

Population need for renal replacement therapy in Thames regions: ethnic dimension

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Abstract

Objectives—To determine the use of renal replacement therapy by ethnic origin and to ascertain the variation in provision of such therapy and to relate this to the distribution of ethnic minority populations.

Design—Analysis of retrospective and cross sectional data from 19 renal units.

Setting—All four Thames regional health authorities.

Subjects—Patients resident in the Thames regions who were accepted as new patients for renal replacement therapy during 1991 and 1992 and the patients who were already undergoing such treatment between December 1992 and April 1993.

Main outcome measures—Rates of acceptance for and prevalence of renal replacement therapy among white, black, and Asian people.

Results—The average annual acceptance rates per million in 1991-2 were 61 for white people, 175 for black people, and 178 for Asians, and the prevalences per million were 351, 918, and 957 respectively. The relative risks increased with age. A threefold increase in the acceptance rate occurred in people aged under 55 in both the black and Asian populations, suggesting that the higher rates are probably not due to factors related to access alone. Treatment rates varied considerably among districts, reflecting both the distribution of ethnic minority populations and access to services.

Conclusion—Black and Asian people receive and have a greater need for renal replacement therapy, and the need will increase as these populations age. These findings have important implications for the provision of renal services in districts with a high proportion of ethnic minorities and for the management of diabetes mellitus and hypertension, two important causes of end stage renal failure in these populations.

Introduction

End stage renal failure is fatal unless renal replacement therapy—dialysis or transplantation—is given. The Renal Association undertook two prospective studies of population need for renal replacement therapy,^{1,2} and a national requirement to treat 80 new patients aged under 80 suitable for renal replacement therapy per million population per year was established.³ The studies were undertaken in areas either with a low proportion of people from ethnic minorities or in which the average age of people from ethnic minorities was low. Evidence suggests that the ethnic composition of a population could be an important determinant of population need. Hypertension and diabetes mellitus, both important underlying causes of end stage renal failure, are more common in black people and in Asians (defined as coming from the

Indian subcontinent) than in white people.⁴ Studies in the United States have shown that a significantly greater proportion of black people are accepted for renal replacement therapy than non-black people.^{5,6} A study in Leicester has shown significantly higher rates of diabetic end stage renal failure in Asians.⁷ Data on ethnic variations in end stage renal failure in Britain, however, are limited.

The London Implementation Group's review of renal services used data from renal units on all patients resident in the Thames regional health authorities.⁸ This large population based dataset enables us to examine the relation between ethnic origin and the provision and uptake of renal replacement therapy. The proportion of people in ethnic minority groups is appreciable in the Thames regions, especially in inner London, where in the 1991 census 13.5% of the total population was black and 8.8% Asian.⁹

Method

We obtained data on the district health authority of residence and patients' age and ethnic origin from all 16 adult and all three paediatric renal units in the four Thames regions (North West, North East, South East, South West), both for the new patients accepted for renal replacement therapy in 1991 and 1992 and for patients currently receiving therapy. Only four of the adult units were outside Greater London (inner and outer London), and these were Stevenage, Southend, Canterbury, and Brighton). The "new patients" excluded those with failed transplants restarting dialysis and those already receiving dialysis who were transferred from one unit to another. Units in neighbouring regions—namely, in Cambridge, Oxford, Ipswich, and Portsmouth and at the Royal Air Force base at Halton—were asked for the same details of any patients under their care who were resident in the Thames regions so that cross boundary flows could be taken into account. Cross tabulations were available for age and ethnic origin (in nine units only) but not for district health authority of residence.

We calculated the acceptance rates (new patients accepted for renal replacement therapy) as the average of new patients accepted in the calendar years 1991 and 1992, and we based the prevalence on the number of patients receiving therapy on or around 1 February 1993 (the date varied by unit from December 1992 to April 1993). Population denominators for health authorities (on the basis of 1991 boundaries) were the provisional rebased mid-1991 population estimates and for ethnic groups the data from the 1991 census. The rates presented are for the total population (those under 16 are included in the denominator) to be consistent with the Renal Association's estimate of population need.³

The ethnic origin of patients was classified by the renal units as white, black, Asian, and other. Ethnic

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TABLE I—Acceptance rates and prevalences of renal replacement therapy in Thames regions by ethnic group

