

Predictors of Depression in Very Young Children : A Prospective Study

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Abstract

Background: There have been only a few previous population-based studies of symptoms of depression in young children. There are no previous population-based studies which examine the factors which might be causally associated with depression in very young children.

Methods: Data are from a cohort study of pregnant women who gave birth to a live singleton baby in a large public hospital in Brisbane, Australia. The Mater-University of Queensland Study of Pregnancy (MUSP) involves a 5-year follow-up, with mothers completing a short form of the Child Behaviour Checklist (CBCL) describing the mental health of their child. Five groups of variables (socio-demographic, pre- and perinatal, maternal mental health, maternal lifestyle and maternal attitude to the child) were used to predict CBCL depression scores at the 5-year follow-up.

Results: There are many factors associated with maternal reports of symptoms of depression in 5-year-old children. These include marital partner changes, mother's health problems in pregnancy, child health over the first 6 months of life, maternal anxiety and marital satisfaction early in the child's development and the mother's attitude towards caregiving. A multiple risk factor model indicates higher rates of depression for children experiencing multiple exposures to risk. While a number of exposures are associated with increased risk, many of those children perceived to be depressed appear to lack any measured exposures.

Conclusion: Many children as young as 5 years of age are observed to experience multiple symptoms of depression. The majority of children exposed to high levels of risk do not appear to become depressed; they appear to be resilient. The majority of children who experience multiple symptoms of depression appear to lack any known exposures to risk.

Keywords children; depression; multiple risk factors; resilience

Introduction

Depression is one of the more common health problems experienced by adults. While there is an extensive body of literature regarding depression in adults, to date, there have been few population studies of the symptoms of depression in young children. Little is known about either the symptoms which are observed or their correlates or causes.

Childhood depression

There have been conflicting views concerning the phenomena of depression in young children. Freudians argued that children could become depressed (Freud and Burlingham 1944; Klein 1948, 1949) and later Bowlby (1952, 1969, 1973 and 1980) related childhood depression to attachment, separation and loss. Others (Rochlin 1959; Mahler 1961; Rie 1966) have argued that it is not until adolescence that depression emerges as a clinical disorder. This debate has been resolved by the observation that clinicians, including paediatric psychiatrists, are prescribing antidepressant medications to young children (Efron et al. 2003).

At least two somewhat distinct issues are relevant here. Firstly, at what age does a child experience depressed mood which is broadly comparable to the form in which it is experienced by an adult? There is evidence suggesting similarities in experiences of symptoms of depression in children and adolescents (Mitchell et al. 1988). Recently, Luby et al. (2002) have developed modified DSM-IV protocols for the detection of major depressive disorder in preschool children. They found that parents were consistent in their reporting of symptoms and that such symptoms were stable over a 6-month period in a clinic-based sample. Secondly, to what extent does the social context within which the child is reared impact on that child's mental health? As distinct from adults, do young children show evidence of emotional and/or mental health problems associated with their experiences? (Young children are here interpreted as from birth to 6 years of age.)

While there have been numerous population studies of depression in adult populations (Alonso et al. 2004; Kessler et al. 2003), and some in adolescent population samples (see Boyd et al. 2000), there are few focussing on young children (birth – 6 years). There have been two re-views of population studies using standard (clinical) criteria to determine the prevalence of depression in young children. These two reviews are based upon a small number of available studies with only one or two studies reporting rates of depression in young children (Fleming and Offord 1990; Angold and Costello 1995). Earls and Richman (1980) sampled 3-year-old children from a community located in the northeastern United States. Parents reported on the behaviour problems they observed in their children. Some 7.9% of the children were reported to have 'unhappy mood' and some 25.7% 'sleeping problems'. It is not possible to directly relate these symptoms to existing diagnostic criteria for psychiatric disorder. Bird et al. (1989) used the Child Behaviour Checklist with a community sample from Puerto Rico. They found that 2.8% and 5.9% of children had depression/dysthymia (Bird et al. 1989). This prevalence was for children aged 4–16. No age-specific rates were provided. Offord et al. (1987) using a community sample of children aged 4–16 from Ontario found that 10.2% of boys aged 4–11 and 10.7% of girls aged 4–11 (Offord et al. 1987) had an 'emotional' disorder. There were no age-specific details nor were the emotional disorders disaggregated into the main subcategories assessed by psychologists. The Dunedin longitudinal study suggested that 1.8% of children 9 years of age had a major depressive disorder and 2.5% a minor depressive disorder (Kashani et al. 1983). Lewisohn et al. (1994) asked adolescents to recall the age of onset of a past or current major depressive disorder. Of the 1,508 adolescents given a diagnostic interview, 24% (n = 362) reported at least one major depressive episode, with a mean age of onset of 14.9 years. The child and adolescent component of the Australian mental health survey reported that 15.1% of 4- to 12-year-olds had a mental health problem – with 4.1% of males and 2.9% of females

