

**EARLY CHILDHOOD AETIOLOGY OF MENTAL HEALTH PROBLEMS:
A LONGITUDINAL POPULATION-BASED STUDY**

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ABSTRACT

Background: Mental health problems comprise an international public health issue affecting up to 20% of children and show considerable stability. We aimed to identify child, parenting, and family predictors from infancy in the evolution of externalising and internalising behaviour problems by age 3 years.

Methods: *Design* Longitudinal, population-based survey completed by primary caregivers when children were 7, 12, 18, 24 and 36 months old. *Participants* 733 children sequentially recruited at 6-months from routine well-child appointments (August-September 2004) across six socioeconomically and culturally diverse government areas in Victoria, Australia; 589 (80%) retained at 3 years. *Measures* 7 months: sociodemographic characteristics, maternal mental health (Depression Anxiety Stress Scale (DASS)), substance misuse, home violence, social isolation, infant temperament. 12 months: partner relationship, parenting (Parent Behavior Checklist (PBC)). 18, 24 and 36 months: child behaviour (Child Behavior Checklist 1½-5 (CBCL)), PBC, DASS.

Results: 69% of all families attending well-child clinics took part. The consistent and cumulative predictors of externalising behaviours were parent stress and harsh discipline. Consistent predictors of internalising behaviours included parent anxiety, stress, and small family size. Between 20-26% of variation in early externalising behaviour and 13-22% of variation in early internalising behaviour was explained.

Conclusions Effective and cost-efficient population approaches to preventing mental health problems early in childhood are urgently needed. Programs must support parents in reducing stress and anxiety as well as negative parenting practices.

Keywords Child, preschool; Mental health; Externalising problems; Internalising problems; Aetiology.

Abbreviations Child Behavior Checklist 1½-5, CBCL; Depression Anxiety Stress Scales, DASS; local government area, LGA; Parent Behavior Checklist, PBC; Socio-Economic Index for Areas, SEIFA.

Mental health problems comprise a public health issue affecting up to 20% of children, including preschool-aged children, in modern western societies (Anderson, 1994; Egger & Angold, 2006; Sawyer et al., 2000). They primarily consist of externalising (aggression, oppositional defiance) and internalising (anxiety, depression) behaviour problems. Internationally, health policies are beginning to focus on children because early mental health problems often continue through childhood and adolescence into adulthood (Australian Health Ministers, 2003; Bosquet & Egeland, 2006; Campbell, 1995; Onunaku, 2005; Prior, Smart, Sanson & Oberklaid, 2001). Sequelae for children and families include peer and learning difficulties, school dropout, substance abuse, poor vocational outcomes, family violence and suicide. Costs to society are also high, including clinical and remedial education services, sick-leave and unemployment, as well as the criminal justice system (Bor, McGee & Fagan, 2004; Stewart-Brown, 1998). Effective public health prevention of externalising and internalising problems early in childhood requires a strong understanding of their aetiological mechanisms, but population studies addressing aetiology in early childhood are lacking.

A substantial body of research (mostly with older children) has highlighted several common risks for externalising and internalising problems (Bosquet & Egeland, 2006; McCarty, Zimmerman, Digiuseppe, & Christakis, 2005; van Zeil et al., 2006). Child risk factors are physical health problems, difficult temperament, and insecure-attachment related behaviours. Family risk factors are parent mental health problems (particularly depression), separation/divorce, daily hassles, and a controlling

parenting style. Additional risks that appear specific to externalising problems are male gender, having siblings, young and low-educated parents, marital problems, poor social support, low parenting efficacy, harsh discipline, and use of poor-quality childcare services. Additional risks specific to internalising problems include temperamental inhibition, parent illness/death, parental anxiety and overprotective parenting modeling avoidant coping to children.

However, little aetiological research at a population level has focused in detail on early development (infancy to preschool age) of externalising and internalising behaviours, which often co-occur. A comprehensive understanding of the relative importance of child, family and parenting factors over this time could inform choices to optimise the content of primary prevention approaches. The current literature, though strong, is fragmented (ie separate studies focus on externalising versus internalising outcomes, on parenting or family context as predictors, on cross-sectional not longitudinal analyses), precluding a population-level understanding. Although an exhaustive review is beyond the scope of this article, the following studies illustrate some more comprehensive early childhood studies to date.

