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Early life family disadvantages and major depression in adulthood

H. SADOWSKI, B. UGARTE, I. KOLVIN, C. KAPLAN and J. BARNES

Background There is evidence that exposure to social and family disadvantages in childhood are a risk factor for adult depression.

Aims To explore the effects of multiple adversity in early childhood on adult depression, and the relative effects of the different adversities.

Method This study utilises data from the Newcastle Thousand Family Study. Information on childhood disadvantages was collected when the participants were 5 years old, and information on mental health was gathered when they were 33 years old. Mental health data were scrutinised blind to the evidence of early disadvantage, and best-estimate diagnoses of major depressive disorder were made according to DSM-III-R criteria.

Results Multiple family disadvantages in childhood substantially increase the risk of suffering a major depressive disorder in adulthood. Such disadvantages include family or marital relationship instability, a combination of poor mothering and poor physical care, and a combination of dependence on social welfare and overcrowding. For females major depression was linked in particular to the quality of parenting in early life.

Conclusions Social and family (especially multiple family) disadvantages during childhood predispose individuals to an increased risk of major depression in adulthood.

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There is now considerable evidence from population studies (Rodgers, 1990*b*; Kessler & Magee, 1993) and other cohort studies (Brown & Harris, 1993; Brown & Moran, 1994) that adults who have been exposed to adverse life events in middle or later childhood are at increased risk for adult depression.

Over the past decades there has been an impressive accumulation of evidence that poor maternal care in childhood (Parker, 1979; Perris *et al*, 1986; Birtchnell, 1988), unsatisfactory child/parent relationships (Abrahams & Whitlock, 1969), parental 'affectionless control' (Mackinnon *et al*, 1993), and parental marital problems or marital separation (Rodgers, 1994) are associated with an increased risk of suffering from depression in later life.

However, most studies have been retrospective and relied on subjective reports, often from clinical samples. Few studies have utilised evidence gathered prospectively in community studies from an objective external source concerning early life experiences and then related these to depression in adulthood using systematic assessment techniques. Further, Kessler & Magee (1993) have pointed out that very little research has explored "the joint effects of multiple adversities . . . or the comparative effects of different adversities" on adult depression.

THE NEWCASTLE THOUSAND FAMILY STUDY (1947-1980)

The Newcastle Thousand Family Study was originally designed to investigate illness in the first year of life of all children born in the city of Newcastle upon Tyne between 1 May and 30 June 1947. Altogether, 1142 children in 1132 different families were enrolled in the study (Spence *et al*, 1954). The study was first continued up to age 5 (Miller *et al*, 1960) and then up to age 15 (Miller *et al*, 1974). During the first five years of life, deaths, withdrawal from the study, and removals from the area left 847 of the original sample and their families in the survey in 1952.

From 1979 to 1981, Kolvin *et al* (1988, 1990) followed-up a stratified sample of the 847 index children still in the study in 1952. The reason for focusing on these individuals was that, during the first five years, extensive psychosocial data had been collected, upon which the definitions of early family disadvantages were based (Miller *et al*, 1960, 1985; Kolvin *et al*, 1990).

Criteria of disadvantage during the first five years of life

Six categories of long-standing family disadvantages were employed (Kolvin *et al*, 1990), defined as follows:

(a) Family/marital disruption (divorce, separation or marital instability).

(b) Parental physical illness.

(c) Poor physical care of child and home.

(d) Social dependence (which included serious debt, unemployment, and reliance on National Assistance).

(e) Family overcrowding.

(f) Poor mothering (poor maternal coping skills).

The specific criteria of disadvantage in childhood in this sample population were present with rates ranging from 24% for parental physical illness to 35% for overcrowding (Kolvin *et al*, 1990).

DESIGN AND METHOD OF THE PRESENT STUDY

The present study is based on the subsequent follow-up study of the subjects of the Newcastle Thousand Family Study (Kolvin *et al*, 1990) using a 'catch-up longitudinal design' (Robins, 1980). Two hundred and ninety-six index children were selected by random stratification according to the degree of disadvantage of the 847 families that were studied in 1952 (Spence *et al*, 1954; Miller *et al*, 1960). The three original selected strata consisted of known proportions of the groups who were not disadvantaged, were disadvantaged in one or two respects, and those who had been exposed to three or more criteria of disadvantage. This stratification allowed the application of an appropriate multiplication

factor to estimate one-year prevalence rates of adult depression for the original population.

