

Increasing incidence of tuberculosis in England and Wales: a study of the likely causes

N Bhatti, M R Law, J K Morris, R Halliday, J Moore-Gillon

See pp 963, 974 and editorial
by Darbyshire

Abstract

Objective—To examine factors responsible for the recent increase in tuberculosis in England and Wales.

Design—Study of the incidence of tuberculosis (a) in the 403 local authority districts in England and Wales, ranked according to Jarman score, and (b) in one deprived inner city district, according to ethnic origin and other factors.

Setting—(a) England and Wales 1980-92, and (b) the London borough of Hackney 1986-93.

Main outcome measure—Age and sex adjusted rate of tuberculosis.

Results—In England and Wales notifications of tuberculosis increased by 12% between 1988 and 1992. The increase was 35% in the poorest 10th of the population and 13% in the next two; and in the remaining 70% there was no increase. In Hackney the increase affected traditionally high risk and low risk ethnic groups to a similar extent. In the "low risk" white and West Indian communities the incidence increased by 58% from 1986-8 (78 cases) to 1991-3 (123), whereas in residents of Indian subcontinent origin the increase was 41% (from 51 cases to 72). Tuberculosis in recently arrived immigrants—refugees (11% of the Hackney population) and Africans (6%)—accounted for less than half of the overall increase, and the proportion of such residents was much higher than in most socioeconomically deprived districts. The local increase was not due to an increase in the proportion of cases notified, to HIV infection, nor to an increase in homeless people.

Conclusions—The national rise in tuberculosis affects only the poorest areas. Within one such area all residents (white and established ethnic minorities) were affected to a similar extent. The evidence indicates a major role for socioeconomic factors in the increase in tuberculosis and only a minor role for recent immigration from endemic areas.

Introduction

The annual notification rate of tuberculosis in England and Wales has declined steadily for over a century. It levelled in the mid-1980s and increased by 12% between 1988 (5162 notifications) and 1992 (5798).^{1,2} The increase was more pronounced in younger age groups.² This paper examines the causes of the increase.

Firstly, we examined national data to see whether the increase was more pronounced in socioeconomically deprived areas. Secondly, using data from one district, we assessed the importance of possible causes of the increase¹—an increase in the proportion of cases notified; the increasing prevalence of homelessness and of HIV infection and AIDS; or a higher rate of introduction of tuberculosis into Britain by residents of Indian subcontinent origin or, particularly, by the recent entry into Britain of refugees from countries where tuberculosis is common. (The total number of refugees granted entry to Britain rose from 5000 in 1988 to nearly 50 000 in 1991.³)

Materials and methods

NATIONAL DATA

We used the Jarman index, a composite score of 10 factors from census data, to identify relatively underprivileged localities.⁴ The 10 factors include overcrowding, poor housing, population mobility, and the proportion of ethnic minority residents. We ranked the 403 local authority districts in England and Wales (comprising London boroughs and districts within metropolitan and non-metropolitan counties) by their total Jarman score (1991 census) and, separately, by components of it. The ranked districts were then grouped allowing for their differing population sizes, so that the total population of England and Wales was divided into 10ths, from the least deprived 10% of the population to the most deprived 10%. Published notification rates of tuberculosis by district² from 1980 to 1992 were used to calculate the changing incidence of tuberculosis in these 10ths of the population.

LOCAL DATA

We examined local data in the London borough of Hackney (population about 200 000), a socioeconomically deprived borough (second highest Jarman score in England and Wales) with large ethnic minority communities (40% of the population). As well as the established ethnic minority communities, roughly 20 000 refugees are estimated to have settled in Hackney. They came mainly from Turkey (about 12 000—Turks in 1980, Kurds from 1988), east Africa (about 6000—Eritreans, Ethiopians, and Somalis from 1990), and (in smaller numbers) South East Asia (Vietnamese).⁵

A register of all cases of tuberculosis occurring in the Hackney population since 1986 was compiled from statutory notifications to the local authority, with additional unnotified cases identified from examination of microbiology and histology records in the three hospitals serving the bulk of the borough's population. The ethnic origin of each patient was established from the clinical records of the three hospitals. When hospital records were not available or the ethnic group was not recorded (45% of cases) health advocates from the ethnic minority communities assigned patients on the basis of their names. (In a series of 131 cases in which the ethnic group was known from the case notes this method correctly identified 118 (90%).)

