

# The Leicester 500 Project. Social support and the development of postnatal depressive symptoms, a prospective cohort survey

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## ABSTRACT

**Background.** A prospective epidemiology study evaluated the role of specific social and psychological variables in the prediction of depressive symptomatology and disorders following childbirth in a community sample. Measures of social support used previously in clinically depressed populations facilitated further comparison.

**Methods.** Nulliparous pregnant women ( $N = 507$ ) were interviewed during pregnancy with the Interview Measure of Social Relationships (IMSR) and a contextual assessment of pregnancy-related support and adversity and 427 were followed up at 3 months postpartum with the 30-item GHQ, including six depression items. To establish the clinical representativeness of the GHQ, high GHQ scorers and a random subsample of low scorers were interviewed using the SCAN. Regression models were developed using the GHQ Depression scale (GHQ-D), the IMSR and other risk factor data.

**Results.** GHQ-D after childbirth was predicted by lack of perceived support from members of the woman's primary group and lack of support in relation to the event becoming pregnant; this held even after controlling for antenatal depression, neuroticism, family and personal psychiatric history and adversity. Informant-rated deficits in provision of social support also predicted later depression. The size of the primary social network group previously found to be related to depression in women, did not predict depressive symptom development.

**Conclusion.** Predictors of depressive symptom development differ from predictors of recovery from clinical depression in women. Interventions should be designed to reduce specific deficits in social support observed in particular study populations.

## INTRODUCTION

While the importance to psychiatry of understanding interpersonal social relationships has never been questioned it is only within recent decades that attempts have been made to study this empirically. Such studies have focused both on the possible effects of illness on relationships and social functioning (Weissman & Paykel, 1974) and on the effect that positive and negative aspects of relationships may have on illness inception and subsequent processes. The term

'social support' has been particularly linked to this second line of investigation; the importance of the topic could lie in the possible opportunity for the development of increasingly effective interventions including early preventative strategies (Brugha, 1995*a*). This might apply particularly to the commoner forms of mental disorder such as depression. However, initial attempts to translate earlier findings from observational social support research, while encouraging, have not been strikingly successful (Brugha, 1995*b*). Therefore, we argue for the collection of standardized clinical and psychosocial risk factor data in an epidemiologically defined population sample. First, this could help

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to identify those who could be selected as being at highest risk of future disorder. Secondly, programmes of more clearly guided and focused risk factor reducing interventions (Mrazek & Haggerty, 1994) could then be evaluated in the same or similar populations.

A new study would provide a valuable opportunity to examine the importance of other antecedent factors that might explain associations between support and later symptoms. In models of future symptom states, a potentially important predictor to take into consideration will be preceding or antecedent symptoms. Similarly, previous research by others pointed to the importance of individual or personality factors (Henderson *et al.* 1980; Duncan-Jones *et al.* 1990) such as EPQ Neuroticism (Eysenck & Eysenck, 1975) and inherited characteristics (Kessler *et al.* 1994). A new study could focus also on an issue upon which public health interest in social support may be said to have been founded, namely the interrelationship with adversity (Alloway & Bebbington, 1987; Sharp, 1995). Measures of family psychiatric history and personal psychiatric history could be examined also as potentially important antecedent factors, that could act as confounding variables in any later association between social risk factors and depression.

### Background to the present work

It is notable that much of the literature on social support and the development of depressive symptoms is based on women, and particularly includes the interval following childbirth (see below). Earlier research reviewed in detail elsewhere (Brugha 1989*a*, 1995*b*) had shown that deficiencies in the quantity and quality of personal relationships were associated with depressive disorders identified by the Present State Examination (Brown & Harris, 1978, Brugha *et al.* 1982, 1987*a*). Prospective studies in which the outcome variable was recovery from depression (Brugha *et al.* 1987*a*) or the development of new episodes of depression (Brown *et al.* 1986) also provided support for the hypothesis that certain types of deficiencies in social support may act causally on depressive disorders (Gotlib & Hammen, 1992). Further work, suggested that some of these associations operate differently between men and women (Brugha *et al.* 1990). This work was based on a

comprehensive, standardized interview measure of social support networks that would allow comparisons to be made between different populations and groups (Brugha *et al.* 1987*b*). Accordingly, it was used in a further prospective study, based on a random sample of adults in the community. This allowed the earlier work in clinical populations on the course and outcome of depressive disorder to be contrasted with a study of symptom inception in a general population sample.

Other arguments can be marshalled for studying a specific contextual focus and a particular general population subgroup. Social evaluative processes are likely to be sensitive to developmental stage (Champion, 1995; Champion *et al.* 1995) gender (Brugha *et al.* 1990) and the social context in which life events occur (Brown & Harris, 1978), which may itself be partly an aspect of social support (Champion, 1990; Brugha *et al.* 1993). For example, in their earlier work on life events and depression in women living in an inner city area, two contextual factors seemed to have a strong influence on whether the life event 'becoming pregnant' was likely to be rated as particularly threatening: an unplanned pregnancy and the absence of a stable partnership with the father of the child (Brown & Harris, 1978). A number of prospective studies of social influences on the development of psychiatric disorder following child birth have been conducted and demonstrate also the importance of deficits in social support (Paykel *et al.* 1980; O'Hara *et al.* 1983; O'Hara, 1986), even when information about support is provided by a confidant (Cutrona, 1989). Other reasons for deciding to work in the area of perinatal psychiatric disorder were the higher prevalence of clinical depression in women, and the growing evidence that women are at increased risk of developing psychiatric disorder in the first 3 months following childbirth (Kendall *et al.* 1987; Cooper *et al.* 1988). Thus, fewer subjects could be studied in a prospective cohort while retaining adequate statistical power and ease of access to a large and co-operative population sample with a similar developmental stage.

A discussion of the perinatal depression risk factor literature with a more detailed consideration of the implications arising from the present study is set out separately (Sharp *et al.* 1997).