identified as anxious/depressed (Sawyer et al. 2000). Specific estimates for young children were not available.

There is then a body of evidence suggesting that young children experience depressed mood, manifesting symptoms which are broadly similar to those experienced by their adolescent peers. There are, however, too few specific studies of young children. The majority of existing studies provide estimates of depression for a wide age range and it is consequently difficult to estimate the rate of depressive symptoms and the correlates of depression for young children.

The present paper reports the results of a study of a large sample of pregnant women (and the children to whom they gave birth) – 5 years after the birth of their child. While there will be a continuing debate about the age at which children can be observed to manifest the symptoms of depression, we examine the proposition that by the time the child is 5 years of age, the mother will have had a good opportunity to observe the mood and affect of her child.

Subjects and methods

Overview

The Mater-University of Queensland Study of Pregnancy (MUSP) is a prospective, longitudinal study of mothers and their children. Details of the study which began in 1981 are described by Keeping et al. (1989). In effect, 8,556 consecutive mothers attending their first pre-natal clinic visit at the Mater Misericordiae Mothers' Hospital in Brisbane, Australia, were invited to participate in the study. Only 1% declined and 8,458 of the women agreed. Of these women, 7,223 mothers gave birth to a live, single baby. (Women giving up their child for adoption and multiple births were excluded.) Medical records of the birth were accessed and follow-ups were conducted at 3–5 days (100% completed the interview), 6 months (93%, $n = 6,720$, completed the interview), and at 5 years (72.8%, $n = 5,259$, of the cohort completed the interview). A wide range of demographic, biological, mental health, family functioning and behavioural data were collected.

While some symptoms of depression in children will be evident to family and friends of a child, others are likely to be subtle and not visible even to intimates of the child. In a child too young to be able to self-report, there is likely to be difficulty in identifying the less visible symptoms. We have used items from the CBCL to measure symptoms of depression. The CBCL was developed to measure the child's competencies and behaviour problems from ages 4 to 18 (Achenbach 1991). It comprises three competence scales and eight problem or syndrome scales. The CBCL is the most-used population measure of child psychopathology/behaviour problems. Validation of the CBCL is argued largely on its psychometric characteristics, its capacity to distinguish between children in clinical care and those in the population (Achenbach 1999), the consistency of CBCL syndromes with a number of DSM diagnostic groups (Krol and Bruyn 1990) and the extent to which the CBCL findings have been replicated in diverse settings (Novik 1991; Bilenberg 2000; Heubeck 2000).

Table 1: Percentage of mothers reporting CBCL symptoms at child age 5

	Often	Sometimes	Rarely/never
Cries a lot	4.0	41.3	54.6
Feels worthless or inferior	1.2	18.8	80.1
Likes to be alone	3.9	54.7	41.3
Too fearful or anxious	2.4	31.6	66.1
Feels too guilty	0.7	15.9	83.4
Trouble sleeping	2.7	21.7	75.5
Withdrawn	1.6	20.9	77.5
Worries	2.3	35.7	62.0

Standardised Cronbach alpha = 0.70

A depression subscale (short form) of the CBCL was developed as the dependent variable in this study. Items were scored as 2 = “often”; 1 = “sometimes” and 0 = “rarely/never”. The items and the Cronbach alpha reliability coefficient for the scale are in Table 1.

Judgements about “caseness” are likely to be particularly problematic when applied to very young children. Unfortunately, relevant clinical data are simply not available. Achenbach and Edelbrock (1983) acknowledge that some decile cut-offs (90th and 10th) have a degree of research appeal. We have selected the youth with scores of 7 or more (at least four symptoms) as “cases” for the categorical analysis (see Table 7). This represented the closest cut-off possible to the top decile of depression scores (constitutes those children with the highest 7.6% of scores).

