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Socioeconomic Disadvantage and Child Morbidity: An Australian Longitudinal Study

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Abstract

While an extensive body of literature has demonstrated an association between socioeconomic status and child mortality, there have been relatively few papers which discuss the impact of socioeconomic inequality on child morbidity. This absence of data is partly attributable to methodological problems (need for large samples, the difficulty of assessing morbidity) and partly to the absence of relevant official health statistics.

This paper reports results from the Mater-University of Queensland Study of Pregnancy (MUSP) and its outcomes. The sample comprises 8556 consecutive pregnancies, of which over 90% were followed up to birth. Of those mothers giving birth, approx. 70% of children were successfully given a health assessment five years after the birth (mothers report of the child's health using a set of standard indicators).
The results indicate a consistent pattern with the children of the most socioeconomically disadvantaged mothers manifesting the worst health. Thus children living in socioeconomic disadvantage have a higher rate of health service utilisation, more chronic health problems and poorer dental health. The paper discusses some social policies for redressing these inequalities.

Keywords

socioeconomic disadvantage; child health; health services; chronic disease; longitudinal studies

There is now a body of evidence which has shown a link between mortality in childhood and socioeconomic status. Children in poverty are more likely to die from a number of causes, particularly accidents and infections [1-7]. The evidence concerning the corresponding association between childhood morbidity and socioeconomic status is somewhat less comprehensive and sometimes conflicting [8], particularly beyond the infancy period.

Factors contributing to this lack of published data on the impact of socioeconomic inequality on children's physical health [9] include problems of data collection such as the large sample size needed to detect functional limitation; inaccuracies in parental reporting of less serious illness; the possibility that the health effects of early deprivation may not become evident until later life; and the absence of socioeconomic status information in many official health statistics.

The Australian College of Paediatrics has recently issued a major report focusing on the impact of adversity on child health [9], citing overseas evidence linking disadvantage with children's poor health status in categories such as: low birth weight and poor growth; poor nutritional status; elevated blood lead levels; iron deficiency anaemia; accidental injury rates; malnutrition; otitis media; higher hospitalisation rates; an increased risk of physical abuse; less preventive dental care and hygiene; obesity and a more serious impact of chronic disease. The report goes on to note the absence of longitudinal studies, in general, and Australian studies, in particular, required to measure the long-term impacts of poverty. The Mater University Study of Pregnancy (MUSP) offers such an opportunity within the Australian context.

SOCIOECONOMIC INEQUALITY AND CHILD HEALTH

Overseas studies have generally found an inverse association between socioeconomic status and child health. This association has been observed for conditions as disparate as infections, accidents, asthma, and a range of chronic physical deficits (hearing, eyesight). Each of these areas of research will be considered in turn.

Morgan and Chinn [10] found that a composite area measure of inequality and an occupational class measure were both related to respiratory illness. Studies of housing have also found a relationship between childhood respiratory illness and the presence of mould and damp, rather than other social factors [11, 12]. In a review of studies of otitis media, including some that relate to indigenous people, Paradise [13] found that this common early childhood condition may be related to poverty. The evidence indicates that children of manual workers are less likely to have surgery for glue ear than children of non-manual classes [14]. The British National Child Development Study found slightly more ear, nose and throat problems and abnormal hearing in teenage children classified as disadvantaged [15]. The Greater Boston Otitis Media Study, however, failed to find an association with socioeconomic status [16].

The importance of the above findings of an association between poverty and middle ear disease is underlined by some evidence that chronic or recur-rent Otitis Media may result in degree of temporary or permanent hearing loss and have a detrimental effect on learning [17-19]. A small study by Hagerman and Falkenstein [20] also found a correlation between recurrent Otitis Media and later hyperactivity. Thus chronic infections in childhood may pro-duce long-term health and behaviour problems, which disproportionately affect the economically disadvantaged.

Accidents are a common cause of childhood morbidity. Marsh and Channing [21] found more casualty attendances for children from a socioeconomically deprived area and, similarly, another study of children under five found a higher relative risk of accidents requiring treatment, for children from families of the lowest Registrar General's occupational class [22]. Accidents were also more severe for children of deprived families [23]. The British National Child Development Study found that disadvantaged children at age 11 had had more accidents requiring treatment, notably burns and scalds [15].

Conversely, in another British study, Murdock and Eva [24] found no socioeconomic difference in rate of accidents seen in a casualty department. The New Zealand Multidisciplinary Study also found no inverse relationship between three measures of socio-economic status (a socioeconomic index, parental education, and a housing measure) and a number of early childhood accidents requiring medical treatment over a seven-year period [25].

Asthma is another childhood condition affecting a significant minority of the population and while results vary it seems unlikely that its aetiology is related to socioeconomic status [26-28]. A British study found under-use of services for child asthmatics was not associated with a number of socioeconomic indicators and a relationship between under-treatment and parents of manual social class appeared to be explained by poor maternal mental health [29].