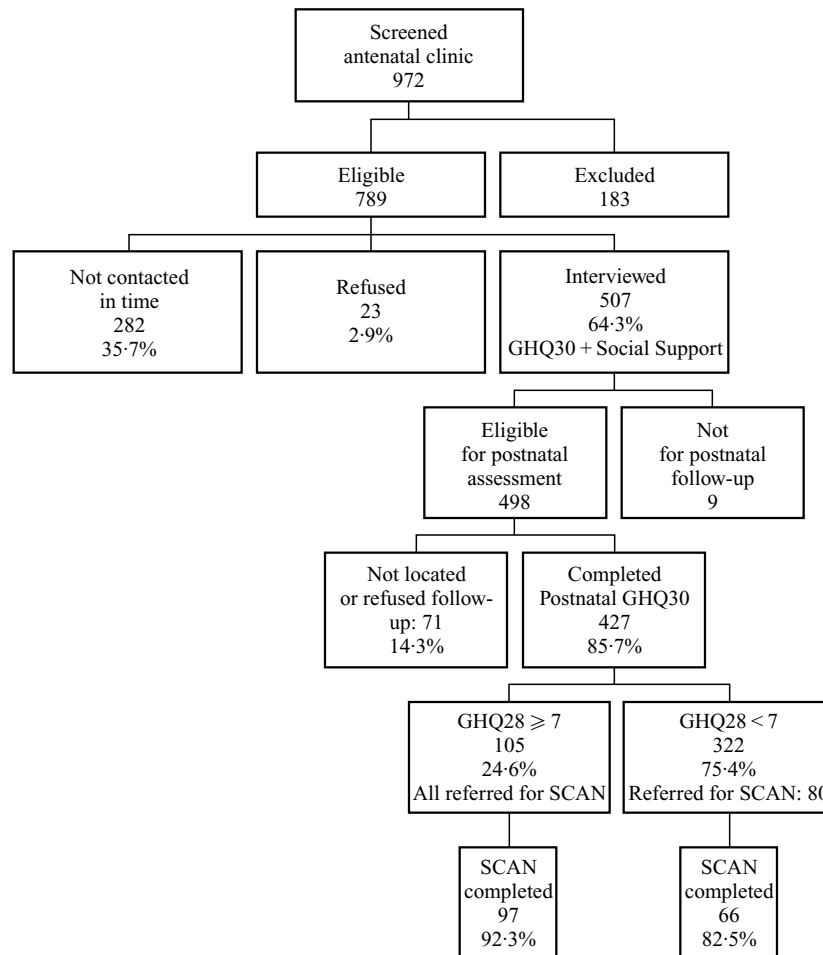


Fig. 1. Design and sampling showing subjects eligible and interviewed at each stage.

### Aim and focus of the Leicester 500 Project

The more general aim of this work however, was to test the hypothesis that deficits in social support, as measured in earlier studies in clinical populations (IMSR: Brugha *et al.* 1987*b*), predict the development of depressive symptoms and disorders in a community sample, by conducting a cohort survey of pregnant women observed prospectively. Earlier work with the IMSR on men and women (Brugha *et al.* 1990) suggested that in women the size and the supportiveness of the close ‘primary group’ (Brugha *et al.* 1982) would predict clinical course, but that the variables ‘living as married’ and primary group negative interaction, would not be predictive.

### METHOD

#### Design

The design is depicted in Fig. 1. A cohort (panel) community survey was employed. All women were to be assessed on at least two occasions: during the pregnancy and 3 months postnatally. A two-stage method was employed postnatally; more detailed interview data were gathered on a subset of those assessed by a postal questionnaire.

Obstetric and neonatal data were also obtained from case-notes after childbirth and a final further attempt was made to contact these women at 12 months. Two hundred and five women also participated in a substudy on women’s antenatal expectations and subsequent

experiences of labour, childbirth, the baby and early motherhood. These women also completed an additional measure of depressive symptoms at 6 weeks postpartum (Sharp, 1995). We examined antenatal and postnatal GHQ depression symptom scores (Surtees & Miller, 1990) and found no differences comparing women according to their participation in the substudy. The present first (published) report deals only with the initial antenatal and 3 month postnatal assessments completed by the full Leicester 500 sample.

Although a formal power calculation was not carried out, the following were taken into consideration in arriving at an estimate of the sample size required. Based on a previous study of psychiatric disorder after childbirth using the PSE-9 (Cooper *et al.* 1988) and previous discussions of statistical power issues in relation to the measurement of social support (Brugha *et al.* 1982, 1987*b*) a sample size of 600 was estimated to be sufficient to provide adequate numbers of cases for the analysis of the relationship of support to the onset of specific types of symptoms and possibly also of disorder. Following an initial pilot stage and modifications of the sampling procedures based on feasibility and the resources available to the researchers, an eventual initial antenatal sample of 507 women was assessed of whom 427 were successfully re-contacted postnatally (Fig. 1).

### Sampling

During the survey Leicestershire was served by two large maternity units and five small community-based units (Leicestershire Health Service, 1987, population approximately 900 000 people). Twenty-seven per cent of women in the district seeking antenatal care during their first pregnancy were registered at the Leicester General Hospital (LGH) maternity unit. The LGH unit is the second largest in the district. The district's largest maternity unit at the Leicester Royal Infirmary is close to the city centre; the LGH unit is located on the east side of Leicester. In spite of its location on the east of the city, the LGH unit provides services to all of the city and its suburbs, to the immediate rural areas, including those to the north between Leicester and Nottingham (confirmed by geographic mapping of the women participating in the study). It also serves a large Asian com-

munity living in the East and South of the city and suburbs, most of whom speak good English. Although serving a smaller proportion of the district population, the LGH unit was chosen because it appeared to serve a population more representative of urban, suburban and rural England and second, for reasons of feasibility and ease of access to the research team. With the help of the LGH maternity unit computerized register (and information routinely supplied by family doctors), most of those eligible for entry to the study could be identified the day before their first booked visit to the clinic.