Efforts were made to trace those families who had moved from the city and eventually 266 (134 females and 132 males) of the 296 individuals and their families were recruited and interviewed between 1979 and 1981 (90% of the selected sample). Extensive psychosocial and mental health data were gathered, which formed the basis for the study of the transmission of deprivation (Kolvin *et al*, 1990). At the time of the follow-up the participants were 33 years of age.

In the original study (Kolvin *et al*, 1990) in which the focus was on social and family doctors and offending, the operational decision was to define multiple disadvantage as three or more criteria. While offending is relatively common (Kolvin *et al*, 1988), major depression is present in only 10% of the population (Kessler *et al*, 1994). It was therefore decided to focus solely on the dichotomy between multiply disadvantaged and not multiply disadvantaged individuals, and the operational definition of multiple disadvantage in the original study was reviewed and a more stringent definition of multiple disadvantage was adopted. The mean number of disadvantages in the original sample (0.9) plus two standard deviations (2.7) above the mean was used as a cut-off to define multiple disadvantage. The participants were dichotomised as follows: (a) 'no multiple disadvantage' (n=227, 85.3%), those who had experienced up to three coexisting criteria of family disadvantage, and (b) 'multiple disadvantage' (n=39, 14.7%), those who had experienced at least four coexisting family criteria of disadvantages in their first five years of life.

The intercorrelations between specific criteria of disadvantage were either negative or non-significant in both defined groups with the exception of poor maternal care and poor mothering (Spearman correlation coefficient 0.43, $P<0.001$ in the 'no disadvantage' group and 0.38, $P<0.05$ in the 'multiple disadvantage' group) and social dependence and parental physical illness in the 'no multiple disadvantage' group (Spearman correlation coefficient 0.32, $P<0.01$). Thus, the two conceptually and statistically related criteria of poor physical care and poor mothering were combined to form a 'composite index of parenting' (n=24 females and 27 males). In addition, although not significantly correlated, a conceptually based composite 'social disadvantage index' was created combining both social dependence and overcrowding during childhood (n=21 females and 18 males). The 'index of parenting' is conceptually comparable to Brown & Harris' measure of parental indifference (1993) and the 'social disadvantage index' encompasses disadvantages which Rodgers listed as socio-economic circumstances (1990*b*). The 'parenting index' was present in 12.5% of subjects in the 'no multiple disadvantage' group and in 80% of the 'multiple disadvantage' group, and the 'social disadvantage index' occurred in 7% of the 'no multiple disadvantage' group and in 60% of those in the 'multiple disadvantage' group.

Diagnoses and classification

The participants were interviewed in their 33rd year of life. They were informed that this was a follow-up study to find out about the general adult functioning of adults who had been studied over the first five years of life. The interviewers were blind to the individuals' experiences of disadvantage and also to other information collected in the first five years of life. All the interviewers had previous training and experience in systematic semi-structured interviewing techniques. Regular quality checks were undertaken to ensure the consistency of the scoring of the information given and any problems were discussed with the senior researcher (I.K.). Satisfactory levels of reliability were achieved (Kolvin *et al*, 1990, p. 27).

A semi-structured open-ended interview was used enquiring about the experience of a wide range of affective and anxiety symptoms over the year prior to the interview. The definitions of the various abnormal phenomena had been modified from the Standard Psychiatric Interview (Goldberg *et al*, 1970). The probes included questions comparable to the stem question from the Schedule for Affective Disorders and Schizophrenia (Endicott & Spitzer, 1978): "Over the past year have you had a time when you felt low, miserable and unhappy all the time? Did you find you could not snap out of it? Did it last more than one month?" The responses to these and additional questions about various symptoms of anxiety and depression were rated by the interviewers according to severity on four-point scales (symptom not present, and symptom present of a mild, moderate, or severe degree).

For the purpose of this study current mental health data on subjects gathered when they were 33 years old were scrutinised blind to the evidence of any childhood disadvantage. First themes relevant to the stem question from the Schedule for Affective Disorders and Schizophrenia (Endicott & Spitzer, 1978) were considered. Fifty-eight subjects (21.6%) – 41 females (30.3%) and 17 males (12.7%) – had experienced dysphoria to a moderate or severe degree lasting for at least one month during the year prior to the interview. Only these individuals were considered to have psychopathology which approximates the mandatory criterion 'depressed mood' of major depressive disorder according to DSM–III–R (American Psychiatric Association, 1987).

In addition all the responses to probes concerning the following symptoms were scrutinised: lack of energy, lack of appetite, sleep disturbance and suicidal ideation. Each was regarded to approximate one of the non-mandatory criteria of major depressive disorder according to DSM–III–R, but only when the symptom had been experienced to a moderate or severe degree. The exception was suicidal ideation which was regarded present if the subject had experienced recurrent suicidal thoughts.