SOCIOECONOMIC INEQUALITY AND SEVERITY OF ILLNESS

Differences in severity and prognosis of illness in children seem to be related to socioeconomic status. The U.S. National Health Survey indicated that children of lower income parents had slightly more days of restricted activity, bed rest and absence from school [2], while the Ontario Child Health Study found children from poor families had higher rates of chronic illness and functional limitation [30]. A Glasgow study found children living in deprived districts were more likely to be admitted to hospital for any reason, than were children from non-deprived districts [31] and Marsh and Channing [21] also found children under five from a deprived area had three times the number of hospital admissions than those from a non-deprived area. In New Zealand, the Christchurch Child Development Study also found that children from disadvantaged family back-grounds (measures used were maternal education, ethnicity, occupation, birth order, maternal age at birth) had an increased relative risk (2.72) of admission to hospital for accidents or infections and more general practitioner contacts [32]. Britton [33] in the U.K. found survival time for cystic fibrosis sufferers according to their parental occupational class.

AUSTRALIAN STUDIES

Australian research has produced equivocal results in relation to the linkage between childhood morbidity and socioeconomic status. There is evidence pointing to the increased amount of illness in Aboriginal children with conditions such as trachoma, ear disease, rheumatic fever, low birthweight and poor nutrition, all related to their low socioeconomic status [34-36].

Some studies have shown an inverse relationship with lower rates of immunisation in lower socioeconomic status areas [37, 38] and confirmed the presence of elevated lead levels in children from less advantaged areas [39]. A subproject carried out by the Australian College of Paediatrics reported by Jolly [9] suggested that childhood injury was significantly and negatively correlated with low socioeconomic status. A relationship between physical abuse and fatal non-accidental injury to children and low socioeconomic status has been found by Vinson *et al.* [40] and Nixon *et al.* [41]. There is also evidence of poorer standards of nutrition among children from low socioeconomic families [42] and the higher prevalence of dental caries in disadvantaged groups [43].

Conversely, Coleman [44], using data from the Australian Health Survey, found no evidence of a relationship between socioeconomic status and child morbidity, as measured by parent reports. Peat *et al.* [26] found no association between asthma and social class in Sydney school children. Based upon the existing Australian data it is not presently possible to meaningfully describe the association between socioeconomic status and health, nor to discuss the magnitude of this association.

MATERIALS AND METHODS

Data for this study were derived from the Mater-University of Queensland Study of Pregnancy (MUSP). Details of sampling, study rationale and overall response rates have appeared elsewhere [45]. Briefly, 8556 consecutive women were invited to participate in a longitudinal study. Less than 1% declined this invitation. Data were obtained at the first clinic visit, 3--4 days after the birth, 6 months after the birth and when the child was 5 years of age. Additional information was abstracted from the medical record of the birth and joined to the survey data.

At the 5-year follow-up three types of data were obtained. Firstly, the mother completed a questionnaire not unlike the one she completed on previous occasions. Secondly, she completed a questionnaire containing items from the Child Health Questionnaire from the Rand Health Insurance Study [46]. These items were derived from an extensive review of the measurement of child health and have been tested (and in some instances validated) on a large American sample. Thirdly, there was a paediatric assessment of the child, focusing on easily measured aspects of the child's health (hearing, eyesight, blood pressure, intelligence, etc.). This paper is concerned only with the association between indicators of the mother's socioeconomic status and health problems experienced by her child. Socioeconomic status is measured using a composite variable, taking assessments from each phase of data collection. Child health is measured only at the 5-year follow-up, and consists of the mother's response to a set of questions asking whether her child has had the listed conditions in the stipulated period of time.

MEASUREMENT OF SOCIAL DISADVANTAGE

An index of social disadvantage was created to identify those families who had experienced economic difficulties over an extended period of time (at least 5 years). To create this measure, data were gathered from four phases of the study (phases 1, 2 and 3) and the last, 5 years later. A list of variables selected for this index of chronic disadvantage appears in the Appendix. Briefly, this index concentrated on those who had experienced low income over an extended period.

Response categories for each variable were dichotomised to score 1 for `disadvantage' and 2 for `no disadvantage'. The extent to which disadvantage was experienced was obtained by totalling the number of instances of disadvantage over all 10 variables (see Appendix). Data for individuals were then examined to ensure that those with the greatest disadvantage scores were experiencing continued disadvantage over time rather than experiencing `incidental disadvantage' during certain phases of their lives. The resulting composite variable (Table 1) had four levels of disadvantage ranging from No Disadvantage (1363), Mild Disadvantage (2417) to Moderate Dis-advantage (902) to Extreme Disadvantage (375). Data analysis was undertaken by SAS package and Tables 6-8 involve the CATMOD procedure (logistic regression).

Table 1. Index of disadvantage (DISI)

No disadvantage	1363	27.0
Mild disadvantage	2417	47.8
Moderate disadvantage	902	17.8
Chronic disadvantage	375	7.4
	5057	

Table 2

	At delivery phase 4	5-year follow-up phase 5.2	Percentage of attrition
Age			
≤ 18 yr	586	317	45.9
19-24 yr	3721	2486	33.2
25-34 yr	2666	1986	25.5
≥35 yr	378	268	29.1
Total	7351	5057	$P < 0.01$
Education			
Did not complete year 10	1327	857	35.4
Completed year 10	3983	2757	30.8
Year 12 or more	1986	1415	28.8
No answer	55	28	49.1
Total	7351	5057	$P < 0.01$
Income per year			
≤ $5199	501	255	49.1
$5200-$10,399	1871	1177	37.1
$10,400-$20,799	3751	2772	26.1
$20,800 or more	741	562	24.2
No answer	487	291	40.2
Total	7351	5057	$P < 0.01$

Table 2 shows the attrition rates for three demo-graphic variables: mother's age, family income and mother's education, all measured at time of birth. Attrition rates over the follow-up period were moderate with 31.2% lost to follow-up over the intervening 5 years. The greatest losses were experienced in mothers 18 years or under (45.9%), having a low family income (49.1%) or poorly educated (35.4%). Only women who participated in the 5-year follow-up are considered in the analyses which follow.