### Subjects

A consecutive sample of 972 primiparous women who presented themselves at the Leicester General Hospital for antenatal care were asked to take part in 'a general health study of first-time expectant mothers'. During the first contact with the antenatal clinic or as soon as possible after that, each woman was asked to consent to participate in the study. The formal agreement and support of the local Division of Obstetrics and the District Committee for the Ethics of Medical Research were obtained.

### Exclusion criteria

Women from the consecutive sample were excluded from participation in the study if they met any of the following criteria: (a) if they were found to have surpassed 28 weeks in a prior pregnancy; (b) if they were non-English speaking, or (c) they were illiterate. (The study inclusion criteria placed no restrictions on age, social class or health status.)

### Measures

#### *Background sociodemographic measures*

Basic data on age, marital status, employment, education, migration and ethnic origins and general health were collected by the research psychologist, during the initial interview. Past contacts with secondary-health care, including psychiatric services, were enquired about and information on drug and other forms of treatment recorded.

#### *Dependent measures*

The 30-item version of the General Health Questionnaire (GHQ; Goldberg, 1972) was administered at the initial interview and as a

postal questionnaire sent 12 weeks after childbirth. This version of the GHQ had been validated in similar populations by Sharp (1988) and by Nott & Cutts (1982). Standardized depression subscales were also derived using a method developed by Surtees & Miller (1990); this additional set of scales, described below in the Analysis section, became available soon after fieldwork had been initiated but required no additional data collection.

#### *Independent measures*

##### *Interview Measure of Social Relationships (IMSR; Brugha et al. 1987b)*

This was administered, together with a measure of stressful life events during pregnancy. The IMSR is a 30 min structured interview that assesses the quantity and quality of a person's social network during the previous 7 days prior to interview with good reliability. It includes a detailed assessment of primary group members (close relatives and friends) and as well as other contacts (such as work colleagues, casual friends and acquaintances). It assesses self-reported emotional closeness to network members and primary attachment figures. Reported, negative interactions and levels of support between the woman and her network members are rated by the interviewer. In a reliability study carried out on 18 IMSR interviews the percentage agreement was 96% for negative interaction and complete agreement was obtained for network support.

##### *Life events*

These were assessed by means of an interview concerning recent major life events, which is based upon the List of Threatening Experiences (LTE; Brugha et al. 1985), a modified and shortened version of the Life Events and Difficulties Schedules (LEDS; Brown & Harris, 1978). The first author had already assessed and found satisfactory the reliability and validity of the interview and questionnaire versions of the LTE in a study in which it was compared with the LEDS (Brugha & Cragg, 1991).

##### *Pregnancy as a life event*

This new structured interview was designed for the present project to assess the social and personal context in which the pregnancy had occurred, drawing on lessons gained in earlier work discussed in the introduction. This

covered: overall level of instrumental and emotional support available from others including the reaction to the pregnancy of key others; the stability of the relationship with the father of the child, thus representing contextual social support; and contextual adversity. This last element was covered by questions on whether or not the pregnancy had been part of a planned or an unplanned and unwanted process.

Specific questions were asked concerning: (a) length and status of the relationship with the partner in terms of it being stable, intermittent, currently broken or permanently broken; (b) the initial reaction to the pregnancy of both the woman's partner and mother; (c) the presence of an understanding person (someone else) to talk to about feelings during pregnancy and whether this had been successfully sought or not; (d) satisfaction with the timing of the pregnancy together with whether the pregnancy was or was not planned; (e) whether contraception was being used and whether a termination of pregnancy was thought about initially, or actually requested; (f) anticipation of financial welfare or practical problems; and (g) associated need, and any help seeking for practical support and its perception of its availability.

The questions and available responses were precoded. These different scores were derived from this interview to reflect positive and negative support and contextual adversity in relation to the life event of becoming pregnant. Where a question response set was scaled, the resulting score was weighed appropriately. The pregnancy contextual positive support score was based on the following responses: that the partnership was stable; the partner and or the mother had reacted positively to the news of the pregnancy; practical support had been obtained in relation to anticipated needs (a double weight was assigned if practical support was obtained without needing to be actively sought); emotional support obtained from someone understanding had been successfully obtained; at her first antenatal clinic visit she had been accompanied by her partner and or by her mother (equal weight being assigned to each). The pregnancy contextual negative support score was based on the following responses: that the partnership was brief and unstable (with additional weights for a duration of less than 6 and

for less than 3 months respectively, and for a relationship that was intermittent, currently broken down or permanently broke down respectively); reactions of the partner or mother, weighted according to whether the reaction was classed as unsure, displeased or 'not told'; according to whether there had been unsuccessful attempts to obtain emotional or anticipated practical (material, financial, welfare) support; and finally, if she had been alone to the antenatal clinic. Pregnancy contextual adversity was scored according to the extent to which the pregnancy was unplanned, attempts were made to avoid it or indeed a termination had been contemplated. Only the contextual adversity score appeared to be highly skewed due to a small number of outlier values; these were recoded to a lesser but high level that would be unlikely to bias least squares regression estimates.

#### *Psychiatric history schedule*

This structured interview requests information about each woman's psychiatric history together with that of her first-degree relatives. Specifically, it enquires about the nature of the illness, its severity, the number of episodes and the type of treatment received. Any contact with health or other professionals, e.g. child guidance services, are recorded as are the number of previous suicide attempts, if any.

#### *Other psychosocial measures*

The Eysenck Personality Questionnaire, neuroticism subscale (EPQ-N; Eysenck & Eysenck, 1965), which is a 23-item checklist, on which women are required to report how they feel or behave as their usual self. Each item is a question to which the subject has to give a 'yes' or 'no' answer.

#### *Postnatal assessments*

##### *General Health Questionnaire (GHQ-30)* (Goldberg, 1972)

The GHQ-30 has also been reported as a reliable screening instrument for postpartum psychiatric disorder (Tarnopolsky *et al.* 1979; Nott & Cutts, 1982; Watson & Evans, 1986). Adopting certain modifications to the GHQ-30, Nott & Cutts (1982) reported a sensitivity of 87%, specificity of 83%, misclassification rate of 16% and a positive predictive value of 53% in relation to a

clinical diagnosis obtained by a standardized, psychiatric interview (Clinical Interview Schedule; Goldberg *et al.* 1970). Their modifications involved using a 28 item subscale score (GHQ-28; omitting responses to items 3 and 5 due to their common occurrence in most postpartum women) together with adopting a threshold of between 6 and 7 as the criterion in future studies for referral onto the psychiatric interview phase of the study. These criteria were adopted in the present study (details below).

