Socio-economic status and childhood asthma

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Abstract

Objective: To examine the links between severity of childhood asthma, socio-economic status and health service utilisation.

Design: Observational study linking children with asthma and their home postcodes to an index of deprivation.

Setting and subjects: Twelve Tayside general practices with 1504 registered children aged 1-15.

Results: There was no association between socio-economic status and treatment step, a proxy for asthma severity. Children with a lower socio-economic status make less use of primary care routine review appointments but more use of outpatients and hospital admissions.

Conclusions: The link between childhood asthma and socio-economic status appears to be related to patterns of health service utilisation, not disease severity.

Introduction

Many aspects of child health vary according to the child's social background.[1] In the 1980s Black[2] and Townsend's[3] work highlighted the national picture of associations between social inequality and health. Local area statistics have been developed to explore links in child health for defined geographical areas.[4] Disease specific work on deprivation and health have concentrated on nutrition[5] and patterns of growth.[6]

Common sense suggests that with a common condition such as childhood asthma there will be an association with socio-economic status. The multi-factorial causes of asthma – genetic predisposition to atopy, allergy to house dust mite, environmental pollutants and viral infections – make it likely that any association will be complex. One might expect socially disadvantaged children to be exposed to more airborne irritants, but house dust mites may be a particular problem in houses with fitted carpets and hence socially advantaged children are also 'at risk' from asthma.[7,8] The rising trend of admissions for childhood asthma despite the apparent availability of effective treatments has focused attention on how socio-economic status might relate to health service utilisation.[7,8] It is thus of concern to parents, health professionals and health service planners to know if and how socio-economic status relates to childhood asthma and to health service utilisation.

The opportunity to explore this link arose from studying a cohort of children with varying degrees of asthma severity,[9,10] socio-economic data from the 1991 census,[11] and health service utilisation amongst children registered with Tayside practices.[12] The aims of this paper were:

1. To test whether severity of asthma was linked to socio-economic status.
2. To test whether socio-economic status was linked to patterns of health service utilisation.

Method

Subjects

The Tayside Childhood Asthma Project tracked the management of an identified group of children aged 1-15 with asthma related features from 1990-1995.[10] The children had been identified from a review of medical records, registered with 12 general practices in the Tayside region of Scotland, by a trained audit facilitator.[9] The children studied for this paper were the control children who could be followed up for the entire four year period.[12] Their symptoms ranged from mild episodic ones suggestive of asthma to severe asthma requiring high dose preventative therapy.

The following were noted for each of the four years of the study from the medical records: primary care consultations for asthma and other respiratory problems, anti-asthma prescriptions, hospital admissions, outpatient and accident and emergency (A&E) attendances for asthma. For each of the four years, the drugs prescribed to each child (i.e. bronchodilators only, cromoglycate-like drugs, low dose and high dose inhaled corticosteroids) were used to classify the children according to the British Thoracic Society (BTS) Treatment Steps (Table 1).[13]

Home postcodes for each child were recorded and these were used to assign an index of deprivation based on the 1991 census data. A validated index of deprivation used by the Department of the Environment[11] (DoE) was adapted to allow for single parent families which previous work had shown to be an important influence on social deprivation within the Tayside area.[14] The index of deprivation was calculated according to the prevalence of a number of different factors for each postcode. The factors were unemployment, overcrowding, lacking amenities, children in unsuitable accommodation or in low-earner households, no car and single parent families. The index gave a range of values where the national average was zero, with better than average scores negative and worse scores positive.

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Table 1: BTS Treatment Step over the 4 years of the study

	Number of children (%)			
	Year 1	Year 2	Year 3	Year 4
No medication	693 (46.1)	781 (59.1)	998 (66.4)	999 (66.4)
BTS Step 1	643 (42.8)	493 (32.8)	226 (15.0)	180 (12.0)
BTS Step 2	71 (4.7)	46 (3.1)	36 (2.4)	25 (1.7)
BTS Step 3	44 (2.9)	86 (5.7)	87 (5.8)	121 (8.0)
BTS Step 4	53 (3.5)	98 (6.5)	157 (10.4)	179 (11.9)

British Thoracic Society Treatment Steps
1 - Patient receiving ß-agonist only
2 - ß-agonist & cromoglycate type drug
3 - ß-agonist & low dose inhaled steroids, typically less than 400 µg per day
4 - ß-agonist & high dose inhaled steroids, typically 800 µg per day