Table 3 presents data correlating the Index of Disadvantage with the child's health, as reported by the mother. As some children were not able to be interviewed when they were 5 years of age, the data are stratified by the child's age at interview.

While the correlations are weak, they are statistically significant and consistent in direction. In every instance, the figures indicate that disadvantaged mothers report that their children are sicker. Mothers classified as disadvantaged report their children are more likely to use medical services, more frequently have a range of chronic health problems and they have worse dental health. Further, there is a consistent inverse association between two indicators of the child's preventive dental health behaviour (frequency of brushing teeth, use of fluoride tablets) and the Index of Disadvantage.

Table 3. Correlation (Kendall Tau B) between index of disadvantage (DISI) and indicators of child health controlled for age of child

	(4259) 4-5 yr	(783) 6-7 yr
Use of health services		
Health of child in general	+0.077***	n/a
Child's health limits activities	+0.047***	+0.103***
No. times child sick in last 6 months	+0.036**	+0.031*
No. times treated by doctor last 6 months	+0.041***	+0.063**
No. times admitted to hospital since birth	+0.052***	+0.111***
Persistent health problems		
Head cold always last 3 months	+0.092***	+0.062*
Asthma always last 3 months	+0.033**	+0.062*
Ear infection always last 3 months	+0.071*	+0.058*
Vomiting/diarrhoea always last 3 months	+0.046***	+0.004
Bronchitis more than 3 months ago	+0.035**	+0.049*
Accidents/injury more than 3 months ago	+0.045***	+0.087**
Dental health		
Frequency child brushes teeth	-0.106***	-0.076**
Fluoride tablet regularly	-0.083***	-0.054*
Caries in teeth	+0.039**	+0.091**

***P <0.001.
** P <0.01.
* P < 0.05.
n/a: not available due to low frequencies.

Table 4. Correlation (Kendall Tau B) between index of disadvantage (DISI) and indicators of child health controlled for mother's age

	(317) ≤ 18 yr	(3709) 10-29 yr	(1031) 30+ yr
Use of health services			
Health of child in general	+0.076***	n/a	+0.104***
Child's health limits activities	+0.031	+0.050**	+0.086**
No. times child sick in last 3 months	–0.029	+0.024*	+0.103***
No. times treated by doctor last 6 months	–0.007	+0.036**	+0.085"
No. times admitted to hospital since birth	+0.063***	n/a	+0.065**
Persistent health problems			
Head cold etc. always last 3 months	+0.001	+0.072***	+0.154***
Asthma always last 3 months	+0.037	+0.040**	+0.047*
Ear infection always last 3 months	–0.010	+0.059***	+0.131***
Vomiting/diarrhoea always last 3 months	+0.036	+0.020*	+0.114***
Bronchitis more than 3 months ago	+0.057*	+0.042**	+0.018
Accidents/injury more than 3 months ago	+0.160***	+0.034**	+0.091**
Dental health			
Frequency child brushes teeth	–0.084***		–0.107***
Fluoride tablets regularly	–0.144***	–0.078***	0.076**
Caries in teeth	–0.164*"	+0.053***	+0.069**

***P <0.001.
** P <0.01.
* P <0.05.
n/a: not available due to low frequencies.

Table 4 examines whether the mother's age con-founds her report of her child's health. While the reduction in sub-sample size clearly produces some fluctuations in the estimates of the association between the Index of Disadvantage and child health, the pattern is remarkably consistent. The data appear to indicate that older disadvantaged mothers are more likely to report their child has an illness, than are younger disadvantaged mothers.

The mother's educational background does not appear to be relevant to the description she provides of her child's health (Table 5). Thus the estimates of the strength of association of the Index of Disadvantage and child health, when stratified by mother's education, are very similar.

Tables 6-8 present the odds ratios (unadjusted and adjusted for mother's education, mother's age and age of the child), of the association between the Index of Disadvantage and various measures of the child's health. These confirm the findings in previous tables, but convey a clearer estimate of the magnitude of the association. In Tables 6-8 only one category of outcome is presented. Thus as Table 6 indicates, over 9.4% of mothers categorised as chronically disadvantaged report their child's general health is poor, compared to 2.9% of mothers who have no socioeconomic disadvantage. Overall, chronically disadvantaged mothers are more than three times as likely to believe their children's health is poor, compared to mothers who have no disadvantage.