##### *Schedules for Clinical Assessment in Neuropsychiatry and the 10th revision of the Present State Examination (SCAN and PSE-10)* (Wing *et al.* 1990)

This provides a clinical and a research diagnostic assessment of psychiatric disorder as required by the ICD-10 Diagnostic Criteria for Research (World Health Organization, 1993) and DSM-III-R (American Psychiatric Association, 1987). The Present State Examination (PSE) consists of a semi-structured interview carried out by a clinically experienced examiner trained in its use at a WHO accredited training centre (in this case Leicester, UK). Respondents are encouraged and helped to describe their own physical and psychological complaints and symptoms in their own preferred words and order of importance. The examiner is trained to compare the respondent's descriptions with glossary definitions of each symptom or item and to rate present only those meeting the particular glossary criterion. Additional clinical course and attributional data required to provide DSM-III-R and ICD-10 diagnostic categories were also included using a development version of the Schedules for clinical Assessment in Neuropsychiatry, which incorporates the 10th version of the Present State Examination (Wing *et al.* 1990). This project involved the first ever use of SCAN in a community survey, following on field trials in which its reliability was assessed in development centres including Leicester (Wing *et al.* 1997). Reliability was not formally assessed during this study but the interviewers regularly discussed rating difficulties together with the SCAN trainers.

#### **Procedures**

The first assessment was to be made during direct personal contact with each patient by a

research psychologist or psychiatrist, either at the antenatal clinic or at home as soon as was feasible. Any woman who consistently failed to attend the antenatal clinic was approached by telephone or letter at home (after appropriate consultation with her obstetrician). The post-partum assessment was based on GHQs sent by the research psychologist to eligible mothers by post 12 weeks after childbirth. A further GHQ was to be sent to any mother who had not replied within 2 weeks. Several attempts were then made by one of the investigators to visit defaulting mothers at home. Using the suggested cut-off point of between 6 and 7 on the modified 28-item GHQ (Nott & Cutts, 1982) the false negative misclassification rate was anticipated to be lower than 5%. The anticipated yield, using the GHQ was expected to be between 15 and 20% of those assessed, but could rise to 25%. These mothers, together with one in four selected randomly scoring below the same cut-off point, were then visited at home by a research psychiatrist who carried out the SCAN examination (Fig. 1).

### Analysis

SCAN data (available only on a subset of the full sample) were used as a check on the clinical validity of self completion GHQ data using tests of sensitivity and specificity. GHQ depression scores (GHQ-D), based on the method of Surtees & Miller, 1990, which were available on almost all subjects who were assessed on both occasions, were used in preference to categorical transformations (such as caseness of depression) in order to maximize statistical power and because categorization requires the arbitrary assignment of a cut-point or threshold. The relationship between deficiencies in personal relationships and social support and the subsequent development and course of depressive symptoms (GHQ-D2) was established in all subjects; subjects with elevated levels of depression at the initial assessment (GHQ-D1) were not included. Multivariate statistical techniques (both least squares and ordinal logistic regression analysis) were used to model the scaled outcome variable GHQ-D2. The relationship of social support to the onset and course of depression was modelled; other potential predictor variables were controlled. Various checks were carried out on possible violations of assumptions required

under least squares linear regression models in addition to the use of ordinal logistic regression models. These checks included plots to check for non-linear trends, and for potentially unduly influential outliers; any recoding procedures are described in the results. These analyses were carried out on subjects on whom all the data were available, hence sample size and degrees of freedom vary slightly between models.

## RESULTS

### Sampling

Six per cent of the 972 women met the exclusion criteria listed earlier and a further 10.0% were excluded for other reasons. The refusal rate was very low (2.9%). A total of 18.8% ( $N = 183$ ) of the original consecutive sample ( $N = 972$ ) were

Table 1. *Sociodemographic composition of the Leicester 500 sample (N = 507)*

Variable/ category	Sample
Age	
Mean	25.04 years
Range	15–43 years
Ethnicity	
European	82.6%
Asian/Indian	14.4
Afro-Caribbean	1.6
Oriental	0.8
Other	0.6
Social class of partner (woman's classification in parentheses)	
I (2.2)	10.0%
II (17.0)	20.2
III (59.1)	53.6
IV (5.2)	9.5
V (16.5)	6.7
Marital status	
Married/Cohabit	85.0%
Single	15.0
Education	
Primary school	1.4%
Secondary lower	60.2
Secondary upper	25.8
Tertiary	12.6
Employment status	
FT/PT employed	34.6%
FT housewife	24.3
Maternity leave	30.6
Unemployed/sick	10.5
Type of delivery	
Normal vaginal	62.1%
Ventouse	12.9
Forceps	10.3
Breach	1.8
Caesarean	11.1

excluded, leaving a total of 789 women who were eligible for the study. Of these eligible women, 282 (35.7%) either were not approached for interview, due to insufficient interviewer time, or were approached but had given birth before the expected delivery date. Five hundred and seven women (64.3%) were successfully interviewed before giving birth (Fig. 1).

Statistical comparisons between those eligible women who were not interviewed and those who were successfully interviewed were performed, to ensure that those seen were representative of the whole eligible group, and that no selection bias was in operation (Sharp, 1995). Demographic, social and clinical variables that could be related to later outcome were compared. As the only significant difference was a higher rate of pre-term deliveries in the non-participating women it was concluded that the final 507 participants in the present study were a representative and largely unbiased sample of primiparous women attending Leicester General Hospital for their antenatal care. Their socio-demographic characteristics are set out in Table 1.