Relative risks of tuberculosis in defined groups compared with national rates were estimated by dividing the observed number of notifications by the expected number. The expected number was calculated by applying age and sex specific notification rates in England and Wales² to the age and sex structure of the local population from the 1991 census. Refugees were mostly not enumerated in the census; the above numbers were derived from registrations with local community groups⁵ and the age and sex structure from family health services authority registrations.

Results

NATIONAL DATA BY DISTRICT

In 1992, 29% of notified cases of tuberculosis occurred in the 10th of the population with the highest

Department of Public Health, East London and City District Health Authority, London E3 2AN
N Bhatti, senior registrar
R Halliday, senior registrar

Department of Environmental and Preventive Medicine, Wolfson Institute of Preventive Medicine, St Bartholomew's Hospital Medical College, London EC1M 6BQ
M R Law, reader
J K Morris, statistician

Department of Respiratory Medicine, St Bartholomew's Hospital, London EC1A 7BE
J Moore-Gillon, consultant physician

Correspondence to:
Dr Law.

BMJ 1995;310:967-9

Jarman index, an incidence nine times that in the 10th with the lowest index. Of the 10 factors that make up the overall Jarman score, two—overcrowding and the proportion of ethnic minority residents in a district—are directly related to the risk of tuberculosis and eight are markers of general socioeconomic deprivation. The risk of tuberculosis was more strongly related to overcrowding: 36% of cases occurred in the 10th of the population with the highest overcrowding index, which was 15 times the rate in the lowest (fig 1). The proportion of ethnic minority residents in districts was a slightly weaker predictor (33% in the top 10th). However, there was a high degree of correlation between the factors (overcrowding with ethnic minorities ($r=0.85$) or with the entire Jarman score ($r=0.80$)), preventing the apportioning of risk to individual causal factors.

Figure 2 plots the annual notification rate of tuberculosis in each 10th of the population (ranked by overcrowding index) from 1980 to 1992. There was an increase of 35% in the notification rate of tuberculosis from 1988 to 1992 in the 10th of the population with the highest index ($P<0.001$) and an increase of 13% in the next two 10ths ($P<0.001$). In the remaining 70% there was no increase.

Geographically, the national increase in tuberculosis from 1988 to 1992 was concentrated in certain regions—inner London and Northern and West Midlands regions.¹ But the average increase of 34% in these regions was largely due to their socioeconomic deprivation. The independent increase (after adjustment for the higher overcrowding scores of the districts within them by multiple logistic regression) was only 12%.

LOCAL DATA

Figure 3 shows the annual numbers of notified cases of tuberculosis in Hackney residents since 1980 and

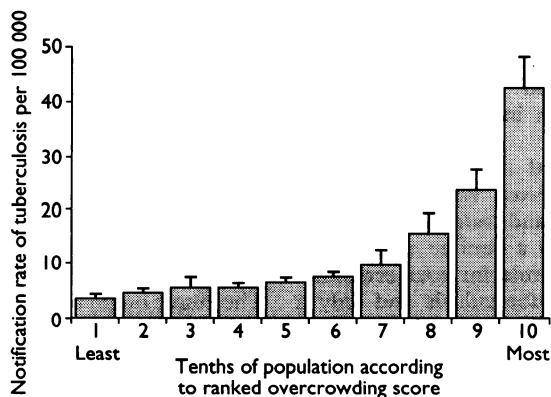


FIG 1—Notification rate of tuberculosis in 1992 by 10ths of England and Wales population according to ranked overcrowding scores in 403 local authority areas. Bars are 2SE

Increase in incidence of tuberculosis between 1986-8 and 1991-3 according to ethnic origin, London Borough of Hackney

Ethnic origin (% of Hackney population, 1991)	No (%) of cases, 1991-3 (A)	Rate relative to England and Wales (95% confidence interval)†	No of cases, 1986-8 (B)	Increase from 1986-8 to 1991-3	
				Absolute (A-B)	Proportionate (%) [(A-B)/B]
Established communities:					
White and West Indian (74)	123 (40)	2.0 (1.6 to 2.5)	78	45**	58
Indian subcontinent (6)	72 (24)	20.2 (15.0 to 25.0)	51	21‡	41
Other (3)	5 (2)	3.7 (0.5 to 6.9)	0	5*	—
All (83)	200 (66)	3.2 (2.7 to 3.6)	129	71***	55
New communities:					
African (sub-Saharan) (6)	36 (12)	8.7 (5.6 to 11.8)	17	19**	112
Refugees:					
Kurdish (6)	34 (11)	8.7 (5.7 to 12.0)	19	15*	79
East African (3)	21 (7)	8.9 (4.8 to 13.0)	2	19***	950
South East Asian (2)	14 (5)	8.6 (3.5 to 14.0)	5	9*	180
All (17)	105 (34)	8.7 (6.9 to 10.5)	43	62***	144
All cases	305 (100)	4.1 (3.6 to 4.6)	172	133***	77

†Based on 254 notified cases only.