Table 5. Correlation (Kendall Tau B) between index of disadvantage (DISI) and indicators of child health controlled for mother's education

	(1415) Grade 12	(2757) Grade 10	(857) <Grade 10
Use of health services			
Health of child in general	+0.050**	+0.081***	n/a
Child's health limits activities	+0.007	+0.053**	n/a
No. times child sick in last 3 months	+0.054*	+0.027*	n/a
No. times treated by doctor last 6 months	+0.041	+0.040*	n/a
No. times admitted to hospital since birth	+0.022	+0.072***	n/a
Persistent health problems			
Head cold etc. always last 3 months	+0.079***	+0.072***	n/a
Asthma always last 3 months	+0.036*	+0.017	n/a
Ear infection always last 3 months	–0.040*	+0.060***	n/a
Vomiting/diarrhoea always last 3 months	+0.042*	+0.010	n/a
Bronchitis more than 3 months ago	+0.016*	+0.022*	n/a
Accidents/injury more than 3 months ago	+0.058**	+0.019*	n/a
Dental health			
Frequency child brushes teeth	–0.076***	–0.101***	n/a
Fluoride tablets regularly	–0.099***	–0.051**	n/a
Caries in teeth	+0.057***	+0.055***	n/a

***P <0.001.
** P <0.01.
* P <0.05.
n/a: not available due to low frequencies.

Table 6. Index of socioeconomic disadvantage by child's overall health and use of health services

	%	(*N*)	Odds ratio (95% CI)	Odds ratio (adj.) (95% CI)
Health of child in general (% poor)				
No disadvantage	2.94	(1360)	1.00 1.00	1.00
Mild disadvantage	4.94	(2407)	1.72 (1.19 2.47)	1.58 (1.09 2.29)
Moderate disad.	6.98	(900)	2.44 (1.633.67)	2.15 (1.403.31)
Chronic disad.	9.38	(373)	3.42 (2.14 5.46)	3.12 (1.88 5.17)
		(5040)[a]		
Child health (sometimes-often limits activities)				
No disadvantage	10.61	(1357)	1.00	1.00
Mild disad.	11.00	(2399)	1.04 (0.84 1.29)	0.99 $X2 = 0.00$
Moderate disad.	15.26	(898)	1.52 (1.18 1.95)	1.38 (1.06 1.80)
Chronic disad.	18.01	(372)	1.85 (1.352.54)	1.63 (1.16 2.30)
		(5026)[a]		
Child sick (≥3 times last 6 months)				
No disadvantage	8.25	(1346)	1.00	1.00
Mild disad.	10.23	(2397)	1.27 (1.00 1.60)	1.19 (0.93 1.51)
Moderate disad.	12.66	(892)	1.61 (1.22 2.13)	1.41 (1.05 1.90)
Chronic disad.	17.61	(369)	2.38 (1.71 3.31)	2.03 (1.42 2.90)
		(5004)[a]		
Treated by doctor (≥4 times last 6 months)				
No disadvantage	8.02	(1347)	1.00	1.00
Mild disad.	10.46	(2400)	1.34 (1.06 1.70)	1.28 (1.00 1.63)
Moderate disad.	14.01	(892)	1.87 (1.42 2.46)	1.70 (1.27 2.28)
Chronic disad.	15.85	(366)	2.16 (1.53 3.04)	1.90 (1.31 2.75)
		(5005)[a]		
Admitted to hospital bed (≥2 times since birth)				
No disadvantage	11.03	(1360)	1.00	1.00
Mild disad.	11.62	(2410)	1.06 (0.86 1.31)	1.00 $X2 = 0.00$
Moderate disad.	15.94	(897)	1.53 (1.20 1.96)	1.36 (1.05 1.77)
Chronic disad.	18.28	(372)	1.80 (1.32 2.47)	1.58 (1.13 2.21)
		(5039)[a]		

[a] Totals differ from 5057 due to missing data.

Table 7. Index of socioeconomic disadvantage by child's persistent health conditions

	%	(*N*)	Odds ratio (95% CI)	Odds ratio (adj.) (95% CI)
Head cold (always present last 3 months)				
No disadvantage	15.25	(1344)	1.00	1.00
Mild disad.	19.67	(2389)	1.36 (1.14 1.63)	1.26 (1.05 1.51)
Moderate disad.	26.84	(883)	2.04 (1.552.52)	1.74 (1.392.17)
Chronic disad.	24.67	(369)	1.82 (1.38 2.41)	1.49 (1.10 2.01)
		(4985)[a]		
Asthma attack (always present last 3 months)				
No disadvantage	4.56	(1339)	1.00	1.00
Mild disad.	5.09	(2378)	1.12 (0.82 1.54)	1.02 (0.69 1.52)
Moderate disad.	6.14	(879)	1.64 (1.15 2.36)	1.40 (0.95 2.06)
Chronic disad.	7.38	(366)	1.67 (1.04 2.67)	1.40 (0.84 2.32)
		(4962)[a]		
Ear infection (always present last 3 months)				
No disadvantage	4.62	(1342)	1.00	1.00
Mild disad.	6.16	(2384)	1.36 (1.00 1.84)	1.27 (0.93 1.74)
Moderate disad.	10.31	(883)	2.37 (1.70 3.31)	2.11 (1.47 3.01)
Chronic disad.	9.29	(366)	2.11 (1.37 3.27)	1.82 (1.14 2.92)
		(4975) [a]		
Vomiting and/or diarrhoea (always present last 6 months)				
No disadvantage	4.25	(1342)	1.00	1.00
Mild disad.	4.99	(2387)	1.18 (0.86 1.63)	1.05 (0.74 1.47)
Moderate disad.	6.68	(884)	1.61 (1.11 2.34)	1.29 (0.86 1.93)
Chronic disad.	6.39	(366)	1.80 (1.12 2.88)	1.35 (0.80 2.27)
		(4979)[a]		
Bronchitis (present longer than 3 months)				
No disadvantage	1.27	(1335)	1.00	1.00
Mild disad.	1.74	(2361)	1.37 (0.77 2.42)	1.16 (0.65 2.07)
Moderate disad.	2.64	(873)	2.10 (1.11 3.95)	1.53 (0.77 3.03)
Chronic disad.	3.30	(364)	2.64 (1.25 5.59)	1.89 (0.83 4.29)
		(4933)[a]		
Accidents (continuing longer than 3 months)				
No disadvantage	1.65	(1331)	1.00	1.00
Mild disad.	2.12	(2358)	1.29 (0.78 2.14)	1.16 (0.69 1.95)
Moderate disad.	3.69	(869)	2.27 (1.31 3.94)	1.84 (1.02 3.32)
Chronic disad.	4.67	(364)	2.91 (1.53 5.55)	2.31 (1.144.68)
		(4922)[a]		