A 'best-estimate' diagnosis of major depressive disorder was made if dysphoria had been present to a moderate or severe degree lasting for one month, and if at least three of the four additional criteria had been judged to approximate the comparable non-mandatory criteria of major depressive disorder according to DSM–III–R. Thus, in order to prevent possible over-inclusion, in this study four of five specified criteria needed to coexist for a diagnosis of an episode of a major depressive disorder over the year prior to the interview. This was considered comparable to the formula of five out of the nine criteria specified in DSM–III–R.

The two research fellows had training and supervision in the use of criteria from the Schedule for Affective Disorders and Schizophrenia and the conversion of the available data into DSM–III–R diagnoses. When a satisfactory level of consensus was achieved, an independent review of the data was conducted on 20 interviews selected randomly. No differences were noted in allocating to groups according to the presence or absence of major

depression. Best-estimate diagnoses were then made for the remaining respondents. In most instances the data available were considered sufficient and complete to make a diagnostic rating with reasonable confidence. However, relevant data were unavailable for four women.

Statistical methods

The aim of the analysis was to examine the links between early family disadvantages and depression in adulthood. The stratification procedure allowed population estimates to be calculated to produce a period prevalence of disorder (covering the year prior to the interview at age 33) for the general population of Newcastle upon Tyne.

For the purpose of this paper, univariate analyses of data were undertaken according to the presence and absence of major depressive disorder using χ^2. Intercorrelations between criteria of disadvantage were analysed using the Spearman correlation coefficient.

In order to examine the independent and joint effects of early life disadvantages on the presence of major depressive disorder in adulthood, multivariate analyses were conducted using logistic regression. Backwards stepwise selection was used, with removal based on the probability of the Wald statistic. All procedures were performed using SPSS for Windows software.

RESULTS

Early life adversities and depression in adulthood

It was estimated that at 33 years of age 8.4% of the general population of Newcastle had suffered a major depressive disorder over the previous year (Table 1). The rate of depression varied according to the degree of exposure in the first five years of life to social and family disadvantage. In the sample population of those who had experienced no or some disadvantage the one-year prevalence rate was 7.2%; but in those exposed to multiple disadvantages the rate was nearly fourfold (28.2%). In the total sample the rate of major depressive disorder was significantly higher in females than in males (χ^2=4.30, d.f.=1, $P<0.05$, odds ratio 2.7, 95% CI 1.1–6.3).

In males the one-year prevalence rate of major depressive disorder in the 'no multiple disadvantage' group was 3.5%, and those in the 'multiple disadvantage group' were more likely to suffer a major depressive disorder (23.5%) (odds ratio 8.5).

For females the picture is similar albeit against the background of a higher base rate. The rate of depression was 11% for females in the 'no multiple disadvantage' group, but nearly 32% for those from multiply disadvantaged backgrounds (odds ratio 3.7).

In the 'no multiple disadvantage' group females were more likely (odds ratio=3.5) than males to suffer a major depressive disorder at 33 years of age (95% CI 1.1–11.1; χ^2=3.79, d.f.=1, $P<0.06$) but this difference fell just short of statistical significance. In the 'multiple disadvantage' group the female-to-male odds ratio was greatly reduced (odds ratio 1.5, 95% CI 0.4–6.8).

Specific criteria of disadvantage in the pre-school years and subsequent adult depression

Table 2 provides data on the specific criteria of disadvantage in the first five years of life and their association with depression at 33 years of age.

Most individual criteria of childhood disadvantage were not significantly associated with increased rates of major depression in adulthood, namely social dependence, overcrowding, poor mothering, poor physical care, and parental physical illness during childhood.

In the total sample, the highest rates of major depressive disorder occurred in the presence of the combination of social dependence and overcrowding during early childhood (Table 2). Similarly, there were significant differences in the prevalence of major depressive disorder between the subgroups of individuals who had experienced the 'parenting index' of both poor physical care and poor mothering in childhood and those who had not. Individuals exposed to family or marital instability during their first five years of life were overall three times more likely to receive a best-estimate diagnosis of major depression in adulthood than those who were not.

For females, significantly increased rates of major depression in adulthood were found in the subgroup exposed to the 'parenting index' of both poor physical care and poor mothering. One-third (8/24) of this subgroup experienced recent major depression.

For males, the childhood experience of the composite 'social disadvantage index' and of family or marital instability was significantly associated with increased rates of major depression in adulthood (Table 2).

