Fifty-nine percent of eligible Australian families participated in the LSAC, which potentially limits generalizability. Psychometric properties of the SDQ are better established for school-aged children than for preschool-aged children; the preschool version has no clinical cutoff points, which precludes prevalence estimates. Finally, it is not possible to determine causality with longitudinal designs. However, randomized, controlled, early-intervention trials have supported causal effects between parenting interactions and children's externalizing and internalizing problems.[32]

Several of these findings are in line with previous findings from less comprehensive studies.[6,14–22] The Norwegian study also found that low levels of partner support predicted child externalizing symptoms,[26] whereas male gender and young mothers predicted externalizing symptoms and nonwhite race/ethnicity predicted internalizing symptoms in the Western Australian study.[24] Low family income as a predictor of child externalizing and internal-

TABLE 6 Prediction of Child Internalizing Symptoms at School Age (4–5 to 8–9 Years)

Potential Predictors	Unadjusted Results[a]		Adjusted Results ($N = 2179$)[b]	
	Coefficient (95% CI)	*P*	Coefficient (95% CI)	*P*
Family				
Mother's age	−0.25 (−0.40 to −0.10)	<.001	−0.10 (−0.25 to 0.05)	.18
Mother completed high school	−0.25 (−0.38 to −0.11)	<.001	−0.05 (−0.21 to 0.12)	.57
Mother's main language not English	0.38 (0.15 to 0.60)	<.001	−0.09 (−0.34 to 0.16)	.49
Sole parent in home at 4–5 y	0.65 (0.42 to 0.88)	<.001	0.32 (−0.09 to 0.73)	.13
Sole parent in home at 6–7 y	0.63 (0.41 to 0.85)	<.001	−0.31 (−0.73 to 0.12)	.15
Sole parent in home at 8–9 y	0.64 (0.42 to 0.86)	<.001	0.26 (−0.05 to 0.57)	.10
Stepparent in home at 4–5 y	0.28 (−0.14 to 0.69)	.19		
Stepparent in home at 6–7 y	0.22 (−0.17 to 0.61)	.27		
Stepparent in home at 8–9 y	0.13 (−0.20 to 0.47)	.43		
Family socioeconomic advantage at 4–5 y	−0.49 (−0.63 to −0.35)	<.001	0.12 (−0.30 to 0.54)	.56
Family socioeconomic advantage at 6–7 y	−0.56 (−0.71 to −0.42)	<.001	0.10 (−0.35 to 0.55)	.67
Family socioeconomic advantage at 8–9 y	−0.54 (−0.69 to −0.40)	<.001	−0.19 (−0.60 to 0.21)	.35
Child				
Male	−0.03 (−0.16 to 0.11)	.69		
Indigenous	0.59 (0.11 to 1.08)	.02	0.02 (−0.47 to 0.51)	.94
Physical health at 4–5 y	−0.72 (−0.87 to −0.57)	<.001	−0.13 (−0.35 to 0.08)	.21
Physical health at 6–7 y	−0.88 (−1.03 to −0.72)	<.001	−0.20 (−0.43 to 0.03)	.09
Physical health at 8–9 y	−1.09 (−1.24 to −0.93)	<.001	−0.79 (−1.01 to −0.57)	<.001
Language at 4–5 y	−0.29 (−0.44 to −0.14)	<.001	0.08 (−0.07 to 0.23)	.31
Language at 6–7 y	−0.29 (−0.43 to −0.14)	<.001	0.03 (−0.14 to 0.20)	.71
Language at 8–9 y	−0.40 (−0.54 to −0.26)	<.001	−0.29 (−0.46 to −0.13)	<.001