‡P=0.06. *P<0.05. **P<0.01. ***P<0.001.

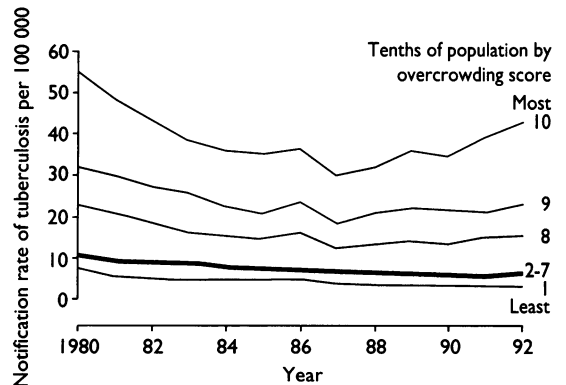


FIG 2—Annual notification rates of tuberculosis in England and Wales, 1980-92, by 10ths of population according to overcrowding scores. (Groups 2-7 are merged because their trends were similar)

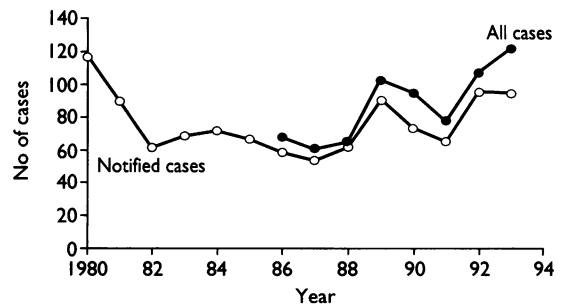


FIG 3—Numbers of cases of tuberculosis in Hackney, 1980-93

of all cases (notified and unnotified) since 1986. The pattern was similar to that in the most socioeconomically deprived 10th of the England and Wales population as a whole (fig 2), but both the decline from 1980 to 1987 and the subsequent increase were steeper: the total number of cases increased by 77% from 1986-8 (172) to 1991-3 (305). The overall notification rate in Hackney residents in 1991-3 (excluding cases identified from laboratory data alone), age and sex adjusted, was four times the national rate.

The table shows the increase according to ethnic group. In white (excluding Turkish and Kurdish) and West Indian residents the risk in 1991-3 was double the national rate ($P<0.001$), and the number of notifications increased by 58% from 1986-8 (78) to 1991-3 (123) ($P=0.002$). White and West Indian subjects could not be distinguished from each other by their names, but in cases where ethnic group was known from hospital records the rates were similar in the two communities. In residents originating from the Indian subcontinent there was a slightly smaller increase of 41% from 1986-8 to 1991-3. The sizes of the local white, West Indian, and Indian subcontinent communities remained fairly steady over the period (from comparison of 1981 and 1991 census data), so these increases represented an increase in incidence in the resident population of similar magnitude in the three communities.

The African and refugee communities increased in size between 1986-8 and 1991-3, and the increased number of cases within them must partly have represented the introduction of tuberculosis into Hackney by immigrants. These communities, however, accounted for less than half of the overall increase in Hackney. The introduction of tuberculosis into the established communities from the newer communities was unlikely as there was little mixing between the two.

SOURCES OF INCREASE

The local data showed that the proportion of all cases that were notified (85% overall) did not increase between 1986 and 1993 (fig 3), suggesting that the

increase in the notification rate in socioeconomically deprived districts represented a real increase in disease frequency. The local increase in tuberculosis was not due to an increase in people sleeping rough, as there were no such cases in 1991-3. It was only in small part due to the increase in HIV infection (three cases of tuberculosis in patients known to be HIV positive in 1991-3).

Discussion

National data show that there has been an increase in the notification rate of tuberculosis since 1988 in the poorest 30% of the population of England and Wales but no increase in the remainder. There was a strong association of tuberculosis risk with overcrowding and a slightly weaker association with the proportion of residents from ethnic minority communities. But the high correlation between different markers of socio-economic deprivation prevents attribution of the increase to specific factors. There are too few socioeconomically deprived districts with small ethnic minority communities.