#### Compliance

Five hundred and seven women successfully completed the antenatal phase of the study. Most women were interviewed during the final 3 months of pregnancy (71%); 18% were interviewed in the first 3 months and 8% during the second trimester of pregnancy. Nine women were excluded from further study after the antenatal interview but during pregnancy or after the birth of their baby (Fig. 1). The reasons were as follows: two women had late miscarriages, one opted for a late termination due to foetal abnormalities, three women's babies were stillborn and one woman's baby died in the early neonatal period. One woman's baby was born with severe congenital abnormalities and she requested removal from the study. Finally, one woman requested withdrawal from the study as she had had a severely distressing birth experience and was pursuing legal action.

Four hundred and twenty-seven (85.7%) of the 498 women eligible for postnatal assessment returned a 3 month postnatal GHQ-30. Of the responders 24.6% ( $N = 105$ ) scored above the threshold of 7 or greater on the GHQ-28 subscale and were referred for a SCAN interview. In

addition, a random sample (1 in 4;  $N = 80$  (24.8%)) of the  $N = 322$  women who scored below threshold were also referred for SCAN. In summary, 185 women were referred for a SCAN interview, 163 women (97 high scorers, 66 low scorers) were successfully interviewed (Fig. 1). For reasons discussed below, 22 women failed to be interviewed (eight high and 14 low scorers). One additional subject received a SCAN interview (bringing the total to 164) without having completed a GHQ-30. This woman was admitted to hospital in the immediate postpartum period and received a diagnosis of unspecified non-organic psychosis. The SCAN was completed while she was in hospital, but as no GHQ data was obtained postnatally she is not included in the analyses in this report. In summary, 92.4% of high scorers on the GHQ-28 and 82.5% of low scorers were successfully interviewed (Fig. 1).

#### Depressive symptoms at follow-up

We hope to report in detail later on the prevalence and incidence of the types of disorder and psychiatric co-morbidity found in our sample using our SCAN-ICD-10 data. Details of the psychometric properties of our GHQ data, including the use of the depression subscale and caseness criterion developed and evaluated by Surtees & Miller (1990), can be requested from the authors. Here we set out the relevant summary findings based on the 163 women with complete GHQ and SCAN data. There were 25 cases of ICD-10 depressive episode in this group at 3 months postpartum, of whom 24 had been referred for a SCAN interview as GHQ-28 positive, thus yielding a sensitivity of 96%. The specificity of the GHQ-28 was 47% (65/138).

We sought also to compare our SCAN depression caseness assessment with the depression caseness rule derived from the GHQ scale of Surtees & Miller (1990), in order to convey a sense of the clinical relevance and significance of our GHQ depression data. The depression criterion rule, fully described in their paper (Surtees & Miller, 1990), requires the endorsement of the GHQ item 22, 'feeling unhappy and depressed'. Of the 161 women with SCAN and GHQ data 77 women endorsed this item (sensitivity = 92%). Of the 136 SCAN non-cases, 82 were correctly identified by non-endorsement of the item (specificity = 60%).



Table 2. Multiple regression models of background clinical predictors of later GHQ-depression

Predictor	F	df	P	%R <sup>2</sup>	Change in R <sup>2</sup>	Significance of improvement in prediction	
						Least squares regression P	Ordinal logistic regression P
Model 1							
Initial GHQ-depression only	50.52	1,414	0.00	10.9	—	—	0.00
Model 2							
Family history of depression or severe mental illness	4.72	1,419	0.03	1.1	—	—	0.01
+ psychiatric history	3.42	2,418	—	1.9	0.8	0.06	0.07
+ EPQ-N	24.48	3,417	—	7.0	5.1	0.00	0.00
+ Initial GHQ depression (GHQ-D1)	31.72	4,411	—	13.6	8.5	0.00	0.00
Model 3							
EPQ-N (at initial assessment only)	25.38	1,419	0.00	5.7	—	—	0.00
Model 4							
EPQ-N after controlling for GHQ-D1 only	8.0	2,413	—	12.6	1.7	0.01	0.00

The misclassification rate was therefore 35%. We could, of course, have used in our model building analyses only that material for which SCAN data was available ( $N = 164$ ) but this would have involved abandoning a substantial amount of data (over 240 subjects) with consequential considerable loss of statistical power. Because of its greater statistical power Surtees & Miller recommend using the full 6-item, 7-point depression scale in risk factor modelling.

When modelling predictors of future health status in a cohort survey there is always the problem of non-responders. The sociodemographic and clinical characteristics of women, who complied at 3 months postpartum by sending their postal GHQ back ( $N = 427$ ), were compared with those women who either refused to participate or failed to respond after numerous follow-ups ( $N = 71$ ). These comparisons show several statistically significant differences, which are worth emphasising particularly as they have been identified as antenatal predictors of postnatal depression in previous studies (Kumar & Brockington, 1988). Non-participants at follow-up were more likely to be younger, unemployed or off sick from work; they were more likely to be members of an ethnic minority, to have a partner from a lower socio-economic group background; they were more likely to have a history of at least one suicide attempt, more severe psychiatric illness in first-degree relatives, an unplanned or unwanted pregnancy; they were more likely to have a briefer or more

intermittent relationship with their partner and less support from their partner and mother in relation to the pregnancy. Although women who were members of ethnic minorities were more likely to be non-participants at follow-up, the mean GHQ scores for participants both antenatally and postnatally were the same as that for the remainder of the participating sample.

### Predictors of future symptoms

#### Demographic predictors

The following were coded into dummy variables and were examined as possible predictor of later GHQ depression (GHQ-D2): low age (18 or under), education ended by early secondary school stage, place of birth (outside Western Europe), single marital status, economic activity (unemployed at least 1 month), occupational status (Goldthorpe & Hope grading of 34 to 36).