Has sibling	−0.21 (−0.41 to −0.02)	.03	−0.25 (−0.48 to −0.02)	.03
Parenting practices				
Warmth at 4–5 y	−0.13 (−0.26 to −0.01)	.04	0.10 (−0.07 to 0.28)	.26
Warmth at 6–7 y	−0.18 (−0.32 to −0.04)	.01	0.01 (−0.17 to 0.19)	.90
Warmth at 8–9 y	−0.34 (−0.50 to −0.19)	<.001	0.07 (−0.12 to 0.27)	.46
Harsh discipline at 4–5 y	0.40 (0.26 to 0.54)	<.001	−0.07 (−0.25 to 0.10)	.40
Harsh discipline at 6–7 y	0.75 (0.61 to 0.89)	<.001	0.15 (−0.04 to 0.35)	.13
Harsh discipline at 8–9 y	0.83 (0.67 to 0.99)	<.001	0.37 (0.17 to 0.57)	<.001
Overinvolved/protective at 6–7 y	0.13 (−0.03 to 0.30)	.11		
Overinvolved/protective at 8–9 y	0.38 (0.22 to 0.53)	<.001	0.14 (−0.02 to 0.30)	.08
Inductive reasoning at 4–5 y	−0.08 (−0.21 to 0.04)	.20		
Inductive reasoning at 6–7 y	0.12 (−0.01 to 0.26)	.07		
Inductive reasoning at 8–9 y	0.02 (−0.12 to 0.16)	.78		
Inconsistent discipline at 4–5 y	0.32 (0.13 to 0.52)	<.001	−0.16 (−0.36 to 0.04)	.12
Inconsistent discipline at 6–7 y	0.08 (−0.08 to 0.25)	.33		
Inconsistent discipline at 8–9 y	0.27 (0.08 to 0.46)	.006	−0.07 (−0.26 to 0.12)	.47
Mother's mental health				
Emotional distress at 4–5 y	0.91 (0.76 to 1.06)	<.001	0.28 (0.08 to 0.49)	.007
Emotional distress at 6–7 y	0.98 (0.80 to 1.15)	<.001	0.38 (0.17 to 0.59)	<.001
Emotional distress at 8–9 y	0.98 (0.84 to 1.12)	<.001	0.19 (−0.01 to 0.40)	.07
Depression at 4–5 y	0.64 (0.49 to 0.80)	<.001	−0.13 (−0.32 to 0.06)	.19
Depression at 6–7 y	0.79 (0.61 to 0.97)	<.001	−0.01 (−0.24 to 0.22)	.94
Depression at 8–9 y	0.87 (0.71 to 1.02)	<.001	0.19 (−0.01 to 0.38)	.06
Mother smokes at 4–5 y	0.37 (0.20 to 0.55)	<.001	0.21 (−0.10 to 0.52)	.17
Mother smokes at 6–7 y	0.25 (0.05 to 0.45)	.01	0.05 (−0.30 to 0.40)	.78
Mother smokes at 8–9 y	0.27 (0.11 to 0.44)	<.001	−0.35 (−0.71 to 0.01)	.06
Mother consumes ≥2 standard alcoholic drinks per d at 4–5 y	−0.23 (−0.65 to 0.18)	.28		
Mother consumes ≥2 standard alcoholic drinks per d at 6–7 y	−0.49 (−0.83 to −0.15)	<.001	−0.48 (−0.75 to −0.21)	<.001
Mother consumes ≥2 standard alcoholic drinks per d at 8–9 y	−0.01 (−0.32 to 0.30)	.95		
Family life stressors				
Financial hardship at 4–5 y	0.61 (0.42 to 0.80)	<.001		
Financial hardship at 6–7 y	0.53 (0.36 to 0.70)	<.001		
Financial hardship at 8–9 y	0.60 (0.43 to 0.77)	<.001	0.15 (−0.07 to 0.36)	.18
Partner conflict at 4–5 y	0.03 (−0.12 to 0.19)	.65		
Partner conflict at 6–7 y	0.28 (0.12 to 0.44)	<.001	−0.12 (−0.31 to 0.06)	.19
Partner conflict at 8–9 y	0.12 (−0.03 to 0.28)	.11		
Partner relationship satisfaction at 4–5 y	−0.12 (−0.26 to 0.01)	.08		
Partner relationship satisfaction at 6–7 y	−0.27 (−0.41 to −0.12)	<.001	−0.17 (−0.35 to 0.02)	.07
Partner relationship satisfaction at 8–9 y	−0.09 (−0.23 to 0.06)	.23		
Family grief/illness events by 4–5 y	0.23 (0.09 to 0.37)	<.001	0.00 (−0.15 to 0.15)	.99

