Socioeconomic inequality and meningococcal disease

JM Stuart, N Middleton, DJ Gunnell

Summary: *Incidence of meningococcal disease was associated with socioeconomic deprivation across a rural English region. In young children the incidence was twice as high in the most deprived compared with the least deprived electoral wards. By addressing social inequalities the incidence of this serious infection could be reduced.*

Key words:
ecology
meningococcal disease
social deprivation

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Introduction

Since the mid 1990s the incidence of meningococcal disease in the UK has been at its highest level for 50 years. It has become a leading cause of death among young children. The introduction of conjugated serogroup C vaccines into the childhood immunisation programme in 1999 led to a marked reduction in disease due to these strains. However, as most cases in young children are caused by serogroup B strains, the identification of preventable risk factors for invasive meningococcal disease is still of public health importance. Analysis of the geographic patterning of meningitis in a predominantly urban area (North East London) indicated an association with socioeconomic deprivation as well as with overcrowding[1]. This prompted us to assess this relationship in a rural region (South West England), where a preliminary analysis has found no association using local authorities as the unit of geographic analysis and Jarman score as the measure of deprivation[2].

Methods

During an enhanced surveillance study (January to December 1998), 191 cases of meningococcal disease (meningitis and septicaemia) were microbiologically confirmed in the South West NHS Region (England). These were linked to electoral wards on the basis of postcode of home address. Using Poisson regression we examined the association of ward levels of socioeconomic deprivation (Townsend index) and overcrowding (households with >1 person per room) with the incidence of meningococcal disease. Census data from 1991 were used to calculate Townsend scores and overcrowding, and we used 1996 mid-year estimates of their population. We estimated the relative risk of meningococcal disease across quartiles of increasing levels of socioeconomic deprivation in all ages, in those aged <5 and in those aged ≥5 years. Summary estimates of linear change in disease risk in relation to change in risk factors were based on fitting the quartiles as a linear term in our model.

Results

The most deprived areas had higher rates of meningococcal disease than the least deprived areas (table 1). Associations with overcrowding were weaker and were eliminated in models controlling for the other components of the Townsend index (unemployment, no car access, household not owner occupied). Associations were strongest in children under five years old. In the most socioeconomically deprived wards the risk of meningococcal disease was almost twofold (95% CI 1% to 358%) higher than in the least deprived wards.

Discussion

We found that young children living in socially deprived areas within a rural region (South West England) were at increased risk of meningococcal disease. The socioeconomic heterogeneity of the populations covered by local authorities (mean population > 100,000) compared to wards (mean population 5,000) probably explains the lack of association in the preliminary analysis[3]. There is some overlap between components of Townsend and Jarman scores, but we did not use Jarman score for this analysis, as we did not have access to this data by electoral ward.

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TABLE 1 Poisson estimates of relative risks of meningococcal disease in SW Region across quartiles of wards with increasing levels of socioeconomic deprivation by age

	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Per quartile increase*	Per quartile increase adjusted for other Townsend components	*p* - value for linear trend
All ages combined							
Overcrowding	1.00	1.55 (0.97, 2.48)	1.04 (0.63, 1.71)	1.63 (1.05, 2.55)	1.11** (0.98, 1.27)	0.95 (0.79, 1.13)	0.11
Townsend index	1.00	1.24 (0.75, 2.05)	1.37 (0.85, 2.21)	1.76 (1.14, 2.72)	1.20 (1.06, 1.37)		0.01
Children aged under five years							
Overcrowding	1.00	1.36 (0.66, 2.81)	0.91 (0.43, 1.94)	1.58 (0.81, 3.09)	1.13 (0.93, 1.37)	0.84 (0.64, 1.09)	0.23
Townsend index	1.00	0.89 (0.39, 2.01)	1.31 (0.64, 2.69)	1.90 (1.01, 3.58)	1.30 (1.07, 1.59)		0.01
People aged five years and over							
Overcrowding	1.00	1.56 (0.84, 2.90)	1.01 (0.52, 1.96)	1.34 (0.73, 2.46)	1.03 (0.86, 1.23)	0.96 (0.76, 1.22)	0.73
Townsend index	1.00	1.51 (0.79, 2.89)	1.38 (0.73, 2.61)	1.43 (0.79, 2.60)	1.08 (0.91, 1.29)		0.37

* To determine whether the observed trends were compatible with this linearity assumption, we compared the goodness of fit of models including the quartiles as a categorical and as a linear term in likelihood ratio tests.

** *p* - value of likelihood ratio test <0.05 supporting the non-linear model.

In contrast to Jones, et al.[1], we found that overcrowding (% households with >1 person per room) was only weakly related to disease risk. Furthermore, its association with meningococcal disease was eliminated in multivariable models controlling for other aspects of socioeconomic deprivation. It is possible that the contrasting findings in these two studies are explained by the higher percentage of overcrowded households in urban London compared to South West England (7.4% and 3.0% respectively, 1991 Census of the Office of Population Censuses and Surveys). Also our assessment of overcrowding may not accurately reflect severe overcrowding (>1.5 person per room) which is more likely to be an important risk factor for meningococcal disease[4,5]. Passive smoking, another recognised risk factor[5,6], is not included in standard deprivation scores and may provide one possible explanation for the socioeconomic gradient observed.

In August 2001, the Department of Health in England issued a consultation document on tackling health inequalities[7]. The omission of infectious disease from the suggested indicators is surprising given established evidence of social inequalities for infections such as tuberculosis, gastroenteritis and gonorrhoea, and the possible long-term influences on health of some childhood infections[8]. For meningococcal disease, incidence is influenced by external influences such as vaccination programmes and by natural fluctuation, but should in the long term be reduced by tackling social deprivation.

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