In a cross-sectional study focusing on externalising problems, Brenner and Fox (1998) studied a United States urban sample (N = 1,056) of 1-5 year old children. Regression analyses found harsh discipline was most strongly associated, uniquely explaining 13% of the variability in early childhood externalising problems. Overall 24% of variability was explained by combined parenting and family factors, with disadvantaged mothers (young, unmarried, poor, low-educated) reporting more externalising problems. In a longitudinal study focusing on internalising problems,

Bayer, Sanson and Hemphill (2006) intensively studied a smaller Australian community sample (N = 112) from age 2 to 4 years. The direct predictors of early internalising difficulties were parenting practices (more over-involved/protective and less warm-engaged) and maternal anxiety/depression, explaining up to 22% of variability. In a longitudinal population study focused on total behaviour problems (rather than on externalising versus internalising), Pike Iervolino, Eley, Price and Plomin (2006) followed more than 5,000 children from birth to 4 years. Maternal depression and feelings, home chaos, and discipline were the dominant predictors of behaviour problems (~20% of variability), with small contributions by gender, medical, socioeconomic, or ethnic minority status. A few effective treatment trials for young children's externalising and internalising problems underscore the important causal relationships between parenting practices and children's social-emotional development (Barlow & Stewart-Brown, 2000; Carr, 2000; Rapee, Kennedy, Ingram, Edwards & Sweeney, 2005).

No population-level early childhood primary prevention initiatives have yet been reported. As highlighted above, this could perhaps partly be due to the lack of comprehensive population studies that are longitudinal, explicitly study both internalising and externalising behaviours at multiple time points across the early childhood years, and contain well-validated measures of family, child and parenting risks. We report here a study, embedded in a randomised controlled trial, which followed a large population sample of infants through to 3 years, to determine the relative importance of numerous potential risks in predicting preschool externalising and internalising problems.

METHODS

Setting and participants: This study presents longitudinal data from a cluster randomised trial (ISRCTN 77531789) of a brief community parenting program to prevent preschool behaviour problems. The trial took place in Greater Melbourne (population 3.4 million) in the state of Victoria, Australia. Metropolitan Melbourne has 31 local government areas (LGAs), which were ranked using the census-derived Socio-Economic Indexes For Areas (SEIFA) Index of Relative Disadvantage (Australian mean = 1000, SD = 100) (Australian Bureau of Statistics: ABS, 2001). To ensure a broad socioeconomic range, two LGAs were selected from each of the lowest, middle, and highest tertiles of metropolitan Melbourne SEIFA scores.

At 6-7 months of age, 85% of all Victorian parents attend the free Maternal and Child Health (MCH) well-child visit (Department of Human Services, 2003). MCH nurses consecutively invited over a two-month period all mothers of infants attending the 6-7 month visit to take part in the study. This recruitment age was chosen as the developmental cusp between infancy and toddlerhood when babies start becoming mobile (Brazelton, 2003). Nurses pre-identified all eligible babies registered at their centre in February-March 2004 (1069 babies identified, 52% boys; Figure 1). At the visit, nurses introduced the study to each mother (except mothers with insufficient English to complete brief questionnaires). After telephone contact with interested mothers, the researchers mailed a baseline questionnaire including written informed consent. The MCH centers were randomised after all recruitment was complete. This study is concerned only with the relationship between potential risk factors and behaviour problems; results of the preventive intervention trial will be reported elsewhere (Hiscock et al, submitted).

Measures: Questionnaires were completed by mothers at ages 7, 12, 18, 24 and 36 months. The primary outcomes were externalising and internalising behaviour problems, measured at 18, 24 and 36 months by the 99-item validated Child Behavior Checklist 1½-5 (CBCL: Achenbach & Rescorla, 2000). Respective item scores were summed to derive externalising and internalising raw subscales which were used in all analyses (van Zeijl et al., 2006).¹ The plausible range for externalising and internalising raw scores is 0-48 and 0-72, respectively.

Regarding risk factors, parenting style was measured at 12, 18, 24 and 36 months by the 32-item Parent Behavior Checklist validated for ages 1-5 (PBC: Brenner & Fox, 1998). Harsh discipline, nurturing, and developmental expectations subscales were summed from their respective item scores then converted to T-scores derived from norms with 6 month age-bands. Maternal mental health was measured at 7, 18, 24 and 36 months by the 21-item Depression Anxiety Stress Scales, from which three subscales are derived from each of the summed item scores for depression, anxiety and stress respectively (DASS: Lovibond & Lovibond, 1995).