Local data in one socioeconomically deprived district, however, show that the increase affected all established communities ("low risk" white and West Indian and "high risk" Indian subcontinent residents) to a similar extent. Though almost half of the overall local increase in the number of cases of tuberculosis occurred among the recent African and refugee immigrants (table), the size of these communities is particularly large in Hackney, as was the recent increase in tuberculosis (77%). The recent immigrants settled mainly in north east London, and they will account for a much smaller proportion of the population of most other socioeconomically deprived districts. Our data suggest that the 35% increase in tuberculosis in the poorest 10% of the national population has affected the white and established ethnic minority communities to a similar extent and is only in small part due to the introduction of tuberculosis into Britain by refugees and other ethnic minority communities.

The local increase did not arise through an increase in the numbers of people sleeping rough. Local and national⁶ data indicate that HIV infection was not an important contributory factor to the increase in tuberculosis (though the results of the 1993 national survey are awaited). There was no increase locally in the proportion of cases notified (fig 3), and the overall undernotification of 15% was in any case too low to account for the average increase in tuberculosis in impoverished districts of 35%.

Data from other socioeconomically deprived districts would be helpful. But the evidence favours a major role for socioeconomic factors that affect all residents in accounting for the increase in tuberculosis in poor districts and only a minor role for factors specifically related to "high risk" ethnic minority residents and the recent entry of refugees. The strong relation between tuberculosis and poverty in England and Wales⁷ (fig 1) may explain the rise in tuberculosis, as the poorest people in Britain are becoming still poorer. The real income of the poorest 20% of the population has declined by a fifth since 1987 and that of the poorest 5% by over half.⁸ Data from the Republic of

Key messages

- During 1988-92 the incidence of tuberculosis increased by 12% in England and Wales
- The increase affected only the poorer areas; in the poorest 10th of the population it was 35%
- Data from one such area suggest that the increase affected white people, West Indians, and residents of Indian subcontinent origin to a similar extent; the recent entry of refugees was likely to be only a minor factor in the national increase in tuberculosis
- Socioeconomic factors affecting all residents are likely to be predominantly responsible for the increase in tuberculosis—not factors specific to high risk ethnic minority groups

Ireland support this interpretation: there is more poverty there but there are far fewer non-white residents than in England and Wales, and the increase in tuberculosis between 1988 and 1991-2 was greater in Ireland (16%).⁹

In responses to the increasing incidence of tuberculosis in inner city areas, simple measures like contact tracing and encouraging early clinical presentation (by dissemination of information on the common symptoms of tuberculosis and ensuring universal access to health care services) are important. Clinically a high index of diagnostic suspicion of tuberculosis is needed when dealing with all patients in deprived inner city areas. Conventional concepts of high risk and low risk subjects based on ethnic grouping are not appropriate. But it is unlikely that the increasing incidence of tuberculosis in underprivileged areas can be reversed without first reversing the underlying decline in real income of the poorest sector of the population.

We thank Professor B Jarman for data on the component factors of the Jarman scores for the 403 local authority areas in England and Wales; Akgul Baylav, Joy Awaih, and Tsegai Gezahegn for helping to assign patients to ethnic groups on the basis of names; Professor S Tabaqchali, Ian Harrison, Steven Jones, Elizabeth Price, and Carol Parkes for microbiological data; and Julian Flowers for computing.

- 1 Watson JM. Tuberculosis in Britain today. *BMJ* 1993;306:221-2.
- 2 Office of Population Censuses and Surveys, Communicable Disease Surveillance Centre. *Communicable disease statistics, England and Wales, 1992*. London: HMSO, 1994.
- 3 Jacobson B. Public health in inner London. *BMJ* 1992;305:1344-7.
- 4 Jarman B. Identification of underprivileged areas. *BMJ* 1983;286:1705-9.
- 5 Awaih J. Refugees and their health needs. In: *Health in the city and Hackney. Annual public health report*. London: Department of Public Health, City and Hackney District Health Authority, 1992:24-7.
- 6 Watson JM, Fern KJ, Porter JDH, Whitmore SE. Notifications of tuberculosis in England and Wales, 1982-1989. *Commun Dis Rep CDR Rev* 1991;1:13-6.
- 7 Spence DPS, Hotchkiss J, Williams CSD, Davies PDO. Tuberculosis and poverty. *BMJ* 1993;307:759-61.
- 8 Jenkins SP. *Winners and losers: a portrait of the UK income distribution during the 1980s*. Swansea: Department of Economics, University College of Swansea, 1994. (Discussion paper series No 94-07.)
- 9 Planning Unit, Department of Health (Republic of Ireland). *Health statistics, 1992*. Dublin: Government Stationery Office, 1994.

(Accepted 27 January 1995)