Logistic regression analyses

Entering multiple disadvantage as a dichotomous variable as present or not, together

Table 1 One-year prevalence of major depressive disorder at 33 years of age in relation to disadvantage experienced in first five years of life

	n (%)	A 'no multiple disadvantage' group	B 'multiple disadvantage' group	Odds ratio B *v.* A	95% CI	d.f.	χ^2	*P*
Sample population								
Total number	27/262 (10.3%)	16/223 (7.2%)	11/39 (28.2%)	5.1	(2.1–12.0)	1	13.69	<0.001
Females	19/130 (14.6%)	12/108 (11.1%)	7/22 (31.8%)	3.7	(1.3–11.0)	1	4.73	<0.05
Males	8/132 (6.1%)	4/115 (3.5%)	4/17 (23.5%)	8.5	(1.9–38.3)	1	7.23	<0.01
Estimated for original sample								
Total number	70/839 (8.4%)	54/781 (6.9%)	16/58 (28.2%)	5.3	(2.8–10.0)	–	–	–
Females	51/423 (12.1%)	41/391 (10.4%)	10/33 (31.8%)	4.0	(1.8–9.0)	–	–	–
Males	19/416 (4.6%)	13/390 (3.4%)	6/25 (23.5%)	8.8	(3.0–25.6)	–	–	–

–, not performed on estimated numbers.

Table 2 Rates of major depressive disorders at 33 years of age in relation to presence and absence of specific criteria of disadvantage in first five years of life

	A Subjects without specific criteria(on)	B Subjects with specific criteria(on)	Odds ratio (B v. A)	95% CI	d.f.	χ^2	P
Sample population							
Both social dependence and overcrowding	16/223 (7.2%)	11/39 (28.2%)	5.1	(2.1–12.0)	1	13.69	<0.001
Both poor physical care and poor mothering	16/211 (7.6%)	11/51 (21.6%)	3.4	(1.4–7.8)	1	7.24	<0.01
Family/marital instability	14/193 (7.3%)	13/69 (18.8%)	3.0	(1.3–6.7)	1	6.18	<0.05
Females							
Both social dependence and overcrowding	13/109 (11.9%)	6/21 (28.6%)	3.0	(1.0–9.0)	1	–	NS
Both poor physical care and poor mothering	11/106 (10.4%)	8/24 (33.3%)	4.3	(1.5–12.4)	1	6.52	<0.01
Family/marital instability	11/93 (11.8%)	8/37 (21.6%)	2.1	(0.8–5.6)	1	–	NS
Males							
Both social dependence and overcrowding	3/114 (2.6%)	5/18 (27.8%)	14.2	(3.0–66.5)	1	13.13	<0.01
Both poor physical care and poor mothering	5/105 (4.8%)	3/27 (11.1%)	2.5	(0.6–11.2)	1	–	NS
Family/marital instability	3/100 (3.0%)	5/32 (15.6%)	6.0	(1.3–26.7)	1	4.75	<0.05

with gender and an interaction variable between gender and disadvantage, into backwards stepwise logistic regression, multiple disadvantage had a highly significant effect (odds ratio 2.22, Table 3). The relative odds ratio of receiving a diagnosis of major depressive disorder was 1.6 times higher for females compared to males. No significant interaction between gender and multiple childhood disadvantage was found.

Another logistic regression was performed to evaluate the cumulative effect of an increasing number of childhood disadvantages on major depression in adulthood. For this purpose six dummy variables were created for those with one, two, three, four, five and six childhood disadvantages. Only three of the variables representing four disadvantages (Wald 5.47, d.f.=1, $P<0.05$), five disadvantages (Wald 4.17, d.f.=1, $P<0.05$) and six advantages

Table 3 Results of logistic regression analyses (backwards stepwise) with major depressive disorder as dependent variable for all subjects

Independent variable	*n*	Odds ratio	95% CI	d.f.	Wald	P
3.1 Degree of disadvantage controlled for gender						
Multiple disadvantage at 5						
Absent	223	1				
Present	39	2.22	(1.43–3.44)	1	12.72	<0.001
Gender						
Male	132	1				
Female	130	1.60	(1.03–2.49)	1	4.29	<0.05
Interaction between gender and multiple disadvantage not selected						
Model predicts 89.7% of outcome (χ^2=16.92, d.f. 2, $P<0.001$)						
3.2 Specific criteria of disadvantage at five years of age and interaction variables						
Family/marital instability						
Absent	193	1				
Present	69	1.74	(1.11–2.75)	1	5.75	<0.05
Parental illness		–	–	1	–	NS
Social dependence		–	–	1	–	NS
Overcrowding		–	–	1	–	NS
Interaction between social dependence and overcrowding		1.95	(1.17–3.25)	1	6.51	<0.05
Interaction between poor physical care and poor mothering		3.07	(1.04–9.08)	1	4.11	<0.05
Interaction between poor physical care, poor mothering and female gender		1.81	(1.12–2.94)	1	5.83	<0.05
All other variables and interaction variables were not selected						
Model predicts 89.3% of outcome (χ^2=33.44, d.f. 7, $P<0.001$)						