At 7 months only, socio-demographic factors were collected (infant gender, birth order, childcare hours per week, parents' age, education, marital status, cultural identity, language mainly spoken at home and family income). Each family was assigned a local neighborhood SEIFA Index of Relative Disadvantage score by home address postal code (ABS, 2001). Infant temperamental difficulty was measured by

¹ CBCL raw scores were not converted to the T-scores (mean=50, SD=10) derived from norms combining children aged 1 through 5 since this could reduce sensitivity to variation in yearly age-bands.

the Australian Temperament Project's global rating scale (1 = "much easier than average" to 5 = "much more difficult than average", dichotomised to 'difficult' (scored 4 or 5) vs. all others) (Sanson, Oberklaid, Pedlow, & Prior, 1991). Kemper and Kelleher's (1996) health service screening questions tapped home violence (3 items, eg "In the past year has your partner or any other family member pushed you, punched you, kicked you, hit you or threatened to hurt you?"), substance misuse (3 items, eg "In the past year have you ever had a drinking problem?") and social isolation (3 items, eg "Can you rely on other people (eg family, other friends) to support you in your role as a parent?"). Parents who indicated a problem on any item in each domain were scored as problematic in that domain. At 12 months only, partner relationship satisfaction was measured with the validated 7-item Dyadic Adjustment Scale (Sharpley & Rogers, 1984) and parenting conflict was assessed with the 16-item Parent Problem Checklist (Dadds & Powell, 1991).

Statistical analyses: Linear regression models were fitted to the CBCL externalising and internalising problems scores, predicting from all potential risk variables available for each time-point. For predictors measured at more than one time-point (maternal depression, anxiety, stress, parenting practices), change scores were used in the regression models for all but the first time point. For example, in the regression analyses predicting the 36 month CBCL outcomes, depression score at 7 months and the change in depression score between 7-18 months, between 18-24 months, and between 24-36 months were used as predictors. Thus the fitted model quantified the effects of parent depression at 7 months and the incremental effects of later changes in this variable. This approach accommodates measures of the same predictor at different time-points in the same regression analysis (De Stavola et al., 2006).

Continuous (rather than dichotomised) outcome measures were used as a dimensional approach better characterises processes across the entire range of functioning in the population; this is important because subclinical difficulties are also associated with impaired functioning and development of clinical disorders (Egger & Angold, 2006; Pike et al., 2006). For mothers without a partner, a value of zero was assumed for conflicts about parenting (ie no partner conflict) and a value of one was assumed for partner relationship quality (ie no relationship problems). In sensitivity analyses, a) when single women were excluded there was negligible impact on the two partner variables' regression coefficients and b) when the two partner variables were excluded there was negligible impact on the marital status variable's regression coefficient.

We report results based on ordinary linear regression without adjusting for trial arm status or clustering because, in sensitivity analyses, neither adjustment for trial arm status nor allowing for variation between MCH centers (clusters) using random effects models (Goldstein, 1995) made a marked difference to the results. The implementation of diagnostics checks and calculation of explained variation was more straightforward under ordinary linear regression than if we had used random effects models. Tests of interaction revealed no strong evidence that trial arm status modified the effects of the predictor variables. Locally weighted scatterplots (Cleveland, 1979) and fractional polynomials (Royston, Ambler & Sauerbrei, 1999) did not suggest any marked non-linear relationships with the outcomes. Only subjects who were non-missing on all predictor and outcome variables were included in the main analyses for each time-point, hence, the sample sizes are not as large as indicated by the

corresponding follow-up rates in Figure 1. Results from analyses using multiple imputation (to impute missing data for participants lost to follow up) were essentially the same as those from the complete case analysis presented here (Allison, 2002; Donders, van der Heijden, Stijnen, & Moons, 2006). Regression coefficients are reported with associated 95% confidence intervals and p-values. Adjusted R-squared values are reported for each regression model.

Analyses were carried out using Stata 9.2 (StataCorp, 2005). Project approval (EHRC 24020A) was obtained from the Ethics in Human Research Committee of the Royal Children's Hospital, Melbourne, Australia.

RESULTS

Population characteristics: Figure 1 provides a flowchart of eligible and consenting participants. Of 1,069 eligible families contactable for their infants' 6-7 month health visit, 840 expressed interest in participating and 733 returned the baseline questionnaire. Table 1 reports characteristics for the full sample and for the subsets of these that were included in the analyses of the 18, 24 and 36 month outcomes. Almost all primary caregivers of infants were in partnered relationships. Parents spanned a broad range of education and cultures. Although the mean SEIFA code of 1044.5 (SD 68.9) suggested slightly higher neighborhood social advantage than the national average (1000, SD 100), families across all social strata were represented (range 825-1140). Mental health of mothers in this sample (see Table 1) was also slightly better than Australian DASS normative data for adults in their 30s (normative mean (SD): depression 5.4 (7.1), anxiety 3.7 (5.0), and stress 8.9 (8.4)). Comparing results across Table 1 it appears that participants included in the analyses were broadly

representative of those originally recruited, although the analysed samples contain a slightly higher proportion of higher socio-economic status participants.