Table 2: Children classified by socio-economic status - Year 4

	Deprivation Group (Quartiles)				
	All Groups	Year 1	Year 2	Year 3	Year 4
BTS Step 0	999 (66.4)	243 (64.6)	254 (67.6)	242 (63.9)	260 (69.7)
BTS Step 1	180 (12.0)	52 (13.8)	46 (12.2)	44 (11.6)	38 (10.2)
BTS Step 2	25 (1.7)	6 (1.6)	8 (2.1)	9 (2.4)	2 (0.5)
BTS Step 3	121 (8.0)	29 (7.7)	3 (8.5)	31 (8.2)	29 (7.8)
BTS Step 4	179 (11.9)	46 (12.2)	36 (9.6)	53 (14.0)	44 (11.8)

Table 3: Primary care contacts for asthma

	Year 1	2	3	4	Total
Deprivation Group 1 (n=376)					
Asthma consultation	125	137	218	265	745
Other respiratory consultation	428	292	124	100	944
GP/Nurse review for asthma	141	188[c,d]	185[d]	211[d]	725[c,d]
Deprivation Group 2 (n=376)					
Asthma consultation	131	167	273	233	804
Other respiratory consultation	421	269	147	114	951
GP/Nurse review for asthma	132	164[d]	198[d]	207[d]	701[c,d]
Deprivation Group 3 (n=379)					
Asthma consultation	164	222[a,d]	287[a]	266	939[a,d]
Other respiratory consultation	446	315	140	123	1024
GP/Nurse review for asthma	129	125	145	158[d]	557
Deprivation Group 4 (n=373)					
Asthma consultation	147	138	230	228	743
Other respiratory consultation	525[a,b]	325	156	102	1108[a,b]
GP/Nurse review for asthma	148	117	120	102	487

a. Significantly higher than Deprivation Group 1 (p<0.05)
b. Significantly higher than Deprivation Group 2 (p<0.05)
c. Significantly higher than Deprivation Group 3 (p<0.05)
d. Significantly higher than Deprivation Group 4 (p<0.05)

The children were then classified into quartiles dependent on the value of their index of deprivation. The socio-economic status of the groups declined progressively from affluent children in Group 1 to 'socially deprived' children in Group 4.

The classification of the children using the BTS Treatment Steps was examined to look for differences over the four years of the study and also through the four groups. The number of primary and secondary care contacts for asthma in each of the socio-economic status groups were also examined for differences in the way health services were utilised.

A statistical test based on the Poisson assumption was used to examine for differences over the groups. If deprivation has no effect on health service utilisation, events, e.g. consultations, will occur randomly at a constant average rate for all individuals in the study. To test the hypothesis, that the average rate of occurrence of events is the same across the groups, the test statistic, L, based on a χ^2 distribution with 3 degrees of freedom was used.

$$L = 2\left[\sum_{i=1}^{4} Y_i \log_e(Y_i/n_i) - Y_T \log_e(Y_T/n_T)\right]$$

where
Y_i = number of events in quartile i, i= 1,2,3,4
n_i = number of subjects in quartile i, i= 1,2,3,4
Y_T = overall number of events
n_T = overall number of subjects.

Ethics
The project was approved by the Tayside Medical Ethics Committee and all computer data were stored under the terms of the Data Protection Act.

Results

Asthma severity and socio-economic status
Over the four years there was a trend amongst children studied towards the use of no medication (Table 1), from 46.1% to 66.4%, reflecting the fact that some children 'outgrow' the need for treatment. The results also show that there is a move towards more aggressive treatment: the numbers of children treated with inhaled steroids tripled (97 on BTS steps 3 and 4 in year 1, and 300 in year 4).

The data displayed in Table 2 show no influence of socio-economic deprivation group on the treatment step to which children were subjected, disproving our initial hypothesis that the more severe asthmatics would be from the lower socio-economic groups.

Health service utilisation and socio-economic status
There are no consistent differences in the patient (or parent) initiated primary care service consultation rates for asthma in the various socio-economic groups studied (Table 3). Although the downward trend to presentation over the four years is maintained, there is a small relative increase in the numbers of children in the lower two socio-economic groups over the higher two presenting for 'other respiratory consultation'. There was a decline in GP and practice nurse initiated reviews for asthma, from the affluent group through to the group with lowest socio-economic status.

Children from the lower two socio-economic groups make most use of hospital admission for asthma: there were twice as many admissions from groups 3 and 4, compared to groups 1 and 2 (Table 4). Groups 3 and 4 were more likely to use the hospital out-patient clinics (467 attendances compared with 299). A&E attendances were more frequent for children from groups 1 and 2 (39 compared with 22).