Analyses revealed that two of these variables were significant predictor of later GHQ-D2: living alone or in a home shared with people other than a partner (79 women not with partners) and being currently unemployed (38 women). The negative findings were not attributable to the categorical transformation of variables that could have been modelled as continuous variates (age and employment status). Unemployment was not a significant predictor of GHQ-D2 after controlling for GHQ-D1 and living without a partner; however, living without a partner remained a significant

predictor ( $P < 0.05$ ) of later GHQ-D2. Because of the social (and quite possibly also economic) significance of this variable as a proxy for single parent mother, it was decided to consider this variable as part of the later modelling of social risk factors. Unemployment was not considered further because of the difficulty of disentangling the effect of its predictive power when contemporaneous depressive symptoms are taken into consideration.

#### *Clinical predictors*

Three possible 'clinical' predictors of GHQ-D2 were available in addition to GHQ-D1: family psychiatric history (depression or 'mental illness') self-report psychiatric history (any disorder including premenstrual tension, anxiety, depression) and a history of any suicide attempt. A model was produced with the history variables entered first, followed by the initial GHQ-D1 score: only a history of at least one suicide attempt was not statistically significant, most probably as only 14 women attested to this. A positive family history (92 families) came out as slightly more significant when compared to a personal psychiatry history. However, the principle findings was the marginal value of these two remaining antecedent predictors (Table 2), when compared with the considerable predictive power of GHQ-D1.

#### *Neuroticism*

The neuroticism score obtained from the neuroticism items of the EPQ administered at the first interview was next considered in two ways: as an additional main effect to be added following previously established clinical predictors and as an 'antecedent' risk factor to be added before incorporating antenatal GHQ-D1. Both approaches produced essentially similar findings. GHQ-D1 continued to be a far more significant predictor than did EPQ-N, the latter adding only 1.7% to the variance in GHQ-D2 predicted by antenatal GHQ-D1 (model 4, Table 2). EPQ-N alone accounted for 5.7% of the outcome GHQ-D2 score (model 3); initial GHQ-D1 alone accounted for 10.9% (model 1). Four models, summarizing these analyses, are set out in Table 2.

It was decided to retain the GHQ-D1 scale in separate analyses as a single background predictor: this is termed model 1, in Tables 2 and 3.

The lesser background clinical predictors were used in conjunction with neuroticism in the next section of the results, as model 2. This is arguably the most theoretically acceptable ordering of background variables, with family psychiatric history preceding neuroticism and finally GHQ-D1. Although model 2 clearly represents a very much more challenging test to any contemporaneous (i.e. social) risk factor to be added in subsequent analysis, its complexity and the relative weakness of its background predictors (apart from GHQ-D1) means that replication is less likely in other populations. Providing analyses with the simple background variable of GHQ-D1 alone (model 1), which is a powerful and more robust predictor, should provide, therefore, a more generalisable set of findings. Thus, only these first two background models (models 1 and 2 in Table 2) were used in subsequent analyses in which putative social risk factors were added to these antecedent predictors.

#### *Social predictors*

Three groups of potential social (i.e. risk factor) variables were available to add to the two background or antecedent models, termed model 1 and model 2: network size variables; quality of network contact and support from primary group network members; and contextual support in relation to the event becoming pregnant. From the IMSR primary group data the following variables used in previous studies were derived: total primary group size, primary group contacts, total good friends named and total attachment figures nominated. In addition, two, possibly related, variables living without a partner and 'living as married' were derived from the sociodemographic interview. Also from the IMSR primary group data mean scores were derived for negative interaction and for support sought unsuccessfully in the past week. Apart from the variable living without a partner, these variables corresponded with similar questions used in the earlier work on men and women in episodes of depression (Brugha *et al.* 1990). Contextual support questions have been described in the method section.

#### *Social network dimensions*

All analyses based on network size were clearly negative. The only primary group variable

Table 3. Psychosocial risk factors predictors of later GHQ-depression controlling for background clinical predictor model

Predictors	Controlling for family and psychiatric history EPQN and initial GHQ depression: (Model 2)				Controlling for GHQ-depression only (Model 1)			
	F	df	Total R <sup>2</sup> %	Change in R <sup>2</sup> %	Least squares* regression	Logistic* regression	Least squares* regression*	Logistic regression*
<b>Main effect</b>								
Any LTE event before T1	1.31	5,406	14.3	0.7	0.25	0.34	0.48	0.62
Pregnancy contextual adversity	6.16	5,410	15.0	1.4	0.01	0.02	0.01	0.01
Primary group size	0.34	5,410	13.8	0.2	0.56	0.50	0.39	0.33
Living without partner	3.93	5,410	14.5	0.9	0.05	0.13	0.04	0.10
Perceived support from primary group	4.5	5,409	15.4	1.8	0.04	0.16	0.01	0.07
Pregnancy contextual positive support	8.18	5,410	15.4	1.8	0.01	0.02	0.00	0.01
Pregnancy contextual negative support	2.57	5,409	14.2	0.6	0.11	0.28	0.09	0.19
<b>Interaction term added to above main effect predictor</b>								
Support from Primary group × adversity (Pre T1 LTEevent)	2.77	7,403	16.7	3.1	0.09	0.13	0.11	0.18
Pregnancy contextual positive support × contextual adversity	1.23	7,409	15.8	2.2	0.27	0.18	0.27	0.17

\* Significance of improvement in prediction by adding this predictor controlling for the specific model.

to show any suggestion of an association with symptomatology was the total number of good friends nominated, which showed a trend towards an association with the initial (contemporaneous) GHQ-D1 score but not with the later follow-up GHQ-D2 score. Under least squares regression living in a household without a partner was a significant predictor (model 1 and 2) but fell somewhat short of being significant under logistic regression (Table 3). The response to the question 'are you living as married' was not a significant predictor, neither was the number of non-primary contacts and acquaintances, both findings predicted from earlier research on women (Brugha *et al.* 1990).

#### *Quality of network contact*

Social support unsuccessfully obtained from members of the primary group in the week before interview proved to be a significant predictor of later GHQ-D2 under least square linear regression, and under ordinal level logistic regression but under model 1 only (Table 3). Negative interaction with primary group members was not a significant predictor of GHQ-D2. Both of these findings appeared to replicate those obtained specifically in women with clinical depression studied previously (Brugha *et al.* 1990).