(Wald 9.76, d.f.=1, $P<0.01$) were selected as significant predictors of major depression in adulthood with odds ratios of 1.95 (95% CI 1.11–3.41), 2.08 (95% CI 1.03–4.19), and 4.40 (95% CI 1.74–11.16). The model accounted for 90% of the overall outcome ($\chi^2=14.89$, d.f.=3, $P<0.01$).

A third logistic regression was performed analysing the independent contribution of each individual criterion of childhood disadvantage to major depressive disorder in adulthood. All individual criteria together with gender, and interaction variables between all criteria, pairs of criteria and gender were entered into logistic regression. Four significant predictors of major depression in adulthood were found, namely: family or marital instability; the interaction between social dependence and overcrowding; the interaction between poor physical care and poor mothering; and a three-way interaction between poor physical care, poor mothering and female gender (Table 3).

DISCUSSION

Multiple family disadvantages during childhood and depression in adulthood

The experience of multiple family disadvantages during early childhood strongly predicted a major depressive disorder at 33 years of age. Although the synergistic effects of multiple risk factors have been examined in studies predicting psychopathology in childhood and adolescence, prospective studies are rare in respect to multiple childhood disadvantages and psychopathology in adulthood. In the National Cohort Study, Rodgers (1990*b*) showed that those subjects who had experienced multiple adversity during childhood had more affective symptoms during the month prior to the interview than anticipated from the separate effects of each of the independent variables studied.

Using univariate analyses, Cadoret *et al* (1990) in their study of adult depression in male adoptees showed a significant correlation between two or more adoptive home conditions (including low adoptive home socio-economic status and poor adoptive parent health among others) and affective symptomatology in adulthood. This association did not retain its significance in multivariate (log-linear) analyses. In the current study, when studying all subjects, the experience of multiple childhood disadvantages remained significant when the effect of gender was also taken into account.

It should be noted that in both this sample of the Newcastle Thousand Family Study with its revised criteria for multiple disadvantage and in the National Cohort Study only a small proportion of individuals were exposed to 'multiple disadvantage' or a 'high level of childhood adversity' (Rodgers, 1990*b*). Nevertheless, this small proportion accounted for a relatively high percentage of 'caseness' or 'best-estimate diagnoses' of major depression. This indicates that high risk clusters in a relatively small group of individuals who experienced many childhood disadvantages, and the risk is associated with substantially increased one-year prevalence rates of major depressive disorder in adulthood.

Specific criteria of family disadvantage in childhood and major depression in adulthood

Univariate and multivariate analyses revealed significant differences in the rates of major depressive disorder between those subjects who had and those who had not experienced (a) family or marital instability; (b) both poor physical care and poor mothering; and (c) both social dependence and overcrowding during childhood.

Based on retrospective reports, Kessler & Magee (1993) found a strikingly similar odds ratio for adult major depression where subjects had been exposed to parental divorce, also using logistic regression analyses. After controlling for socio-economic status using MANOVA, Rodgers (1994) demonstrated a significant relationship between parental separation or divorce and an increased affective symptom score for females, but not for males.

Most of the studies supporting the notion that the exposure to poor parental care and other adverse social and family-rearing experiences in childhood is related to depression in adulthood have used retrospective recall measures (Parker, 1979; Perris *et al*, 1986; Brown & Harris, 1993). Since the other two prospective studies have not employed adequate measures of parenting and care (Cadoret *et al*, 1990; Rodgers, 1990*b*), the present study is currently the only one available which used a catch-up longitudinal design to examine the relationship between parenting in childhood and affective disorders in adulthood.

The findings in this study suggest that females are especially vulnerable in view of having a major depression in adulthood, if they experienced both poor mothering and poor physical care in childhood. Thus, it is important to note the convergence between the results in this prospective study and the findings for females where the data were collected retrospectively. The measure of parental indifference used by Brown & Harris (1993) comes nearest to the parenting index employed in the present study. After controlling for adult adversity, they found a comparable odds ratio of 2.6 when comparing groups with and without adverse early parenting experiences.

