Multiple admission and deprivation

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Abstract

The relationship between multiple hospital admission (three or more) in early childhood and social deprivation was explored using data from two Sheffield whole year birth cohorts (1980 and 1985). The findings demonstrate a strong relationship between multiple admission for mainly, and exclusively, organic reasons and residence in an area of deprivation. The relationship persists when low birth-weight infants and those with young mothers are excluded from the analysis. The results suggest a dual effect of deprivation on early childhood hospital admission; an increase in admissions associated with organic pathology and those associated with impaired parental coping.

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The association between adverse health outcomes and social deprivation is well documented.^{1,2} Though marked social class gradients have been noted in some aspects of childhood morbidity, it has been argued that most of these are related to behaviour rather than social circumstances.³ Similarly, the assumption that the association between residence in an area of deprivation and increased tendency to hospital admission in childhood is directly related to experience of morbidity⁴ has been challenged on the grounds that hospital admission is mediated by staff perceptions of parents ability to cope.⁵

This paper examines the relationship between deprivation and multiple admission (three or more) in children under the age of 2 years. We have reported elsewhere the disproportionate contribution of children experiencing multiple admission to the overall increase in admissions in early childhood.⁶ This group is divided broadly into children admitted repeatedly for organic conditions and those frequently admitted for social and behavioural reasons. The study examines the relationship between deprivation and these 'organic' and 'non-organic' admissions.

Subjects and methods

Children living within the Sheffield city boundary and experiencing multiple admissions before the age of 2 years were identified in two whole year birth cohorts (1980 and 1985) using the Sheffield Child Development Study (SCDS) database.⁷ The next child on the database born on the same day and not experiencing multiple admissions was identified as a control. Children leaving the city or dying before 2 years of age were excluded and no attempt was made to identify children admitted to hospitals outside the city. Maternal age at birth, birth weight, and postal code of address at birth were extracted

from the SCDS data. For the cases, admission diagnoses were extracted for all admissions before the age of 2 years.

Admission diagnoses were reviewed for each case by a single observer (NJS). Cases admitted on every occasion with a clear organic diagnosis, for example asthma, pneumonia, bronchiolitis, cerebral palsy, surgical procedure, were classified as *organic* (group 1). Those for whom the majority of admissions came within the organic category were classified as *primarily organic* (group 2). Those admitted on every occasion with an admission diagnosis of social problem, non-accidental injury, management problems (sleeping, feeding, crying) were classified as *non-organic* (group 4). Finally those for whom the majority of admissions came within the non-organic category were classified as *primarily non-organic* (group 3). Some cases were impossible to classify due to inadequate information; these were placed in a separate group 5 (unclassified).

Some examples may serve to clarify the criteria used: a child admitted on seven occasions with the diagnosis of asthma was classified as organic as was a child admitted initially with a ventricular septal defect and subsequently with Fallot's tetralogy and cyanosis. A child admitted once with gastroenteritis, twice with abdominal pain, and twice with febrile convulsions was classified as primarily organic. A child admitted on two occasions with gastroenteritis, on one occasion with vomiting, and on one occasion with head injury and social problems was classified as primarily non-organic. A child admitted with teething and social problems on one occasion, head injury (possible non-accidental injury) on one occasion, and two accidental ingestions was classified as non-organic.

The Townsend deprivation index⁸ was calculated for each of the Sheffield city electoral wards⁹ from 1981 census data. The indices were aggregated into five groups (A: <-4=least deprived; B: -4 to -2=less than average level of deprivation; C: -1.9 to +1.9=average levels of deprivation; D: +2 to +4=more than average deprivation; and E: >+4=most deprived) and

Table 1 All cases versus controls for deprivation group, birth weight, and maternal age

	Cases (n=360)	Controls (n=360)	Odds ratio (95% CI)
Deprivation group:			
Non-deprived			
A	23	68	
B	29	61	
C	96	102	2.53 (1.86 to 3.46)
Deprived			
D	104	66	
E	108	63	
Birth weight (g):			
<2500	58	22	2.96 (1.72 to 5.12)
≥2500	302	338	
Maternal age:			
<21	92	56	1.87 (1.27 to 2.75)
≥21	268	304	

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children allocated to groups according to the electoral ward of their address at birth. For the purposes of analysis, groups A, B, and C were combined to form a non-deprived group and groups D and E combined to form a deprived group.

Relative odds (odds ratios with 95% confidence intervals (CI)) of admission associated with residence in a deprived area, low birth weight, and low maternal age were calculated. In addition, relative odds of admission associated with residence in an area of deprivation were calculated after excluding infants with mothers under 21 years and low birth weight (<2500 g).

Results

A total of 360 children in the two cohorts were admitted three or more times before 2 years of age: 140 in 1980 and 220 in 1985. Table 1 shows the distribution of deprivation group, birth weight, and maternal age in the multiple admission and control groups.

There was a strong correlation between all three variables and multiple admission. Altogether 52% of children in the multiple admission group were from deprived areas of the city (groups D and E) compared with 36% of controls; 26% of cases were born to mothers under 21 compared with 15% of controls and 16% were low birthweight babies compared with 6% of controls.

When low birthweight infants were excluded from the analysis, the relative odds for multiple admission associated with residence in an area of deprivation fell from 2.53 to 2.48 (95% CI 1.78 to 3.45). If only infants with mothers aged 21 or over were analysed, the relative odds for multiple admission associated with residence in a deprived area rose to 2.71 (95% CI 1.90 to 3.87). With both low birthweight infants and infants with young mothers excluded from the analysis, the relative odds were 2.74 (95% CI 1.88 to 4.01).