#### *Contextual support*

Two contextual social support scores and the adversity score from the 'Pregnancy as a Life Event Interview' were entered separately also (Table 3). Only the positive support score clearly proved to be a statistically significant predictor of later GHQ-D2 both under least square linear regression and under ordinal level logistic regression, and this was confirmed under both modelling procedures. Thus, when the history variables and EPQ-N were incorporated into models of GHQ-D1 and contextual positive social support (Table 3, Model 2) the importance of positive social support was essentially unaltered. Contextual adversity was also clearly statistically significant.

#### **Models involving main effects and interaction terms**

Two indices of adversity were available to be employed: a report of at least one event on the LTE during the 6 month period prior to the first

interview and, second, the negative contextual (adversity) score derived from the Pregnancy as a Life Event interview. (Data on LTE events prior to the later depression assessment were only available on those re-interviewed by clinicians and are not used in this report.) The first of these variables, life events preceding the first interview, was not a significant predictor of later depression but, nevertheless, was used further in this report as a test of the possible effect of an interaction with support. Model building of interaction terms was entirely in accordance with theory, examining the main effect of the two significant social support measures (contextual positive support and primary group support) and the effect of introducing adversity (negative contextual adversity and life events preceding the first interview respectively) and the interaction terms (Table 3). The support and adversity scores used in these models were virtually uncorrelated with one another (positive and negative support were however strongly correlated with one another but were not used in a single model together). The interaction term, life events  $\times$  primary group support was not statistically significant at conventional levels: it was notable that this occurred although life events before the first interview was clearly not significant at all in its effect on later depression. The interaction term contextual positive support  $\times$  contextual adversity was also not significant, both under least squares linear regression and under ordinal logistic regression, irrespective of which antecedent model preceded it (Table 3).

## **DISCUSSION**

A central aim of the work reported in this paper was to apply standardized measures used in earlier work on the prediction of course and outcome of clinical depression in men and women (Brugha *et al.* 1990) to a homogenous cohort of women identified and later followed up in the community. When the present findings are compared with the earlier work on course and outcome, this cohort survey of primiparous women has shown that social support as indicated by primary group network size is not a significant predictor of depression symptom development in the community. Only one primary network contact variable, whether woman and her partner were living together, appeared

to be a predictor of later depression. However, in general, satisfaction with support from others in the primary group (as in the earlier work) and in particular positive support in the context of the event becoming pregnant did act as a significant, independent main effect predictors of later symptom development. These findings clearly held up even when the level of antenatal self-report symptoms (GHQ depression: GHQ-D1) was controlled using linear and logistic regression modelling. Further, in relation to the event 'becoming pregnant', contextual adversity was a significant predictor of onset.

Before discussing further the present findings in relation to the earlier work using similar measures, the strength and possible criticism of the work reported here will be considered. The sampling methods used were intended to provide us with an epidemiologically representative sampling frame. Several factors could be set against our achievement of this aim: maternity services in the NHS were not strictly geographically and catchment area-based and, therefore, our sample cannot be precisely compared with a known base population. Secondly, 34% of eligible women could not be approached due to limited resources. However, we believe our strict adherence to a sequential sampling strategy in a service with a wide population coverage gives us confidence in the generalizability of our findings. The decision to study women only and in first pregnancy also represents a trade-off in terms of generalizability. We have gained advantage in being able to develop more meaningful and contextually relevant ways of assessing support but at the cost that this must limit the generalizability of these findings to this subgroup of the population.

We have made use of the SCAN-ICD-10 data obtained by experienced clinical examiners to examine the specificity of the self-report GHQ-D data (defined in terms of caseness and found to be satisfactory in a subset of the women). Nevertheless, it must be clearly stated that our findings are based on the self-completion, dimensional measure of depression available on successfully followed up women, and this cannot be taken to represent precisely the inception of case level depressive episodes. It is, however, of interest to note that all but one of the cases achieving SCAN-ICD-10 depressive criteria had developed after the initial interview and before

the GHQ-D2 assessment. In terms of clinical depression, therefore, most were first ever 'onset' cases.

We approached the statistical analyses of these data in a relatively straight forward and conventional manner. Because it is difficult to be confident that all the necessary assumptions are fulfilled in the use of conventional, least squares regression techniques, ordinal logistic regression models were also employed with little apparent reduction in statistical power. The use of ordinal logistic modelling of the outcome variable, however, did result in some minor diminution in statistical significance for some of the other models of support and adversity, but not for the models involving contextual support. For this report we did not attempt to develop more complex models in which the actual timing of measures is taken into account, such as stage of pregnancy, or delay in returning the GHQ forms following dispatch by post at 3 months after childbirth. Preliminary analyses on these lines do not appear to alter significantly the findings reported here; we hope to be able to address this issue in greater detail at some point in the future.

A particular strength of this work lies in the robustness of the findings for contemporaneous psychosocial risk factors after taking account of key antecedent predictors. It is abundantly clear that in this population, the most important antecedent risk factor for later depression is prior level of depression. Because of the considerable predictive power and therefore robustness of this variable, we felt that we should report separate models (Table 2, model 1) in which only this background predictor is retained. These models are more likely to be confirmed in other populations and therefore to be useful. The findings for contextual positive support in particular were shown to hold up when controlling for prior level of depression. This was in addition to other potentially important but less significant, in statistical terms, background predictors such as family and personal psychiatric history and neuroticism. These findings accord with ongoing discussion and recent reports based on analyses of the relative effects of heritable and environmental influences in the aetiology of depression in twins (Kessler *et al.* 1994).

A very limited amount of data, which we obtained from 101 partners concerning their

observations of the support available to the women antenatally, were subjected to preliminary analyses (of which details can be provided). Although clearly hampered by low statistical power, the findings obtained did not contradict the main study results and were in accord with those recorded concerning confidants of pregnant teenagers by Cutrona (1989).