[Insert Figure 1 here]

[Insert Table 1 here]

Summary of externalising and internalising scores: The mean (sd) scores at 18 months for externalising and internalising problems were 12.1 (6.9) and 5.9 (4.4), respectively; at 24 months 12.4 (7.4) and 6.4 (6.0), respectively; at 36 months 11.9 (7.5) and 6.7 (5.2), respectively.

Predicting externalising and internalising problems: Table 2 presents the three regression models predicting externalising problems at 18, 24 and 36 months from all child, family and parenting variables available at each time-point. Maternal stress and parenting harsh discipline were the most consistent (across time) and cumulative (increasing risk) predictors of both toddler and preschool externalising behaviours (most p-values <0.001). Additional contributors were mothers' social isolation and perception of the baby as having a difficult temperament. The models explained 20% of the variation in internalising problems at 18 months, 26% at 24 months and 25% at 36 months.

[Insert Table 2 here]

Table 3 presents the three regression models predicting internalising problems at 18, 24, and 36 months. Maternal stress, anxiety, and having no older siblings were the most consistent predictors of early childhood internalising problems. Additional predictors were maternal depression, harsh discipline, and perhaps parenting conflicts and single parenthood. The models explained 15% of the variation in internalising problems at 18 months, 22% at 24 months and 13% at 36 months.

[Insert Table 3 here]

The mutual risks for both externalising and internalising problems early in childhood appeared to be maternal stress and harsh discipline, perhaps with low income making a smaller contribution.

DISCUSSION

Maternal stress and harsh discipline parenting practices were consistent and cumulative predictors of externalising problems over the first three years of life, while maternal stress and anxiety, as well as having no siblings, were the strongest predictors of internalising problems. These findings are consistent with existing knowledge about early childhood risks for externalising problems (Brenner & Fox, 1998). However, they are the first to quantify the risks of maternal stress and parenting practices from population-level longitudinal data. This study also contributes the first comprehensive population level data focusing on prediction of internalising problems using a detailed combination of early child and family variables. Results concur with previous studies that highlighted the importance of maternal anxiety (Bayer et al., 2006). The variation explained in mental health

problems for these young children was similar to that previously reported for school-age children (Dwyer, Nicholson & Dattistutta, 2003).

This study has a number of strengths. It sampled a broad sociodemographic population at repeated time points within the early childhood years, assessed multiple potential risks, and used well-validated measures. However, the study also has some limitations. First, while a 69% uptake based on eligible birth records is high for population surveys (Bayer, Hiscock, Morton-Allen, Ukoumunne, & Wake, 2007; Ruband & Blasius, 1996), it excludes 30% of babies of unknown risk status. Second, a measure of over-involved/protective parenting, a potentially important risk for early internalising problems, was not included. Prenatal risks (ie smoking) were not measured, although if prenatal risks have physiological effects they might be expected to contribute to infant difficult temperament (Martin, Dombrowski, Mullis, Wisenbaker & Huttunden, 2006), which did not emerge as a key predictor. Other potential risks (eg the role of fathers) might also increase the total variability explained above 26% (Mezulis, Hyde & Clark, 2004). Third, we included only mothers as informants. However, the primary caregiving parent in the infant-toddler parent is generally the mother (van Zeijl et al., 2006); maternal variables more strongly predict early childhood behaviour than paternal variables (Brook, Zheng, Whiteman, & Brook, 2001); and relatively few young Australian children have formal day care arrangements. Finally, follow up was limited to three year outcomes, and the longitudinal design can suggest but not determine causal directions of influence.

Further population-level longitudinal research is required to follow children and families to at least school-entry, including data on over-involved/protective parenting

practices and multi-source data (mother, father, childcare reports). Twin studies could possibly help to differentiate genetic and environmental aspects of the family risk variables (Olds, Sadler & Kitzman, 2007). Preventive intervention trials targeting the key identified risks could clarify causal influences, as could further trials for children's established externalising and internalising problems (Barlow & Stewart-Brown, 2000; Carr, 2000).

These findings also have practical implications for developing primary prevention at a population level. Programs should address risks for both externalising and internalising problems, as both are highly prevalent and they are frequently comorbid, and should focus on improving parent mental health (especially reducing parental stress) as well as improving parenting practices.