Predictor variables

The analyses in Tables 2–6 involve 32 independent or predictor variables in five categories; socio-demographic, pre- and perinatal factors, maternal lifestyle, maternal mental health, maternal attitudes to child/child rearing practices, and attitudes towards the child/pattern of child rearing.

Socio-demographic predictors

Six socio-demographic predictors of depression were selected. Mother’s age and level of education were self-reported at the first clinic visit. All other socio-demographic variables are maternal self-reports at the 5-year follow-up. Reliability coefficients (Cronbach alpha) are reported for scales. For symptoms/signs, we have summed the total number reported.

Prenatal and perinatal predictors

Eight predictors of depression were selected. Birthweight of the baby and its gender were taken from the medical record of the pregnancy. Mother’s health problems during pregnancy is a summed self-report of seven problems (morning sickness, constipation, heartburn, back-ache, vaginal infection, leg cramps and feeling generally unwell) experienced during pregnancy. Perceptions of the pregnancy are a self-report of three items (pregnancy straightforward, complications, physically well during pregnancy (Cronbach alpha = 0.72). Problems/complications during delivery is a six-item self-report index (enema, pubic slave, severe pain during labour, labour induced, drip in arm, stitches needed). Post-delivery medical problems is a scale based upon three items (baby had medical problems, baby spent time in special care nursery, baby

had feeding problems (Cronbach alpha = 0.69). The previous four variables were all obtained 3–5 days after the birth. Medical attention at 6 months is based upon a maternal report of the number of doctor visits in the first 6 months, while the child health variable is a maternal report of the frequency of nine symptoms in the child's first 6 months (colic, sleeplessness, vomiting, diarrhoea or constipation, feeding problem, skin problem, overactivity, cough/cold, convulsions or fits).

Table 2: Sociodemographic predictors of depression (CBCL short scale) at age 5 (mean of total sample = 2.76; n = 4,866)

	n	Adjusted mean *	P-value
Mother's age at study first visit			
13 to 19 years	644	2.90	0.047
20 to 34 years	4,000	2.76	
35 years plus	222	2.44	
Mother's level of education			
At first visit			
Incomplete high	832	2.87	0.076
Complete high	3,101	2.71	
Post-high	933	2.84	
Index of Chronic Poverty from prenatal to 5 Years			
Consistently poor	273	2.90	0.013
Mid-income	4045	2.79	
High income	548	2.50	
Number of children in household at 6 month follow-up			
Study child only	1,970	2.86	0.029
Two to four	2,735	2.70	
Five or more	161	2.49	
Number of maternal partner changes - prenatal to 5 Years			
Nil partner change	3980	2.66	<0.001
One	495	3.25	
Two plus	391	3.15	
Mother's partner at 5 Years ever arrested			
No	3,794	2.73	0.079
Yes	796	2.92	
No partner	276	2.68	

* Adjusted for all other variables in table
Multiple r = 0.14; r² = 0.02

Maternal mental health predictions

Five measures of maternal mental health were derived. Depression/ anxiety of the mother at the 3- to 5-day and 6-month follow-up are based on the Delusions Symptoms States Inventory (SAD) of Bedford and Foulds (1977). The DSSI/SAD was initially developed by psychiatrists and validated using population and clinical samples. Reliability coefficients (Cronbach alpha) for anxiety and depression subscales are consistently above 0.80 at each phase of data collection. Marital satisfaction was measured using the core items from the Spanier (1976) Dyadic Adjustment scale. Reliability (Cronbach alpha) for the items in the scale is 0.86.