In the current study, there was a strong association of the experience of both family social dependence and overcrowding in childhood with major depression in adulthood. Rodgers (1990*b*) did not report an association between an overall index of material home conditions, but there was a link between overcrowding in childhood and affective symptomatology in adult females. However, this link was not confirmed when using multivariate analyses.

Limitations of this study

Post-hoc diagnoses

The 1980 follow-up survey of the Newcastle Thousand Family cohort was intended as a longitudinal study of the transmission of deprivation (Kolvin *et al*, 1990). The reported findings are based on one-year prevalence rates of major depressive disorders linked to data that were not originally intended for a study of affective disorder in adulthood. The method incorporates a *post-hoc* diagnostic evaluation of available information about symptoms to ascertain which subjects met DSM–III–R diagnostic criteria based on a one-year recall of symptoms in 1979/80 when the subjects were approximately 33 years of age. Kessler & Magee (1993) employed a similar method, that is making best-estimate diagnoses of major depressive disorder. They derived comparable rates. Face validity of this procedure is also supported by comparing the prevalence rates of major depressive disorder in this study to other epidemiological studies since it was possible to re-estimate the prevalence for the general population in Newcastle upon Tyne based on the known stratification factors.

The estimated one-year prevalence rate of 8.4% for the general population is slightly lower than the 10.3% reported by

Kessler *et al* (1994) from the National Comorbidity Survey in the United States. Further, the estimated one-year prevalence for females in the general population (12.1%) is very close to the findings for females in the National Comorbidity Survey (12.9%). However, the estimated rate for males (4.6%) is about 3% lower than that recorded in the National Comorbidity Survey (7.7%).

Absence of information about other salient stressors

A crucial limitation is that information was not collected which allowed identification of salient stressors which are known to be important – such as sexual, physical or emotional abuse. Therefore, it was impossible in this study to control for the impact of abuse or the synergistic effect of the forms of abuse and any of the recorded disadvantages during childhood.

Absence of data about relevant childhood psychopathology

Another limitation is that the catch-up longitudinal design of the study precluded collecting information about the onset or prevalence of affective or other disorder in childhood or adolescence. Nor was information available concerning affective disorder in the parental generation, and thus the contribution of parental mental illness could not be explored.

Strengths of this study

Prospective design

The main strength of the current study is that information about disadvantage during the first five years of life had been collected prospectively by professionals visiting the parental home (Kolvin *et al*, 1990). Thus, classification of families according to the degree of disadvantages was not distorted by subjective or retrospective accounts of childhood circumstances (Brewin *et al*, 1993). Further, when the respondents were interviewed at around 33 years of age, the interviewers were blind to the childhood experiences of disadvantage. It is important to note that in this study the results based on prospective research confirm earlier findings from studies employing retrospective designs.

Sampling procedure

The sampling procedure employed in this study allowed an exploration of all degrees of severity of family disadvantages experienced during childhood. The attrition of the baseline cohort of 847 subjects over 25 years by the time of follow-up was estimated to be under 10% (Kolvin *et al*, 1990).

In the original stratification procedure, sub-samples representing strata were selected randomly and thus contained known proportions in relation to the original population. The new and more rigorous definition of multiple disadvantages does not affect the estimations back to the original population as the available data can be calculated either to the new or previous system. Thus, the sub-samples studied were representative of the selected strata.

Avoiding biases of over-sampling

Since all statistical analyses of data were performed on the actual numbers of individuals summating all three original strata, there remained the possibility that over-sampling of multiple disadvantage and the adoption of a more stringent definition of multiple disadvantage could have contributed to distortions. Therefore, the data for the original population were reconstituted employing relevant stratification algorithms. This was followed by repeating the statistical analyses, and all odds ratios were recalculated accordingly and compared with those reported in this study. All odds ratios were slightly higher than those derived by comparing actual numbers, confirming the statistical findings reported in this study.

The elegance of the stratification procedure and over-sampling of individuals who had experienced multiple family disadvantages during childhood was that it had ensured higher actual numbers in the multiply disadvantaged group. Thus, significant differences between groups of the original population were not lost in univariate or multivariate analyses when based on the actual numbers in this study.

Mechanisms

The current findings demonstrate that early life disadvantages predispose to depression in adulthood. Other studies have shown the continuing effect of social and family disadvantages in later childhood and teenage years (Brown & Harris, 1993; Rodgers, 1994). However, there is a need to go beyond the general conclusion that bad experiences may have bad effects (Rutter, 1981). The future challenge is the search for mechanisms by which disadvantaged children are predisposed to develop specific disorders (Kolvin *et al*, 1990).