CONCLUSION

The consistent and cumulative predictors of early childhood externalising difficulties in this population-based sample were parent stress and harsh discipline, while key risks for internalising difficulties were parent stress and anxiety. Trials of effective population prevention strategies which address these risk factors and commence early in childhood are urgently required.

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Table 1 Sample Characteristics at 7months

Variable	Full sample (N = 733)¹	Analysed at 18m (N = 581)²	Analysed at 24m (N = 556)³	Analysed at 36m (N = 488)⁴
Infant				
Male (%)	51.3	51.8	52.2	51.4
Family position (first-born) (%)	53.4	53.2	53.2	54.3
Family				
Maternal age in years (mean (SD), range)	33.2 (4.7), 18.0 – 46.8	33.4 (4.6), 18.9 – 46.8	33.4 (4.5), 19.8 – 46.8	33.5 (4.5), 18.9 – 46.8
Married / defacto (%)	96.6	97.9	98.0	98.6
Anglo-Australian cultural identity (%)	78.0	79.5	80.0	78.9
Language other than English at home (%)	4.0	2.9	2.3	2.3
Education status (% mothers / % fathers)				
Did not complete high school	20.5 / 31.1	18.9 / 30.0	19.1 / 30.3	16.8 / 29.1
Completed high school	33.2 / 29.8	33.1 / 28.2	32.6 / 27.9	32.8 / 28.3
Completed tertiary / postgraduate degree	46.3 / 39.1	48.0 / 41.8	48.4 / 41.7	50.4 / 42.6
Annual household income \$AUD (%)				
<30,000	9.9	7.4	7.2	7.0
30,000-60,000	32.7	31.8	31.7	30.9
>60,000	57.4	60.8	61.2	62.1
Maternal mental health (mean (SD))				
Depression	3.8 (4.9)	3.7 (4.9)	3.6 (4.6)	3.6 (4.6)
Anxiety	2.1 (3.3)	2.0 (3.2)	2.0 (3.2)	2.0 (3.1)
Stress	8.9 (6.4)	8.9 (6.3)	8.9 (6.3)	8.9 (6.2)
Neighborhood				
SEIFA (mean (SD))	1044.5 (68.9)	1049.2 (66.9)	1049.4 (66.4)	1049.8 (64.3)

¹ Statistics reported are based on 686 to 733 participants.

² Statistics reported are based on 567 to 581 participants.

³ Statistics reported are based on 544 to 556 participants.

⁴ Statistics reported are based on 481 to 488 participants.

Table 2: Prediction of Early Childhood Externalising Problems

Potential risks	CBCL 18 months (N = 581)			CBCL 24 months (N = 556)			CBCL 36 months (N = 488)		
	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value
<i>7 months</i>									
Male child	1.54	0.52 to 2.56	0.003	0.94	0.14 to 2.02	0.09	0.94	-0.27 to 2.14	0.13
Difficult temperament	3.36	1.23 to 5.49	0.002	0.90	-1.37 to 3.17	0.44	0.66	-1.81 to 3.14	0.60
Hours in childcare per week	-0.01	-0.09 to 0.07	0.73	0.03	-0.06 to 0.11	0.52	0.02	-0.07 to 0.12	0.62
Number of siblings	0.33	-0.80 to 1.47	0.56	-0.31	-1.51 to 0.89	0.61	-1.17	-2.50 to 0.16	0.08
Family income < \$30,000	0.27	-2.03 to 2.57	0.82	2.59	0.13 to 5.05	0.04	1.16	-1.47 to 3.79	0.39
Home violence	-1.53	-3.46 to 0.40	0.12	-1.01	-3.09 to 1.07	0.34	0.86	-1.41 to 3.14	0.46
Single parent	-0.65	-5.06 to 3.75	0.77	0.24	-4.52 to 4.99	0.92	0.80	-4.93 to 6.53	0.78
<i>Maternal</i>									
education < Yr 12	-0.20	-1.55 to 1.15	0.78	-0.73	-2.18 to 0.71	0.32	0.79	-0.88 to 2.46	0.35
non Anglo-Australian	-0.38	-1.69 to 0.94	0.57	-0.40	-1.80 to 1.00	0.58	-0.91	-2.43 to 0.61	0.24
social isolation	1.11	-0.41 to 2.63	0.15	1.68	0.07 to 3.30	0.04	2.28	0.47 to 4.09	0.01
substance use	-3.81	-6.80 to -0.82	0.01	-0.59	-3.87 to 2.69	0.72	1.60	-2.59 to 5.78	0.45
depression	-0.15	-0.34 to 0.04	0.11	-0.22	-0.45 to 0.01	0.06	-0.23	-0.49 to 0.02	0.07
anxiety	0.03	-0.21 to 0.27	0.79	0.21	-0.07 to 0.49	0.15	0.02	-0.33 to 0.36	0.91
stress	0.36	0.22 to 0.50	<0.001	0.49	0.33 to 0.65	<0.001	0.47	0.29 to 0.65	<0.001
<i>12 months</i>									
<i>Parenting</i>									
inappropriate expectations	-0.05	-0.12 to 0.02	0.14	-0.07	-0.14 to 0.01	0.09	-0.09	-0.18 to 0.00	0.05
nurturing	0.01	-0.06 to 0.09	0.72	0.02	-0.06 to 0.10	0.66	-0.04	-0.13 to 0.05	0.38
harsh discipline	0.38	0.27 to 0.49	<0.001	0.34	0.22 to 0.46	<0.001	0.29	0.16 to 0.43	<0.001
Partner conflict about parenting	0.03	-0.27 to 0.34	0.83	0.21	-0.12 to 0.53	0.21	0.02	-0.34 to 0.39	0.90
Partner relationship problems	0.61	-0.33 to 1.54	0.20	0.62	-0.37 to 1.60	0.22	-0.01	-1.10 to 1.08	0.98
<i>18 months</i>									