Table 3: Pre- and perinatal predictors of depression (CBCL short scale) at age 5 (mean of total sample = 2.74, n = 4267)

	n	Adjusted mean *	P-value
Birthweight			0.337
Low birthweight (2499 or less gms)	152	2.92	
Normal birthweight (2500 or more gms)	4,115	2.73	
Gender			0.421
Male	2,237	2.77	
Female	2,030	2.71	
Mother's health problems during pregnancy (3-5 days)			< 0.001
Few symptoms	624	2.52	
Some symptoms	3,476	2.75	
Many symptoms	167	3.33	
Perceptions of pregnancy (3-5 days)			0.018
Few problems	3,643	2.70	
Some problems	539	3.00	
Lots of problems	85	2.86	
Problems/complications during delivery (3-5 days)			0.971
Few problems	820	2.75	
Some problems	3,089	2.74	
Lots of problems	358	2.76	
Post-delivery medical problems experienced by child (3-5 days)			0.720
Few problems	3,942	2.74	
Some-many problems	325	2.78	
Medical attention required by child in first 6 months			0.007
No medical visits	830	2.52	
1-5 medical visits	3,034	2.79	
6+ medical visits	403	2.85	
Child health during first 6 months			<0.001
0-3 symptoms	3,684	2.68	
4 symptoms	313	2.92	
5+ symptoms	270	3.65	

*Adjusted for all other variables in table

Multiple $r = 0.16$; $r^2 = 0.03$.

Maternal lifestyle predictions

Four measures of maternal lifestyle were derived. Maternal reports of tobacco and alcohol use at the first clinic visit were obtained. At the 6-month follow-up, the mother was asked to describe the length of time she had breastfed.

Maternal attitude to child predictors

Nine measures of the mother's attitudes and/or behaviour towards the child were obtained. Four items describing whether the pregnancy was planned/wanted were aggregated into a scale at the first clinic visit [planned pregnancy, meant to avoid

pregnancy, wanted to get pregnant, method of family planning failed (Cronbach alpha = 0.89)]. Five items relating to how the mother felt about the baby (Cronbach alpha = 0.77) were used to create a scale at the 6-month follow-up. Four items describing how the mother interacts (stimulates/teaches) with the child (Cronbach alpha = 0.71) were administered at the 6-month follow-up. Maternal self-reports of the hours in childcare were obtained at 6 months and 5 years. Also at 5 years, mothers were asked to respond to five scenarios of child behaviour and to indicate how they would punish their child if their child behaved in the manner designated in the scenario. The “reason” scale had a Cronbach alpha of 0.82; the “smack” scale had a Cronbach alpha of 0.62, and the “take” scale a Cronbach alpha of 0.74. Finally, the mother was asked to respond to five items by describing the age at which the child would be allowed to engage in specified activities (Cronbach alpha = 0.60).

Table 4: Maternal mental health predictors of depression (CBCL short scale) at age 5 (mean of total sample 2.76; n = 4300)

	n	Adjusted * mean	Adjusted P-value
Maternal depression 3-5 days post-birth			0.462
Not depressed	4163	2.76	
Depressed	137	2.91	
Maternal anxiety 3-5 days post-birth			0.030
Not anxious	3862	2.73	
Anxious	438	3.01	
Maternal anxiety 6 months Post-birth			< 0.001
Not anxious	3919	2.67	
Anxious	381	3.68	
Maternal depression 6 months post-birth			0.209
Not depressed	4133	2.75	
Depressed	167	3.00	
Maternal marital satisfaction at 5 year follow-up			< 0.001
Good	2687	2.59	
Some conflict	709	3.03	
Conflict	396	3.14	
No partner	508	3.01	

* Adjusted for all other variables in table
Multiple r = 0.22; r² = 0.05.

Results

The data analysis is primarily in the form of a series of multivariate simultaneous models which permit consideration of: (a) the importance of each group of predictors, and (b) an assessment of the independent effects of individual variables when controlling for the association between that variable and other variables within the same group.

Table 5: Maternal lifestyle predictors of depression (CBCL short scale) at age 5 (mean of total sample = 2.76; n = 5059)

	n	Adjusted mean *	P-value
Index of smoking early in pregnancy (FCV)			
Non-smoker	3,320	2.69	0.020
Light-moderate smoker	1,377	2.88	
Heavy smoker	362	2.92	
Index of drinking alcohol early in pregnancy (FCV)			
Abstainer	2,524	2.76	0.903
Light drinker	2,464	2.76	
1+ drinks per day	71	2.64	
Presence of maternal binge drinking in pregnancy (FCV)			
Never binge	4,069	2.75	0.192
Occasionally binge	854	2.76	
Binge half the time	136	3.12	
Length of time mother breastfed the study child (FCV)			
Still feeding at 6 months	1,617	2.68	0.026
Breastfed 2 wks-6 months	2,440	2.85	
Not breastfed	1002	2.68	

* Adjusted for all other variables in table

Note: (mean of total sample = 2.76; n = 5,059)

Multiple r = 0.07; r² = 0.00.