First, there is the question of why only a minority of children exposed to such experiences develop a disorder. Environmental experiences may fluctuate over time, some for the better, some for the worse and this may account for substantial discontinuities as well as continuities (Kolvin *et al*, 1990). There may be other operative positive influences.

In brief, when postulating that early life disadvantage is associated with vulnerability to adult depression, there needs to be the appreciation that this can be modified by protective factors. Thus, some of the exposed individuals will be adversely affected, while others may be protected from adverse consequences by their intelligence, strength of character, pre-existing social skills or other positive personal or family qualities. Such qualities may lead the individual to overcome life-term disadvantages – the so-called 'steeling effects'. Other protective factors include the achievement of a positive personal relationship or other continuous or chance experiences between the individual and their life situations.

Second, there are the more precise mechanisms eventually giving rise to depression. Some may consider that the early life adversities have 'sleeper effects' implying that there are hidden operative mechanisms, which only after a long delay give rise to the disorder. A more plausible view is that girls exposed to poor mothering qualities, may be particularly liable to develop insecure attachments giving rise to low self-esteem and poor relational skills; they may have less in the way of academic aspirations and will seek a solution in early cohabitation. In adulthood, exposure to a series of other adverse life events could provoke the emergence of depression (Brown & Harris, 1993). It has been hypothesised by Elder (1973) that adverse economic deprivation often gives rise to marital (spouse) relational strains and in due course, emotional estrangement of the family from the father – with balance of power in the family being changed. Father's role and position may become reduced or undermined. Thus, boys exposed to such family circumstances may tend to identify more strongly with their peer culture. While this culture may serve a function in childhood, it provides only limited skills for solving

financial, personal and social problems in adulthood. They do not provide healthy chain reactions, often in social contexts over the course of time. Thus, males are often at greater risk of offending but at lesser risk of emotional problems.

DISADVANTAGES IN EARLY LIFE AND PREDISPOSITION TO DEPRESSION

In conclusion, the current findings demonstrate that early life disadvantages may predispose to depression in adulthood. Individuals exposed to family or marital instability in childhood, to both social dependence and overcrowding, or to both poor mothering and poor physical care were significantly more likely to experience a major depressive disorder at 33 years of age than those who were not. Females were especially sensitive to the quality of early life parenting in respect of vulnerability towards depression in later life.

Strikingly, a cluster of subjects having experienced multiple family disadvantages in childhood are at significant risk of suffering a major depressive disorder in adulthood. It is plausible that the basic mechanism is that as a consequence of these experiences once a threshold has been reached, there is an increased vulnerability to major depression in later life.

Further research is needed to explore the impact of both social disadvantage in the family and the quality of parenting during early childhood on later life psychopathology in males and females. Current concepts about the psychosocial origins of depression need to take into consideration the potential synergistic effects of multiple and diverse disadvantages during early childhood and need to consider how these adversities contribute to greater vulnerability to depression in adult life. Consideration needs to be given to the potential utility of preventive intervention by targeting families at high risk, or in adulthood targeting those individuals previously exposed to high-risk experiences.

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APPENDIX. VALIDATING THE FINDINGS FROM CATEGORICAL ANALYSES USING A DIMENSIONAL APPROACH

Two related crucial issues are the *post hoc* diagnoses and the small number of subjects judged as depressed on a categorical variable – a total of 27 out of 262 subjects. These are the basis of the chi-squared and logistic regression analyses and could give rise to concerns about the validity of the findings. One way of checking the findings is by using a total depression symptom measure or index. Previously Kolvin *et al* (1990, p. 127) had shown a strong relation between such individual depressive symptoms in adulthood and childhood evidence of family disadvantage. However, these data had not been aggregated into a depression index, nor had they been analysed by gender or according to the individual criteria of disadvantage. In essence, a depression index constitutes a dimension which allows supplementary cross-validity analysis of the data. Further, in previous research total depression symptom scores have proved to be a more robust summary statistic than dichotomous variables in multivariate statistical analysis (Rodgers, 1990*a*).