TABLE 6 Continued

Potential Predictors	Unadjusted Results[a]		Adjusted Results ($N = 2179$)[b]	
	Coefficient (95% CI)	*P*	Coefficient (95% CI)	*P*
Family grief/illness events between 4–5 y and 6–7 y	0.26 (0.11 to 0.40)	<.001	0.09 (−0.05 to 0.23)	.19
Family grief/illness events between 6–7 y and 8–9 y	0.37 (0.23 to 0.51)	<.001	0.13 (−0.03 to 0.30)	.12
Mother's job quality at 4–5 y		.53		
1	Reference			
2	−0.13 (−0.54 to 0.27)			
3	−0.07 (−0.47 to 0.32)			
4	−0.20 (−0.60 to 0.19)			
Mother's job quality at 6–7 y		.10		
1	Reference			
2	−0.28 (−1.09 to 0.54)			
3	−0.19 (−0.97 to 0.59)			
4	−0.31 (−1.07 to 0.45)			
5	−0.48 (−1.24 to 0.29)			
Mother's job quality at 8–9 y		.26		
1	Reference			
2	0.19 (−0.54 to 0.92)			
3	−0.21 (−0.83 to 0.42)			
4	−0.15 (−0.77 to 0.47)			
5	−0.21 (−0.85 to 0.43)			
Community				
No. of types of child care at 4–5 y		.06		
0	Reference			
1	0.28 (−0.07 to 0.62)			
2	0.35 (−0.01 to 0.71)			
3–5	0.10 (−0.29 to 0.48)			
Time in center-based child care at 4–5 y	0.08 (−0.05 to 0.20)	.22		
Time in nonparental child care at 6–7 y	0.09 (−0.07 to 0.25)	.25		
Time in nonparental child care at 8–9 y	0.14 (0.02 to 0.26)	.02	0.01 (−0.18 to 0.19)	.95
Neighborhood disadvantage at 4–5 y	−0.26 (−0.41 to −0.12)	<.001	0.05 (−0.14 to 0.23)	.61
Neighborhood disadvantage at 6–7 y	−0.36 (−0.50 to −0.21)	<.001	−0.20 (−0.57 to 0.17)	.28
Neighborhood disadvantage at 8–9 y	−0.32 (−0.45 to −0.18)	<.001	0.18 (−0.14 to 0.50)	.28

CI indicates confidence interval. $R^2 = 23.2\%$.

[a] Sample sizes ranged from 1761 to 3698.

[b] Financial hardship at 4 to 5 years and financial hardship at 6 to 7 years were omitted from the adjusted model because they were strongly colinear with financial hardship at 8 to 9 years.

izing symptoms was consistent with results from the studies in Queensland and Western Australia.[23,24] The present national findings for the preschool years confirmed data from the Victorian study highlighting harsh discipline, maternal stress, and emotional distress as key predictors of early childhood externalizing and internalizing symptoms.[25] Finally, the present national finding that overinvolved/protective parenting predicted early childhood internalizing symptoms extended data from a small Victorian community study.[21]

A single unexpected finding was that maternal alcohol consumption of ≥2 drinks per day, on average, predicted fewer child mental health symptoms, and posthoc analyses using a range of other cutoff points did not change the conclusion. Our initial a priori cutoff point reflects Australian policy guidelines on "hazardous/harmful" consumption. We have no explanation for this single unexpected finding, which is most likely attributable to chance. Nevertheless, the finding does argue against alcohol, in the amounts commonly consumed by the LSAC population sample, having a major impact on child mental health, when all other factors considered are taken into account.

Future research into the causes of children's mental health problems should include measures of fathers' mental health and parenting, as well as children's peer interactions. Recent research indicated that paternal depression makes a contribution to children's mental health,[33] but the influence of fathers is overlooked in most child health research.[25] Emerging evidence also has implicated peer bullying in the development of internalizing problems.[34] Mechanisms of interactions between environmental risks and genetic and biological vulnerabilities should be explored in future etiologic studies.

Mental health is a neglected area of global health.[4] Up to 30% of the global population experiences mental health problems every year, with at least two-thirds being untreated. Therefore, a public health perspective that attends

to prevention from childhood is warranted. The present national findings suggest that prevention efforts should focus on parenting interactions and support for families in distress. Such programs could begin in infancy and be available throughout childhood for families in need.

CONCLUSIONS

This study provides the first comprehensive, nationwide, longitudinal data on the development of children's mental health. From infancy to late elementary school age, key predictors of children's externalizing and internalizing symptoms were parenting interactions, embedded in the wider context of family distress and social disadvantage. Population-level, randomized, controlled trials of family support programs are required to determine the cost-effectiveness of preventive efforts to improve public mental health.

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