[a] Totals differ from 5057 due to missing data.

Table 8. Index of socioeconomic disadvantage by child's dental health

	%	(*N*)	Odds ratio (95% CI)	Odds ratio adj. (95% CI)
Child rarely brushes teeth				
No disadvantage	8.23	(1361)	1.00	1.00
Mild disad.	12.51	(2407)	1.59 (1.27 2.00)	1.53 (1.21 1.93)
Moderate disad.	12.89	(900)	1.65 (1.25 2.17)	1.46 (1.09 1.96)
Chronic disad.	21.56	(371)	3.07 (2.24 4.20)	2.61 (1.85 3.67)
		(5039)[a]		
Fluoride tablets taken				
No disadvantage	13.86	(1349)	1.00	1.00
Mild disad.	9.15	(47.9)	0.63 (0.51 0.77)	0.66 (0.53 0.82)
Moderate disad.	7.39	(893)	0.50 (0.37 0.67)	0.55 (0.40 0.75)
Chronic disad.	6.42	(374)	0.43 (0.27 0.66)	0.51 (0.36 0.83)
		(5021)[a]		
Child caries in teeth				
No disadvantage	28.13	(1344)	1.00	1.00
Mild disad.	33.36	(2374)	1.28 (1.11 1.48)	1.24 (1.07 1.44)
Moderate disad.	35.58	(877)	1.41 (1.18 1.69)	1.34 (1.10 1.63)
Chronic disad.	3534	(365)	1.40 (1.09 1.79)	1.30 (1.10 1.69)
		(4960)[a]		

[a] Totals differ from 5057 due to missing data.

Associations in a similar direction, but of a lesser magnitude, are observed for all the other variables in Table 6. More disadvantaged mothers report their children are sicker, more often treated by a doctor, and more often admitted to a hospital bed.

Table 7 presents details of the association between socioeconomic disadvantage and the presence of various chronic health problems experienced by the child. The results are generally consistent, indicating that disadvantaged mothers are twice as likely to have children with a chronic health problem, when compared with their non-disadvantaged counterparts. While adjusting for the possible confounders of mother's age, education and child's age is inclined to produce less stable or significant results, this is likely to reflect the limitations created by small numbers when the data are adjusted. Broadly the patterns derived from the unadjusted and adjusted figures are similar, indicating relationships are not a consequence of compounding.

Table 8 presents details of the association between the mother's socioeconomic disadvantage and her child's dental health. Children of disadvantaged mothers more frequently do not brush their teeth, less often take fluoride tablet supplements and not surprisingly are reported to more frequently have dental caries. Here it is relevant to emphasise that these are children only 5-6 years of age and that while the rate of caries in the most disadvantaged group is not much higher than for other children, the pattern of teeth brushing and fluoride tablet use, suggests that later differences are likely to be much greater.

DISCUSSION

Previous studies of child health have pointed to the impact of socioeconomic inequality on child mortality. Children living in poverty have been found to have higher death rates from a range of causes. Australian data confirm the existence of socioeconomic inequalities in infant mortality [47] but previous data describing socioeconomic correlates of child morbidity have produced equivocal results.

This paper has used data from the Mater-University of Queensland Study of Pregnancy (MUSP) and its outcomes to assess the impact of socioeconomic factors on child morbidity. Child morbidity was assessed using standardised paper and pencil tests, which sought the information from the child's principal caregiver (almost always the mother). There is no reason to believe that

socioeconomic factors would differentially influence the accuracy of the mother's report of her child's health.

Socioeconomic status was assessed using a composite scale with indicators taken from each phase of the study. Mothers described as disadvantaged can be interpreted as living in relative poverty over the period from conception to the birth, to the 5-year follow-up. Again there is no reason to believe that mothers would systematically misreport their economic circumstances and certainly the method used to construct the scale ensures consistency of reports.