Using admission diagnoses, 99 (27.5%) cases were classified as organic (group 1), 83 (23.0%) as primarily organic (group 2), 65 (18.0%) as primarily non-organic (group 3), and 27 (7.5%) as non-organic (group 4). Eighty six (24.0%) cases were unclassified (group 5). Table 2 compares cases classified as organic and primarily organic (groups 1 and 2) with controls for deprivation, birth weight, and maternal age. Table 3 compares non-organic and primarily

Table 3 Non-organic (groups 3 and 4) cases versus controls for deprivation group, birth weight, and maternal age

	Non-organic cases (n=92)	Controls (n=360)	Odds ratio (95% CI)
Deprivation group:			
Non-deprived			
A	3	68	
B	9	61	
C	23	102	2.88 (1.75 to 4.75)
Deprived			
D	29	66	
E	28	63	
Birth weight (g):			
<2500	20	22	4.29 (2.12 to 8.69)
≥2500	72	338	
Maternal age:			
<21	30	56	2.74 (1.57 to 4.78)
≥21	62	304	

non-organic (groups 3 and 4) cases with controls for the same variables.

The relationship between address in an area of deprivation and multiple admission held for those admitted for mainly organic causes as well as those admitted for mainly non-organic reasons. When cases admitted solely for organic reasons (group 1) were compared with controls, the relative odds associated with address in a deprived area were 2.15 (95% CI 1.33 to 3.48). When infants with addresses in deprived areas (groups D and E) were compared with those in the most privileged areas (groups A and B), the relative odds for mainly organic admissions (groups 1 and 2) increased to 4.73 (95% CI 2.82 to 7.99). Making the same comparison for mainly non-organic admissions (groups 3 and 4), the relative odds for multiple admission were 6.55 (95% CI 3.24 to 13.49).

Admission diagnosis data were insufficient to classify some of the cases accurately into organic or non-organic groups. The unclassified cases (group 5) when analysed against controls for deprivation group showed an association with address in areas of deprivation with relative odds of 2.37 (95% CI 1.43 to 3.93).

Discussion

Children experiencing multiple admissions form an important group accounting for over 30% of all admissions under the age of 2 years.⁶ Repeated admissions are detrimental to child and family. The results of this study suggest that the burden falls disproportionately on those living in deprived areas, young mothers, and families with low birthweight infants.

The previously reported correlations between early childhood hospital admission and low birth weight¹⁰ and teenage mothering¹¹ are confirmed by the results of this study. The links between hospital admission and deprivation have been well established.^{4 12 13} This study establishes a relationship between multiple admission and deprivation and confirms previous findings.

With the decline in mortality rates, morbidity indicators have taken on more importance. Hospital admission is an indirect indicator of morbidity but, especially in early childhood, problems of disease definition, differential service provision and use, and variation in parental coping skills make interpretation difficult.⁵ Specifically it has proved difficult to

Table 2 Organic (groups 1 and 2) cases versus controls for deprivation group, birth weight, and maternal age

	Organic cases (n=182)	Controls (n=360)	Odds ratio (95% CI)
Deprivation group:			
Non-deprived			
A	12	68	
B	15	61	
C	46	102	2.64 (1.80 to 3.88)
Deprived			
D	53	66	
E	56	63	
Birth weight (g):			
<2500	23	22	2.24 (1.16 to 4.31)
≥2500	159	338	
Maternal age:			
<21	41	56	1.65 (1.02 to 2.65)
≥21+	141	304	

clarify whether socially deprived children are more ill more often or admitted to hospital more readily than their more privileged peers.⁵

The results of this study indicate that young children admitted three or more times before the age of 2 years for mainly non-organic reasons are very much more likely than controls to live in areas of above average deprivation. This finding is unsurprising; it is consistent with paediatric anecdote and is in line with other study results.³ The increased risk of multiple admissions for mainly, and exclusively, organic reasons associated with residence in areas of above average deprivation has not been reported previously. This increased risk persists even when infants of low birth weight and those with mothers aged under 21 are excluded from the analysis.

Our findings suggest that residence in deprived areas is associated with a dual effect on early childhood hospital admission. Admissions related to definite organic pathology are increased as are those related to impaired parental coping and lowered threshold for admission.

Some caution in the interpretation of the results should be exercised. Admission diagnoses can change before discharge¹⁴ and other variables, such as maternal smoking that might influence admission, have not been considered in this study. The allocation of cases to organic/non-organic groups based on limited information is open to criticism. In addition, the use of deprivation indices to characterise electoral wards, which are often heterogeneous in social composition, has been criticised.¹⁵ However, the imperfect classification of cases and deprivation groups used in this study are likely to bias the relative odds towards unity. Studies using more homogeneous units, such as enumeration districts, for calculation of deprivation indices show greater health inequalities than those based on electoral wards.¹⁶

The results confirm the association of residence in areas of deprivation with hospital admission in early childhood and provide strong

evidence of an association of social deprivation with hospital admission for organic as well as non-organic reasons. Further studies using measures of illness severity and more complete diagnostic data are required to confirm this association. The study indicates that hospital paediatric units serving deprived areas are likely to experience higher readmission rates and greater levels of morbidity as a result of the social make-up of the population they serve rather than the quality of their clinical practice. Measures of 'performance' based, wholly or in part, on readmission rates could lead to misinterpretation unless a social weighting is introduced.

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