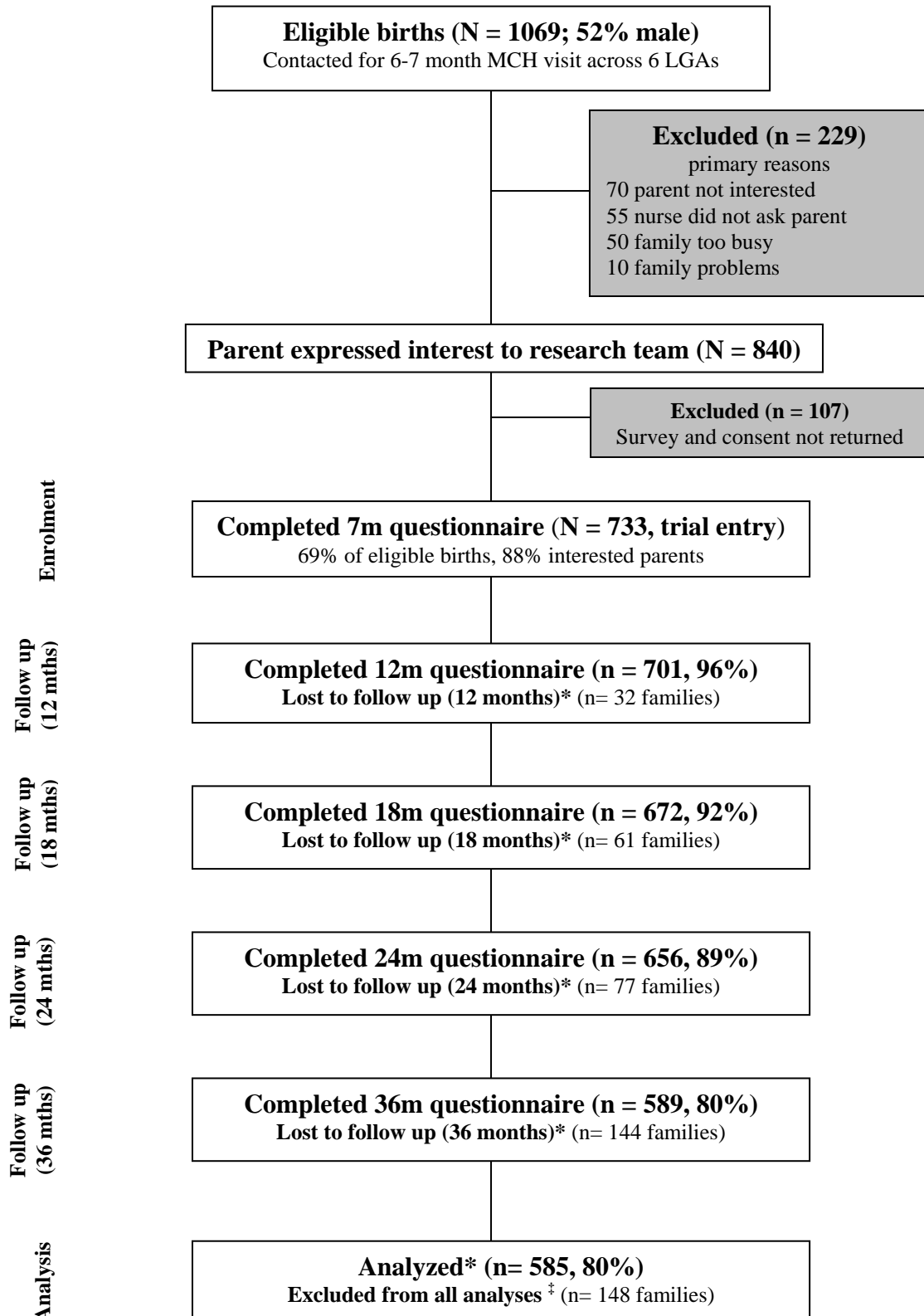
<i>Maternal</i>									
depression 7<18m	-0.07	-0.24 to 0.10	0.44	-0.18	-0.40 to 0.05	0.13	-0.18	-0.44 to 0.08	0.18
anxiety 7<18m	0.03	-0.20 to 0.25	0.81	0.09	-0.20 to 0.37	0.55	0.01	-0.36 to 0.38	0.96
stress 7<18m	0.24	0.11 to 0.37	<0.001	0.43	0.27 to 0.60	<0.001	0.46	0.27 to 0.65	<0.001
<i>Parenting</i>									
inappr. expectations 12<18m	-0.02	-0.08 to 0.04	0.48	-0.04	-0.11 to 0.03	0.31	-0.05	-0.13 to 0.04	0.26
nurturing 12<18m	-0.02	-0.10 to 0.05	0.56	-0.07	-0.16 to 0.01	0.09	-0.05	-0.15 to 0.05	0.34
harsh discipline 12<18m	0.44	0.32 to 0.57	<0.001	0.35	0.21 to 0.48	<0.001	0.25	0.10 to 0.41	0.001
24 months									
<i>Maternal</i>									
depression 18<24m				-0.05	-0.24 to 0.14	0.61	-0.05	-0.30 to 0.20	0.71
anxiety 18<24m				0.01	-0.21 to 0.24	0.90	-0.04	-0.38 to 0.30	0.83
stress 18<24m				0.33	0.19 to 0.48	<0.001	0.43	0.24 to 0.62	<0.001
<i>Parenting</i>									
inappr. expectations 18<24m				-0.01	-0.09 to 0.06	0.70	-0.01	-0.10 to 0.08	0.82
nurturing 18<24m				-0.02	-0.09 to 0.06	0.67	0.00	-0.10 to 0.10	0.93
harsh discipline 18<24m				0.18	0.09 to 0.27	<0.001	0.31	0.19 to 0.42	<0.001
36 months									
<i>Maternal</i>									
depression 24<36m							0.00	-0.18 to 0.18	0.99
anxiety 24<36m							0.16	-0.13 to 0.44	0.28
stress 24<36m							0.18	0.03 to 0.33	0.02
inappr. expectations 24<36m							0.03	-0.04 to 0.10	0.45
nurturing 24<36m							0.00	-0.08 to 0.09	0.96
harsh discipline 24<36m							0.28	0.18 to 0.38	<0.001
			$R^2 = 20.1\%$			$R^2 = 26.3\%$			$R^2 = 24.5\%$