The results are also consistent and presented under three headings. Socioeconomically disadvantaged mothers report their children use a range of health services more frequently, with the most disadvantaged mothers reporting they use health services, on average, about twice as frequently as mothers who are not disadvantaged. Disadvantaged mothers were also about twice as likely to report that their child's health was poor or that their child's activities were limited because of the child's health. Health service use differentials here appear to parallel differentials in the perceived health of the child.

This interpretation is reinforced by the results showing that children of mothers categorised as disadvantaged have approximately twice the rate of a range of persistent health problems including colds, asthma attacks, ear infections, vomiting, bronchitis and accidental injuries. Dental health is also worse for children of disadvantaged mothers, as is the use of preventive dental procedures.

This paper has been concerned with identifying the existence and magnitude of socioeconomic inequalities in child morbidity, rather than explaining them. Nevertheless it is useful to speculate about why the above differences exist. Mothers categorised as disadvantaged are likely to have poorer nutrition, a less adequate pattern of antenatal care use and to have higher rates of cigarette and, more frequently, higher levels of alcohol consumption [48, 49]. Their children are consequently more often born prematurely, and lighter. There are also likely to be socioeconomic differences in patterns of breast feeding the child [50] and in the child's physical growth and development [10]. Children of disadvantaged mothers are likely to manifest less adequate patterns of nutrition and live in more crowded circumstances which more often expose the child to infection. The explanation of the observed inequalities is, we suggest, likely to involve many aspects of the mothers' social and psychological circumstances.

It would, we suggest, be an error to interpret our results narrowly. They represent the consequences of a lifestyle dominated by poverty, by a lack of access to ideal nutritional, recreational and educational facilities. Thus the problem is poverty itself, rather than some of its correlates and consequences.

It is not new to find evidence supporting the view that children born and reared in poverty, experience long-term health (and developmental) problems. Governments have typically responded to such concerns in one of two ways. The first has been to offer various `patchwork' programs which treat some of those who manifest the health and related consequences of economic disadvantage. The second response has been to use the taxation and welfare systems to reduce the overall level of economic inequality in society. Both these responses warrant some consideration.

Patchwork programs tend to identify specific con-sequences of poverty, e.g. a lack of access to health care, child developmental delay or child chronic health problems, and advance a series of initiatives intended to ameliorate the inequality. The Head Start program initiated by Lyndon Johnson in 1965, and the U.S. Special Supplemental Food Program for Women, Infants and Children (WIC) are two such programs. Head Start is offered predominantly to disadvantaged children and their families. It provides an intensive educational experience and food supplements for young children, and its evaluations indicate that both short and longer term health, nutrition and behaviour improvements are observed in the participant children [51-53]. These improvements appear to be dependent upon the length and intensity of the program in different locations. The WIC program is focused more narrowly on pregnant women living in poverty and the post-natal period. Again, the results of evaluations are encouraging, suggesting that nutritional supplements and other aspects of the program have been able to improve pregnancy outcomes (reduce prematurity and low birthweight) and improve the health and nutritional status of the children of these mothers [54, 55]. The major concern associated with both these programs is that the benefits sometimes disappear once the program is no longer active. Other initiatives which are directed to smoking reduction and improved dietary habits could also be targeted to those social groups with the highest disease and mortality rates (those living in poverty).

A more comprehensive response to addressing the association between health and socioeconomic disadvantage lies in using the taxation and welfare systems to more effectively redistribute

resources. Countries like Sweden and Norway, for example, have very low rates of poverty in all age categories (around 5% of children, adults and the elderly) while countries like Australia (16.9%), the United States (17.1%) and the United Kingdom (10.7%) have high rates of children (in brackets) and adults living in poverty [56]. There is little doubt that economic redistributions can re-duce the gap in the health problems between the rich and poor [57], but such redistributions appear to face significant political impediments. It is salutary that the evidence of social inequalities in child morbidity and mortality appears to have generated few enduring reforms significant enough to dramatically reduce the incidence and duration of poverty in this country.