Socio-demographic predictors

An analysis of the socio-demographic predictors of de-pression (measured by the CBCL short scale) with the predictors in categorical form is given in Table 2. The mean of the total sample was 2.77 symptoms of depression (n = 5,063). When we examine the adjusted means, a number of the differences are at the borderline of statistical significance. Maternal marital age, maternal poverty, mothers with fewer children in the household, and with one or more partner changes are associated with childhood depression.

Only about 2.0% of the variance in the child depression scores can be attributed to the combined effect of demographic variables.

Prenatal and perinatal predictors

Several measures assessing maternal health and well-being were obtained post-natally and used in the current analysis (Table 3). Consistent with other studies (Angold and Worthman 1993; Birmaher et al. 1996), we found no gender differences in depression at 5 years of age.

Table 6: Mother's attitude to child and child rearing predictors of depression (CBCL short scale) at age 5 (mean of total sample = 2.79; n = 4542)

	n	Adjusted mean *	P-value
Whether mother wanted baby at prenatal assessment (FCV)			0.843
Unplanned/not wanted	880	2.77	
Unsure	1,098	2.82	
Planned/wanted	2,564	2.78	
Mother's attitude to caregiving at 6 month follow-up is positive:			<0.001
Not always	262	3.72	
Mostly	2,503	2.90	
Always	1,777	2.50	
Amount mother stimulates/teaches baby at 6 months			0.618
Not always	650	2.83	
Mostly			
Always	3,892	2.78	
Hours of childcare at 6 months			0.057
Nil	2,228	2.71	
4 hours or less	1,757	2.85	
5-10 hours	305	3.03	
11-20 hours	103	2.58	
21+ hours	149	2.93	
Hours of childcare at 5 years			0.170
Nil	1,915	2.86	
1-10 hours per week		2.57	
11-20 hours per week	140		
21+ hours	2,143		
	344		
Take away something the child enjoys as discipline at 5 years			0.002
Always	187	3.01	
Sometimes	2,672	2.87	
Never	1,683	2.64	
Use reason to discipline at 5 years			0.476
Always	2,417	2.81	
Sometimes	1,867	2.79	
Never	258	2.63	
Smack to discipline at 5 years			0.304
Always		2.76	
Sometimes	467	2.82	
Never	3,203	2.69	
	872		
Maternal supervision at 5 years			0.311
Controlled	371	2.76	
Some freedom	3,728	2.81	
A lot of freedom	443	2.64	

*Adjusted for all other variables in table.

Multiple r = 0.17; r² = 0.03.

Table 7: Depression at age 5 by composite risk score*

Number of risk exposures	n	Percent depressed	(Number depressed)	Odds ratio	95% CI
Nil/few (0-2)	3,771	6.3	(238)	1	
Some (3)	357	10.6	(38)	1.77*	1.23-2.54
Many (4-6)	173	20.8	(36)	3.90	2.64-5.76

*Includes number of maternal partner changes from prenatal to five years (1 = one or more), child health during first six months (1 = 4 or more symptoms), mother's health problems during pregnancy (1 = anxiety yes), marital satisfaction postnatal to five years (1 = conflict or no partner), maternal anxiety six months post birth (1 = anxiety yes) and mother's attitude to care giving at six month follow-up (1 = not always positive).

Mothers who reported that they had more health problems during their pregnancy (two variables) were more likely to subsequently report that their child had symptoms of depression. These differences remain after adjustment for the other variables in the model. Mothers who reported that the child had more medical attention in the first 6 months or more symptoms at 6 months had children who were subsequently found to have higher depression levels.

There is a weak multiple correlation between all the pre- and perinatal predictors and subsequent depression in the child (multiple $r = 0.17$). Only about 3.0% of the variance in the child depression scores can be attributed to the combined effect of these pre- and perinatal variables.

Maternal mental health predictors

Table 4 examines various indicators of maternal mental health as predictors of depression for the 5-year-old child. Maternal anxiety at 6-month follow-up is associated with a high depression score of the child at age 5 ($p < 0.001$). Poor maternal mental health in the period immediately after the birth of the child is associated with a higher level of maternal reports of symptoms of depression.