Table 3: Prediction of Early Childhood Internalising Problems

Potential risks	CBCL at 18 months (N = 581)			CBCL at 24 months (N = 556)			CBCL at 36-months (N = 488)		
	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value
<i>7 months</i>									
Male child	0.26	-0.40 to 0.93	0.44	0.38	-0.51 to 1.27	0.40	0.31	-0.59 to 1.21	0.50
Difficult temperament	0.77	-0.61 to 2.16	0.27	0.85	-1.03 to 2.72	0.38	-0.46	-2.31 to 1.40	0.63
Hours in childcare per week	-0.05	-0.10 to 0.00	0.05	0.00	-0.06 to 0.07	0.89	-0.06	-0.13 to 0.01	0.10
Number of siblings	-0.82	-1.56 to -0.08	0.03	-2.32	-3.31 to -1.33	<0.001	-1.71	-2.70 to -0.71	<0.001
Family income <\$30,000	-0.19	-1.68 to 1.30	0.80	3.26	1.24 to 5.29	0.002	-0.40	-2.37 to 1.57	0.69
Home violence	-0.72	-1.97 to 0.54	0.26	-0.64	-2.36 to 1.07	0.46	0.50	-1.20 to 2.20	0.57
Single parent	0.62	-2.24 to 3.48	0.67	-0.92	-4.83 to 3.00	0.65	5.89	1.60 to 10.19	0.007
<i>Maternal</i>									
education < Yr 12	0.56	-0.32 to 1.43	0.21	0.32	-0.87 to 1.51	0.59	1.19	-0.07 to 2.44	0.06
non Anglo-Australian	0.74	-0.11 to 1.60	0.09	0.76	-0.39 to 1.92	0.20	-0.26	-1.39 to 0.88	0.66
social isolation	0.72	-0.27 to 1.71	0.15	0.81	-0.52 to 2.14	0.23	0.76	-0.60 to 2.12	0.27
substance use	-1.30	-3.25 to 0.64	0.19	0.59	-2.11 to 3.29	0.67	1.41	-1.73 to 4.54	0.38
depression	-0.04	-0.16 to 0.09	0.57	-0.21	-0.40 to -0.02	0.03	-0.24	-0.43 to -0.05	0.01
anxiety	0.18	0.03 to 0.34	0.02	0.47	0.23 to 0.70	<0.001	0.19	-0.07 to 0.45	0.16
stress	0.13	0.04 to 0.22	0.006	0.20	0.07 to 0.33	0.002	0.26	0.13 to 0.40	<0.001
<i>12 months</i>									
<i>Parenting</i>									
inappropriate expectations	0.04	-0.01 to 0.08	0.10	0.05	-0.02 to 0.11	0.15	0.01	-0.06 to 0.08	0.76
nurturing	-0.01	-0.06 to 0.04	0.60	-0.03	-0.09 to 0.04	0.42	-0.03	-0.09 to 0.04	0.43
harsh discipline	0.15	0.08 to 0.22	<0.001	0.11	0.01 to 0.21	0.03	0.12	0.01 to 0.22	0.03
Partner conflict about parenting	0.11	-0.09 to 0.31	0.27	0.27	0.00 to 0.54	0.05	0.16	-0.11 to 0.43	0.25
Partner relationship problems	0.38	-0.23 to 0.99	0.22	-0.04	-0.85 to 0.77	0.92	0.08	-0.74 to 0.89	0.86
<i>18 months</i>									
<i>Maternal</i>									

depression 7<18m	0.04	-0.07 to 0.15	0.48	-0.13	-0.32 to 0.05	0.15	-0.18	-0.37 to 0.02	0.08
anxiety 7<18m	0.08	-0.06 to 0.23	0.26	0.30	0.06 to 0.53	0.01	0.05	-0.23 to 0.32	0.75
stress 7<18m	0.08	0.00 to 0.17	0.05	0.14	0.01 to 0.28	0.04	0.22	0.08 to 0.37	0.003
<i>Parenting</i>									
inappr. expectations 12<18m	0.00	-0.04 to 0.04	0.96	-0.03	-0.08 to 0.03	0.38	-0.01	-0.08 to 0.05	0.65
nurturing 12<18m	-0.01	-0.06 to 0.04	0.73	0.01	-0.06 to 0.08	0.79	0.00	-0.07 to 0.07	0.99
harsh discipline 12<18m	0.14	0.06 to 0.22	<0.001	0.13	0.02 to 0.24	0.02	0.16	0.05 to 0.28	0.006
24 months									
<i>Maternal</i>									
depression 18<24m				0.01	-0.15 to 0.17	0.89	-0.21	-0.39 to -0.02	0.03
anxiety 18<24m				0.25	0.06 to 0.44	0.009	0.18	-0.07 to 0.43	0.16
stress 18<24m				0.20	0.08 to 0.32	0.002	0.25	0.11 to 0.40	<0.001
<i>Parenting</i>									
inappr. expectations 18<24m				-0.08	-0.13 to -0.02	0.01	-0.02	-0.09 to 0.04	0.51
nurturing 18<24m				0.02	-0.04 to 0.09	0.43	0.02	-0.05 to 0.10	0.55
harsh discipline 18<24m				0.06	-0.02 to 0.14	0.14	0.10	0.01 to 0.19	0.03
36 months									
<i>Maternal</i>									
depression 24<36m							-0.09	-0.22 to 0.04	0.19
anxiety 24<36m							0.20	-0.01 to 0.42	0.06
stress 24<36m							0.11	0.00 to 0.23	0.05
<i>Parenting</i>									
inappr. expectations 24<36m							0.01	-0.04 to 0.07	0.64
nurturing 24<36m							-0.01	-0.07 to 0.05	0.78
harsh discipline 24<36m							0.07	0.00 to 0.15	0.05
		$R^2 = 15.4\%$			$R^2 = 22.2\%$			$R^2 = 13.2\%$	

Figure 1: Flow chart of participants



* All loss to follow up due to failure to return questionnaires.

‡ Were not included in any regression models.