REFERENCES

1. Wise P. H., Kotelchuck M., Wilson M. L. and Mills M. Racial and socioeconomic disparities in childhood mortality in Boston. N. Engl. J. Med. 313, 360-366, 1985.
2. Shah C. P., Kahan M. and Krauser J. The health of children of low-income families. CMAJ 137, 485-490, 1987.
3. Moore A. Preventable childhood deaths in Wolverhampton. Br. Med. J. 293, 656-6658, 1986.
4. Townsend P. and Davidson N. (Eds) Inequalities in Health: The Black Report. Penguin, Harmondsworth, 1982.
5. Adelstein A. M. and White G. C. Causes of children's deaths analysed by social class (1959-63). Child Health-A Collection of Studies (Edited by Adelstein A. M., Alberman E., Barrett J. C., Donovan J. W., Leighton P. C., Pike M., Weatherall A. C., Weatherall R. and White G. C.). Studies on Medical and Population Subjects No. 31, London, 1976.
6. Carstairs V. and Morris R. Deprivation and mortality: an alternative to social class. Community Med. 11, 210-219, 1989.
7. Brennan M. E. and Lancashire R. Association of childhood mortality with housing status and unemployment. J. Epidemiol. Community Hlth 32, 28-33, 1978.
8. Starfield B. Child health care and social factors: poverty, class, race. Bull. N.Y. Acad. Med. 65, 299-306, 1989.
9. Jolly D. I. The Impact of Adversity on Child Health-Poverty and Disadvantage. Australian College of Paediatrics, Parkville, Australia, 1990.
10. Morgan M. and Chinn S. ACORN group, social class and child health. J. Epidemiol. Community Hlth 37, 196-203. 1983.
11. Platt S. D., Martin C. J., Hunt S. M. and Lewis C. W. Damp housing, mould growth and symptomatic health state. Br. Med. J. 298, 1673--1678, 1989.
12. Martin C. J., Platt S. D. and Hunt S. M. Housing conditions and ill health. Br. Med. J. 294, 1125 1127, 1987.
13. Paradise J. L. Otitis Media in infants and children. Pediatrics 65, 917 943, 1980.
14. Black N. Surgery for glue ear - a modern epidemic. The Lancet pp. 835-837, April 14, 1984.
15. Wedge P. and Essen J. Children in Adversity. Pan Books, London, 1982.
16. Teele D. W., Klein J. O., Rosner B. and the Greater Boston Otitis Media Study Group. Epidemiology of Otitis Media during the first seven years of life in children in greater Boston: a prospective cohort study. J. Infect. Dis. 160, 83 -94, 1989.
17. Maw A. R. Secretory Otitis Media in childhood. Br. Med. Bull. 43, 950-965, 1987.
18. Kaplan G. J., Fleshman J. K., Bender T. R., Baum C. and Clark P. S. Long-term effects of Otitis Media a ten-year cohort study of Alaskan Eskimo children. Pediatrics 52, 577-585, 1973.
19. Freeman B. A. and Parkins C. The prevalence of middle ear disease among learning impaired children. Clin Pediat. 18, 205-212, 1979.
20. Hagerman R. J. and Falkenstein A. R. An association between recurrent otitis media in infancy and later hyperactivity. Clin. Pediat. 26, 253-257, 1987.
21. Marsh G. N. and Channing D. M. Comparison in use of health services between a deprived and an endowed community. Arch. Dis. Childhood 62, 392 396, 1987.
22. Alwash R. and McCarthy M. Accidents in the home among children under 5: ethnic differences or social disadvantage? Br. Med. J. 296, 1450-1453, 1988.
23. Alwash R. and McCarthy M. Measuring severity of injuries to children from home accidents. Arch. Dis. Childhood 63, 635-638, 1988.
24. Murdock R. and Eva J. Home accidents to children under 15, survey of 910 cases. Br. Med. J. 3, 103 106, 1974.
25. Langley J., Silva P. and Williams S. Socio-economic status and childhood injuries. Aust. Paediat. J. 19, 237-240, 1983.
26. Peat J. K., Woolcock A. J., Leeder S. R. and Blackburn C. R. B. Asthma and bronchitis in Sydney school children. 11. The effect of social factors and smoking on prevalence. Am. J. Epidemiol. 111, 728-736, 1980.
27. Horwood L. J., Fergusson D. M. and Shannon F. T. Social and familial factors in the development of early childhood asthma, 1985. Pediatrics 75, 859-868, 1985.