Discussion

The data from this study did not support a relationship between severity of asthma and lower socio-economic status. The trend towards lessening use of medication by the children is probably explained by ageing of the cohort and the trend towards natural resolution of asthma symptoms. The move to more aggressive treatment is consistent with reports elsewhere[15] and is typical of a cohort effect.

The data suggested that children with high socio-economic status will receive more practice initiated reviews of asthma. However, this could be because children from low socio-economic backgrounds are less likely to attend review appointments. Relatively greater use of in-patient hospital services by asthmatic children from lower socio-economic groups might be explained by a tendency to admit more 'deprived' children initially assessed at A&E departments. This could occur because of staff perceptions concerning effective use of home treatment by better educated parents, and the perceived greater likelihood of appropriate representation, and therefore clinical safety, of children from higher socio-economic groups should deterioration of a child's condition occur. In Tayside, most children with asthma who are admitted are automatically followed up in an out-patient clinic. This could explain the increase in out-patient attendances by 'socially deprived' children. Another possible explanation would be more general practice referrals from this group

of children because of perceived clinical need. In some inner cities A&E attendance may be a proxy marker of asthma severity but in Tayside, A&E attendance for acute asthma is too infrequent an event to make such an inference. Unfortunately the number of siblings each child in the study had is unknown. Recent work suggests that large family size may provide 'protection' against asthma.[16] A follow-on study could explore this.

Asthma is difficult to define and classify. Consensus is lacking on what constitutes valid markers of clinical outcome or disease severity. For pragmatic reasons the BTS Treatment Steps were used as proxy markers of severity of childhood asthma. We accept that prescribed treatment depends on clinician behaviour and thus is not ideal. Lung function measurements were outside the scope of this study.

The use of the children's full home postcode allowed us to accurately place them within the correct enumeration district from the 1991 census data. The index of deprivation used was adapted from one produced by the DoE.[11] Previous work in Tayside had shown that the prevalence of single parent families was a key factor influencing social deprivation[14] and so this was included as an influencing factor. Doubts have been raised over the validity of allocating census data to general practice populations,[17] but the 1991 census remains a source of data which could not otherwise be replicated.[18]

The aims of the project were to assess if deprivation influenced the severity of asthma in a cohort of children and in health service utilisation. The study did not try to answer whether asthma is more prevalent in children with low socio-economic status.[19] The resources required to follow-up all the children registered with the 12 practices at the start of the study were not available. Also, six years on from the original assessment the changes in the practice population would be substantial. This could mean that the current population would not be a representative sample of the one from which the children were drawn.

All large cohort studies demonstrate practice variability of results. The practices were selected to be representative of one region and thus included a mix of urban/rural and rich/poor area practices. Within practice analysis showed that 'more deprived practices' had more patient initiated asthma consultations and less structured reviews. Individual practice data on hospital service utilisation are not presented due to numbers being too small to draw valid conclusions.

While this study does not support the hypothesis that low socio-economic status is linked to increased asthma severity, trends emerged in the treatment and management of asthma which remain inadequately explained. Careful study of the clinical decision making processes in relation to the use of practice-based recall and hospital services for asthma could illuminate further the relationship between socio-economic status and the disease.

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Table 4: Secondary care contacts for asthma

	Year 1	2	3	4	Total
Deprivation Group 1 (n=376)					
Hospital admission	11	9	2	1	23
A&E attendance	4	3	4	4	15
Outpatient clinic attendance	64 [b]	59 [b]	38	38	199 [b]
Deprivation Group 2 (n=376)					
Hospital admission	11	0	6	5	22
A&E attendance	9	7	4	4	24
Outpatient clinic attendance	25	29	24	22	100
Deprivation Group 3 (n=379)					
Hospital admission	3	11	4	9	27
A&E attendance	0	3	5	3	11
Outpatient clinic attendance	79 [b]	71 [b]	57 [b]	44	251 [b]
Deprivation Group 4 (n=373)					
Hospital admission	16 [c]	24 [b]	8	4	52 [a,b,c]
A&E attendance	5	0	5	1	11
Outpatient clinic attendance	54 [b]	52 [b]	63 [b]	47 [b]	216 [b]

a. Significantly higher than Deprivation Group 1 (p<0.05)
b. Significantly higher than Deprivation Group 2 (p<0.05)
c. Significantly higher than Deprivation Group 3 (p<0.05)

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