The use of the IMSR in cohort surveys of two different populations opens the way to comparisons that are often not possible in this field of research (Brugha, 1989*b*). First, the importance of respondent described partner support, or its absence, is particularly striking in this report and confirms that of earlier studies of depression in general (Brown & Harris, 1978) and depression following childbirth in particular (Paykel *et al.* 1980; Kumar *et al.* 1984). However, what has been unclear after many years of research is how best to specify the nature of this form of support. Both in our previous study of clinical depression outcome (Brugha *et al.* 1990) and in the present study, the variable 'living as married' was not a protective factor in women, although it clearly acted as such among men in the depressive series. The present study provides some contextually specific findings about partner support also: living under the same roof with the partner and having a positive reaction from the partner to the event of becoming pregnant were protective. A negative reaction to the pregnancy by the partner has also recently been shown to be predictive of depression in pregnant women (Kitamura *et al.* 1993). Although we are not aware of any social support research that asks questions about the nature of physical contact and intimacy shared by a couple, these two kinds of questions do imply that continuing intimacy or a form of adult secure attachment may play a fundamental part in the support process at this level.

Secondly, however, the lack of importance of IMSR primary network or primary group size in women is surprising and appears to be the only finding contrary to our previous work (Brugha *et al.* 1982, 1987*a*, 1990, 1993) and to initial reports from the National Survey of Psychiatric Morbidity (Meltzer *et al.* 1996) in which the same questions were used from the IMSR during interviews with 10000 householders. Although, in this study, primary group size did not predict the development of depressive symptoms, there

was a suggestion in the data that women with smaller primary groups antenatally were more likely to be symptomatic at that time. There may be a further clue to the puzzle in our own findings in the earlier depressive cohort (Brugha *et al.* 1997) showing that it is predominantly in later recurrent episodes of depression that the subsequent level of depression is predicted by the size of the primary group membership. We have made the suggestion that, in effect, it is only those individuals who have previously endured and overcome depressive ill health who will have discovered who truly is a close and a reliable source of support; it may be at such a stage that descriptions of larger primary networks are most clearly protective and valid. This may also explain why attempts in community-based social support intervention trials to persuade individuals to enlarge and enhance their networks have typically fallen on deaf ears (Dalgard *et al.* 1995). This suggestion may apply particularly to older individuals whose preference is to improve how they relate to their immediate family (Brugha, 1995*b*); the implications for selective intervention strategies should inform the next stage of our research.

These findings also highlight once again the importance in such work of perceived support rather than of the perhaps more objective component of network size and weekly contact. Nevertheless, in developing additional measures for use in this study, we endeavoured as far as possible to gather data on actual behaviours of others (Brugha, 1989*b*) such as the respondent's partner and mother.

Although less attention was given in the present work to individual attributes that might either enhance or diminish the level of risk, or its perception and reporting by respondents, we did obtain limited data from observers (partners) and we assessed initial neuroticism levels. Henderson and his colleagues (1980) found that the association between deficits in social support and later GHQ symptoms no longer held when neuroticism, based on an averaged score (but not an initial measure), was controlled for. More recent re-analyses of their data suggest that neuroticism may better be viewed as an indicator of ongoing neurotic symptoms rather than as a separate trait measure (Duncan-Jones *et al.* 1990). The finding that incorporating EPQ neuroticism in the model tested here had a

relatively modest effect on the results was, therefore, surprising. We would point out that GHQ-D and EPQ-N were correlated, but only to the extent that they shared approximately 10% of variance. The finding, based on a limited amount of data provided independently by some of the women's partners, which favoured the general thrust of the findings from the study as a whole, could argue also against a purely individual explanation for the link between support and outcome. Nevertheless, we do favour the view that individual, or personality variables are of considerable importance in predicting later clinical outcome, as discussed in a series of contributions appearing elsewhere (Henderson, 1984; Brewin, 1995; Brugha, 1995*b*; Gilbert, 1995; Parry, 1995).

The possibility that (on its own) the relatively weak association between adversity and disorder may be explained by the mediating, or so called buffering, effect of social support (Alloway & Bebbington, 1987) has been the subject of long-standing debate within social psychiatry. While, in general, our findings do not seem to support clearly the stress buffering model this may be because we have chosen only to test this by means of the more stringent statistical method of incorporating multiplicative interaction terms. Furthermore, and probably more importantly, we did not have data on adversity in the 3 months prior to the GHQ-D2 assessment. Our analyses appear to suggest that positive contextual support and contextual adversity act as main effects that are not noticeably conditional upon one another over the time period we have studied. Although our choice of statistical methods is a protection against accepting chance findings, considerable statistical power is required in order to replicate such interaction effects; therefore, our data do not amount to a refutation of the buffering hypothesis of social support. When we examined the effect of positive support after taking account of adversity, and vice versa, we found that adversity was the lesser of these two predictors of GHQ-D2; thus, our data do not appear to go along with the original prediction by Brown & Harris (1978) that support alone is unimportant but assumes a particular importance only in the presence of adversity (unless a planned and intended pregnancy can be considered to be a form of adversity). In conclusion, our findings

are equivocal and leave open the status of the stress buffering hypothesis.

A central aim of our present work was to help to clarify the basis for moving forward from observational to experimental research (Mrazek & Haggerty, 1994; Brugha, 1995*a*; Parry, 1995). The data gathered in this study are now being used to develop both a screening and a risk factor reducing preventative intervention for this population, which will be evaluated in a randomized controlled trial. We have learnt from the present study and from other related research that such an intervention should address both individual and wider social environmental predictors. The quality of support received rather than the size of the support network, together with skills and confidence in addressing the specific kinds of problems that predict a worse outcome, will be central to the design of the intervention.

In conclusion, in spite of a number of caveats regarding the methods and execution of this study we believe that we now have a clearer specific knowledge of the factors that place women in their first pregnancies at risk of developing postnatal depressive symptoms. Using an established measure of support networks, the IMSR, predictors of depressive symptom development differ from predictors of recovery. This prediction model can now be used to inform the design of a randomized controlled trial of a risk factor reducing intervention to prevent the development of depressive symptoms in the same population.

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