28. Silva P. A., Sears M. R., Jones D. T., Holdaway M. D.. Hewitt C. J., Flannerey E. M. and Williams S. Some family social background, developmental, and behavioral characteristics of nine year old children with asthma. N.Z. Med. J. 100, 318-320, 1987.
29. Anderson H. R., Bailey P. A., Cooper J. S., Palmer J. C. and West S. Medical care of asthma and wheezing illness in children: a community study. J. Epidemiol. Community Hlth 37, 180-186, 1983.
30. Cadman D., Boyle M. H., Offord D. R., Szatmari P., Rae-Grant N. I., Crawford J. and Byles J. Chronic illness and functional limitation in Ontario children: findings of the Ontario child health study. CMAJ 135, 761-767, 1986.
31. MacClure A. and Stewart G. T. Admission of children to hospitals in Glasgow: relation to unemployment and other deprivation variables. The Lancet September 22, pp. 682-685, 1984.
32. Fergusson D. M., Horwood L. J. and Lawton J. M. Vulnerability to childhood problems and family social background. J.Child Psychol. Psychiat. 31, 1145-1160, 1990.
33. Britton J. R. Effects of social class, sex and region of residence on age at death from cystic fibrosis. Br. Med. J. 298, 483-487, 1989.
34. Thompson N. Aboriginal health - current status. Aust. N.Z. J. Med. 14, 705- 718, 1984.
35. MacDonald K. T. and Walker A. C. Rheumatic heart disease in aboriginal children in the Northern Territory. Med. J. Aust. 150, 503 505, 1989.
36. Cameron F. J. and Debelle G. D. Nutrition of aboriginal infants and children in the Murray Valley. Med. J. Aust. 144, Suppl., 55- 58, 1986.
37. Roder D. Immunisation status of South Australian children by socioeconomic status and ethnicity. Community Hlth Stud. VI, 19-24, 1982.
38. Radford A. J. Immunisation patterns in Australia: the present situation and suggested future strategies. Community Hlth Stud. IV, 228 -238, 1982.
39. Calder I. C., Roder D. M., Esterman A. J., Lewis M. J., Harrison M. C. and Oldfield R. K. Blood lead levels in children in the north-west of' Adelaide. Med. J. Aust. 144, 509-512, 1986.
40. Vinson T., Berreen R. and McArthur M. Class surveillance and child abuse. Impact pp. 19-21, 1989.
41. Nixon J., Pearn J., Wilkey I. and Petrie G. Social class and violent child death: an analysis of fatal nonaccidental injury, murder and fatal child neglect. Child Abuse Neglect 5, 111 116, 1981.
42. Health and Development Foundation. The Elizabeth Food and Health Project, Unpublished data, Adelaide, March 1988.
43. Carmichael C. L., Rugg-Gunn A. J. and Ferrell R. S. The relationship between fluoridation, social class and caries experience in 5 year-old children in Newcastle and Northumberland in 1987. Br. Dental J. 167, 57-61, 1989.
44. Coleman M. Child poverty and child health. Public Health .4.vsociation of ,4ustralia, Annual Conference, University of Melbourne, 24-27 September 1989.
45. Keeping J. D., Najman J. M., Morrison J., Western J. S., Andersen M. .1. and Williams G. M. A prospective longitudinal study of social, psychological and obstetric factors in pregnancy: response rates and demographic characteristics of 8556 respondents. Br. J. Obstet. Gynaecol. 96, 289-297, 1989.
46. Eisen M., Ware J. F.., Donald C. A. and Brook R. H. Measuring components of children's health status. Med. Care 17, 902 921. 1979.
47. Siskind V.. Najman J M. and Copeman R. Infant mortality in socioeconomically advantaged and disadvantaged areas of Brisbane. Community Hlth Stud. 11, 24 30, 1987.
48. Keeping J. D., Chang A., Morrison J. and Western, J. S. Employment, unemployment and the health of pregnant women. New Doctor, Sept/Oct. pp. 9-12, 1983.
49. Morrison J., Najman J. M., Williams G. M., Keeping J. D. and Andersen M. J. Socio-economic status and pregnancy outcome. An Australian study. Br. J. Obstet. Gynaecol. In press.
50. Williams H. E. and Carmichael A. Nutrition in the first year of life in a multi-ethnic poor socioeconomic municipality in Melbourne. Aust. Paediat. J. 19, 73-77, 1983.
51. Borden E. and O'Beirne K. W. False start? Policy Rev. 47, 48-51, 1989.
52. Holden C. Head start enters adulthood. Science 247, 1400-1402, 1990.
53. Schweinhart L. J. and Weikart D. P. Research support for head start. Science 248, 1 174 1175, 1990.
54. Rush D., Alvir J. M., Kenny D. A., Johnson S. S. and Horvitz D. G. The national WIC evaluation of special supplemental food program for women, infants and children, 1 1 1 historical study of pregnancy outcomes. Am. J. Clin. Nutr. 48, 412-428, 1988.
55. Rush D., Leighton J., Sloan N. L., Alvir J. M., Horvitz D. G., Seaver W. B., Garbowski G. C., Johnson S. S., Kulka R. A., Devore J. W. et al. The national WIC evaluation: evaluation of the special supplemental food program for women, infants and children, V1 study of infants and children. Am. J. Clin. Nutr. 48, Suppl. 2, 484-511, 1988.
56. Smeeding T., Torrey B. B. and Rein M. Patterns of income and poverty: the economic status of children and the elderly in eight countries. The Vulnerable (Edited by Palmer J. L., Smeeding T. and Torrey B. B.). Urban Institute, Washington, 1988.
57. Najman J. M. Health and poverty: past, present and prospects for the future. Soc. Sci. Med. 36, 157-166, 1993.

APPENDIX

Inter-item Associations (Cramer's V) of Variables in the Chronic Socio-economic Disadvantage Scale

	A80	A90	A 102b	B89	B96b	E95	E96b	H 10lb	H104	H114
A80	1.000	0.103	0.072	0.064	0.084	0.094	0.078	0.116	0.067	0.103
A90		1.000	0.148	0.130	0.187	0.262	0.164	0.138	0.144	0.179
A102b			1.000	0.101	0.368	0.142	0.327	0.084	0.134	0.116
B89				1.000	0.458	0.127	0.119	0.066	0.108	0.090
B96b					1.000	0.195	0.415	0.111	0.146	0.117
E95						1.000	0.232	0.150	0.172	0.216
E96b							1.000	0.134	0.152	0.147
H101b								1.000	0.139	0.273
H104									1.000	0.216
H114										1.000

Phase I (A):
A80 Level of education of mother.
A90 Gross family income.
A102b Welfare benefits recipient in 6 months prior to pregnancy.

Phase 2 (B):
B89 Serious financial problems in last 6 months.
B96b Welfare benefits recipient in last 6 months.

Phase 3 (E):
E95 Gross family income.
E96b Welfare benefits recipient in last 6 months.

Phase 4 (C and D):
This was the obstetric data sheet containing details of the pregnancy record.

Phase 5 (H):
Hl0lb Partners' occupational status.
H104 Partner unemployed at all in last 5 years.
H114 Gross family income