There is a linear association between the perceived quality of the marital relationship, or where there was no partner, and child depression scores. Where the mother's marital relationship at the 5-year follow-up is characterised by conflict, the child is more likely to be reported to have more symptoms of depression.

The combined effect of these variables shows a weak multiple correlation with subsequent depression in the child (multiple $r = 0.22$). About 5.0% of the variance in the child depression scores can be attributed to the combined effect of these maternal mental health variables.

Maternal lifestyle predictors

There is a linear association between mothers smoking in pregnancy and child depression scores when the child is 5 years of age (Table 5). When means are adjusted, the association remains statistically significant. By contrast, maternal alcohol consumption in pregnancy does not appear to be related to childhood depression. The combined effect of the maternal lifestyle variables shows only a very weak multiple correlation with subsequent depression in the child.

Mothers' attitude to child and child rearing predictors

The mother was asked a series of questions at the prenatal interview concerning whether she wanted/planned the baby. Whether the mother wanted the baby at prenatal assessment was not significantly associated with subsequent child depression scores at 5 years (Table 6).

The mother's attitude to caring for her child was also assessed at the 6-month follow-up. Mothers who were more positive about caring for their child at this follow-up were substantially more likely to deny that their child subsequently experienced symptoms of depression.

There is an inverse linear relationship between number of hours in childcare at 6 months and child depression scores at 5 years ($p < 0.001$). The association between hours in childcare at age 5 years and child depression scores at age 5 is not statistically significant.

Maternal disciplinary method at 5 years was associated with child depression. The combined effect of these nine variables in Table 6 shows a weak multiple correlation between all these variables together and subsequent depression in the child (multiple $r = 0.17$). Only about 3% of the variance in the child depression scores might be attributed to the combined effect of the maternal attitudes to child and child rearing variables.

In Table 7, we have used a combined risk factor score developed by selecting the seven independent variables in Tables 2–6 with an adjusted p value of 0.001 or better. These were: whether the mother had had a change of partner in the previous 5 years (Table 2), whether the mother had poor health in pregnancy or the child had more symptoms at the 6-month follow-up (Table 3), the mother's anxiety level at 6 months and the marital adjustment at 5 years (Table 4), and how positive the mother's attitude to the child was at the 6-month follow-up (Table 6). Children were given a score of 0 or 1 for each variable depending upon whether they were in the risk category for that variable.

Some 312 children were categorised as depressed at the 5-year follow-up. The risk of becoming depressed appears to be a linear function of the number of risk exposures (Table 7). Of the 173 children in the highest (4–6) risk group, 20.8% meet the depression cut-off criteria. In the medium risk group, 10.6% of children were classified as depressed. In the lowest risk group, 6.3% of children were depressed. However, if we examine the total number of children depressed (312), 36 are in the high risk group, and 38 are in the medium risk group. Thus, despite the higher risks of depression in child-hood which can be attributed to such factors as marital breakdown, maternal mental health and child rearing practices, the majority of children who are observed to be depressed at the 5-year follow-up have nil/few (0–2) risk factors (238 of 312).

Discussion

Mothers of 5-year-old children report that their child frequently manifests symptoms which are consistent with those associated with depression. Many mothers perceive their children to be depressed and/or worried. This is not to imply that these children would meet the criteria for clinical 'caseness', but rather to emphasise that it is common for children as young as 5 years of age to be perceived to manifest a variety of symptoms of depression and/or anxiety.

Mothers who are separated or divorced, or where the mother and child have a history of poor health, where the mother has a history of impaired mental health (anxiety), and when the mother's attitude to the child at 6 months of age was not always positive are more likely to subsequently describe their child as having the symptoms of depression.

The association between poor maternal health in pregnancy and child health when the child is 6 months old and reports that the child has symptoms of depression at 5 years of age raises the possibility that poor child mental health at 5 years of age is a continuation of earlier health problems. To what extent might child mental health be an indication of the generational transmission of health inequalities?

Many studies have found that maternal depression is a predictor of child depression (Weissman and Jensen 2002), though the over-reporting of child symptoms by depressed mothers explains some of this association (Najman et al. 2001). It was interesting that maternal depression in the postnatal period was not related to child depression. The association between postnatal anxiety and child depression does suggest that disturbed maternal mood/mental health is more important than maternal depression in influencing subsequent child depression.