Table 4 Univariate analyses of mean depressive symptom score over the year prior to the interview in relation to individual criterion of family disadvantage during first five years of life

	n	Criterion absent (s.d.)	*n*	Criterion present (s.d.)	*t*	*P*
All subjects	262					
Poor mothering	184	6.4 (3.2)	78	7.6 (3.3)	−2.79	<0.01
Poor physical care	197	6.5 (3.2)	65	7.5 (3.3)	−2.26	<0.05
Parental relationship instability	193	6.4 (3.1)	69	7.5 (3.5)	−2.17	<0.05
Parental physical illness	200	6.7 (3.3)	62	6.9 (3.2)	–	NS
Overcrowding	170	6.4 (3.0)	92	7.3 (3.6)	−2.04	<0.05
Social dependence	173	6.3 (2.9)	89	7.5 (3.7)	−2.69	<0.01
Females	130					
Poor mothering	94	6.9 (3.6)	36	8.7 (3.5)	−2.55	<0.05
Poor physical care	99	7.1 (3.5)	31	8.5 (3.8)	(−1.94)	(<0.06)
Parental relationship instability	93	7.3 (3.6)	37	7.7 (3.8)	–	NS
Parental physical illness	100	7.5 (3.6)	30	7.1 (3.6)	–	NS
Overcrowding	84	7.2 (3.5)	46	7.9 (3.9)	–	NS
Social dependence	81	7.2 (3.3)	49	7.9 (4.0)	–	NS
Males	132					
Poor mothering	90	5.7 (2.6)	42	6.6 (2.8)	(−1.79)	(<0.08)
Poor physical care	98	5.8 (2.7)	34	6.6 (2.5)	–	NS
Parental relationship instability	100	5.6 (2.4)	32	7.3 (3.1)	−3.10	<0.01
Parental physical illness	100	5.8 (2.6)	32	6.7 (2.9)	–	NS
Overcrowding	86	5.7 (2.2)	46	6.7 (3.3)	−2.03	<0.05
Social dependence	92	5.6 (2.3)	40	7.0 (3.3)	−2.79	<0.01

Table 5 Multiple regression analysis indicating relative contribution of individual criteria of disadvantage during first five years of life to depressive symptomatology at 33 years of age

Independent variable	Females		Males		All subjects	
	Beta	*P*	Beta	*P*	Beta	*P*
Poor mothering	0.22	<0.05	0.08	NS	0.15	<0.05
Poor physical care	0.05	NS	0.03	NS	0.02	NS
Parental relationship instability	−0.03	NS	0.29	<0.001	0.09	NS
Parental physical illness	−0.09	NS	0.17	<0.05	−0.03	NS
Overcrowding	0.05	NS	0.22	<0.01	0.08	NS
Social dependence	0.03	NS	0.13	NS	0.14	<0.05
Adjusted R^2	0.04	<0.05	0.12	<0.001	0.04	<0.01

Method

The symptom score of all five relevant variables was summated to give a total depressive symptom score. Thus, the range of the total depressive symptom score ranged between 0 and 15. It proved an adequate predictor of a best-estimate diagnosis of major depressive disorder (Spearman correlation coefficient $r=0.53$, $P<0.001$), but the procedure to derive best-estimate diagnoses of major depressive disorder ensured that 'caseness' was not simply a function of any affective symptom cut-off but related rather more to a valid clinical concept.

Statistical analyses

Univariate analyses for the depressive symptom score were conducted using *t*-tests. In addition, multivariate analyses were conducted using stepwise linear-regression, in order to ascertain which factors had an independent influence on a high total depressive symptom score in adulthood.

Univariate analyses of mean depressive symptom score

When all subjects were included in the analyses then, except for parental illness criteria, the presence of all the other criteria of disadvantage were associated significantly with a higher mean depressive symptom score (Table 4). However, females more commonly reported depressive symptoms than males over the year prior to the interview and had a higher mean depressive symptom score (7.4 *v.* 6.0; *t*-value −3.61, $P<0.001$). A contrasting pattern of vulnerability emerged when the data were analysed by gender. In females, only poor mothering in childhood was significantly associated with a higher depressive symptom score in adulthood; whereas in males early life exposure to parental relationship instability, overcrowding and social dependence were associated with depressive symptom score.

Multivariate analyses of mean depressive symptom score

Only two early life disadvantages continued to exert an influence on adult depressive symptoms in the total sample population, namely poor mothering and social dependence (Table 5). They were responsible for about 4% of the variance.

Poor mothering was the only disadvantage experienced in childhood that significantly predicted depressive symptomatology in females, whereas in males parental physical illness assumed significance, with overcrowding and parental relational instability proving the main predictors. These findings corroborate broadly the picture obtained with logistic regression analyses.

CLINICAL IMPLICATIONS

- Multiple disadvantages during early childhood predispose individuals to major depression in adulthood.
- The quality of parenting experiences are crucial both as protective or risk factors for later life psychopathology.
- Preventive measures should be focused on children and parents from multiply disadvantaged families.

LIMITATIONS

- Data collected were not originally intended for DSM–III–R diagnosis of major depressive disorder.
- No information was collected about affective disorders in the subjects' parents.
- Data on sexual or physical abuse were not available.

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