The multivariate models we have tested represent a subset of all the variables in which we have had an interest. We excluded from consideration those variables which were of marginal interest on theoretical grounds, or which prior analysis indicated were not related to childhood depression. While we have examined some 32 variables, many of these will be related to other variables not assessed (e. g. we have only examined a small number of the available socio-economic variables). It is consequently surprising that we have identified only a few strong associations, with the majority of other associations being weak, albeit sometimes statistically significant. Few of the models accounted for more than a few per cent of the variance in childhood depression.

The composite multivariate model of risk factors predicting depression indicated that the high risk group (those with 4–6 risk factors) only accounted for about one in ten (11.5%) of the children meeting the “case” cut-off. Indeed, the majority of children who are categorised as depressed come from families where there are few or no risk factors. Further, of the children whose mothers have many risk factors, the majority of children do not meet the “caseness” criteria for depression. Why is it that only a minority of children exposed to many risk factors are perceived to become emotionally impaired? One plausible explanation is that those who do become impaired are biologically more susceptible to the risks to which they are exposed. This possibility can-not be specifically tested in this study. Evidence of early onset of symptoms and high levels of continuity of symptoms (as suggested by Angold and Worthman 1993; Luby et al. 2002) might equally argue for a biological or social/environmental basis for childhood depression. The latter of these explanations would be more plausible if the social/environmental associations were somewhat stronger. The consistent finding that, while some associations were statistically significant, they were weak predictors of child depression, points to a biological predisposition/susceptibility explanation as more credible.

In interpreting the data, some important caveats need to be considered. Firstly, the data are restricted to maternal reports of an emotional state experienced by the child. Mothers may not be aware their child is depressed or the mother's own emotional state may influence her observations such that she attributes depressive symptoms to the child when they are not present. Further-more, only eight symptoms of depression

were presented to the mother. Children may have experienced symptoms not on the list presented to the mother.

In acknowledging these caveats, it must be noted that the symptoms presented to the mother had a good reliability coefficient which suggests that mothers had a consistent view about their child's depressive symptoms. It must also be noted that most of the risk factors are either not related or only weakly related to maternal depression. Consequently, maternal depression is un-likely to substantially bias the observed associations. While the mean numbers of symptoms of child depression are used as a measure of outcome in most analyses, depression caseness cut-offs are presented in Table 7. It is true that these cut-offs are somewhat arbitrary and that different criteria for caseness might have produced a different result. Repeated sensitivity analyses using different criteria for caseness produced identical findings to those in Table 7.

Another caveat in interpreting the data concerns bias associated with those mothers of children lost to follow-up. While it is the case that low income, young and single mothers are disproportionately lost to follow-up, the question of the impact of this effect on our findings is more difficult to determine. Loss to follow-up is in the order of 30% of our sample, with about 45% of mothers in the higher risk groups not being followed up. Children living in high-risk environments, and more likely to have symptoms of depression, are most likely to be lost to follow-up. However, the association between child depression and maternal age, income and marital status is not strong. Most "high-risk" children remain in the study. The likely consequence of selective attrition is to provide a conservative risk estimate. Thus, attrition bias is likely to have the effect of producing a modest under-estimate of this study's capacity to predict depression in children.

Conclusion

We have noted that many factors are weakly associated with childhood depression. Contrary to our expectations, we can see that the social overlay has a modest effect on whether a child becomes depressed, and that even dysfunctional family relationships and poor communication styles have a limited impact on the observed mental health of the child. Few children who live in a high-risk environment become impaired. Most children who are impaired/depressed come from a low-/no-risk background.

When did these children first exhibit signs or symptoms of depression? In our study, we were unable to estimate the age at which symptoms were believed to commence. Evidence of the early origins of depressive symptoms in children arguably suggests a biological basis for these symptoms – as does the evidence pointing to weak social and environmental effects. To what extent then are symptoms of depression constitutional? Are these symptoms ones that recur periodically through the life course? Is a model which interprets depression as a biological predisposition influenced by a social context the most parsimonious interpretation of our data? If children in their pre-school or early school years can become depressed, does this have implications for a population health strategy relating to the early onset of mental health problems in young children?

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