	Population group				Whole population
	White	Black	Asian	Other	
Acceptances 1991-2:					
Average No	743	101	123	35	1002
Annual rate per million*	61	175	178	119	73
Relative risk (95% confidence interval)	1.0	2.9 (2.3 to 3.5)	2.9 (2.4 to 3.6)	2.0 (1.4 to 2.8)	1.2 (1.1 to 1.3)
Prevalence:					
No (%)	4284 (76)	530 (9)	660 (12)	162 (3)	5636
Rate per million*	351	918	957	552	409
Relative risk (95% confidence interval)	1.0	2.6 (2.4 to 2.9)	2.7 (2.5 to 3.0)	1.6 (1.4 to 1.8)	1.2 (1.1 to 1.2)

*Total population.

group specific rates were derived on the basis of the 1991 census population denominators. The box shows a comparison of the classification of ethnic origin by the renal units and by the 1991 census. We included half of the population of the census group "Asian (other)" in the denominator of the renal units' "Asian" category because further examination of the census data by country of birth showed this to be a reasonable approximation.

The age specific breakdown by ethnic origin was available from a representative group of nine renal units (which included over half of all new acceptances). This distribution was applied to all the acceptances to derive overall age specific acceptance rates for the ethnic groups for the Thames regions.

Classification of ethnic origin	
Renal units	1991 census
White	White
Black	Black (Caribbean), black (African), black (other)
Asian	Indian, Pakistani, Bangladeshi, and 50% of Asian (other)
Other	All other

TABLE II—Age profile of patients accepted for renal replacement therapy* in Thames regions by ethnic group, 1991-2. Values are numbers (percentages) of patients

Age (years)	White (n=857)	Black (n=106)	Asian (n=129)
16-	402 (47)	55 (52)	71 (55)
55-	166 (19)	32 (30)	35 (27)
≥ 65	289 (34)	19 (18)	23 (18)

*Based on analysis from nine renal units.

To estimate district health authorities' needs for renal replacement therapy that took into account the ethnic minority population we gave a range or relative risk of need for therapy of 1.5, 2.0, 3.0, and 4.0 to the proportion of black people and Asians in each district. We then calculated estimates of need on the basis of the underlying need of white people only of 80 per million.³ The data are presented as the median and interquartile range of district acceptance rates and as the overall mean rate for the Thames regions.

We mapped patients by district health authority of residence to examine district based rates of acceptance and prevalence. We classified district health authorities as being in inner London, outer London, or a shire (county outside Greater London) according to the Office of Population Censuses and Surveys' categories. Data on children, obtained from the relevant paediatric renal units, did not include district or residence so these cases were not included in the mapping, but the numbers for districts were too low to affect overall rates greatly.

We calculated 95% confidence intervals on rate ratios (relative risk).¹⁰ Simple linear regression was used to correlate the proportion from ethnic minorities and acceptance rate for each district health authority.

Results

ACCEPTANCE RATES AND PREVALENCES FOR ETHNIC GROUPS

Crude acceptance rates and prevalences were three times as high in the black and Asian populations as in the white population (table I). The acceptance rates

and prevalences for the population as a whole were 20% and 17% higher respectively than those for the white population only. Further analysis showed that the difference in the rates of renal transplantation between the black population and the population as a whole was less than 17%. Table II shows the age profile of patients accepted for renal replacement therapy in nine of the renal units by ethnic group. Higher proportions of both black and Asian patients than white patients were under 55. The relative risk of acceptance for the ethnic groups compared with the white population increased with age, being threefold at age 16-54, between fivefold and sixfold at age 55-64, and eightfold at age 65 and over (table III).

TABLE III—Age specific acceptance rates for renal replacement therapy in Thames regions by ethnic groups, 1991-2

	Population group		
	White	Black	Asian
Age 16-54 years:			
Rate per million	53	160	158
Relative risk (95% confidence interval)	1.0	3.1 (2.3 to 4.0)	3.0 (2.3 to 3.9)
Age 55-64 years:			
Rate per million	114	623	831
Relative risk (95% confidence interval)	1.0	5.5 (3.6 to 8.2)	6.0 (4.5 to 8.0)
Age ≥ 65 years:			
Rate per million	119	923	952
Relative risk (95% confidence interval)	1.0	7.8 (4.8 to 12.5)	8.0 (5.2 to 12.4)

*Average annual rate 1991-2.

ESTIMATES OF DISTRICT BASED POPULATION NEED

Varying the assumptions about the relative risk of need for renal replacement therapy in black and Asian people has little effect in districts with low proportions of these groups but has a substantial effect in those with appreciable proportions. On the assumption that the increased relative risk in the black and Asian populations was 1.5, districts with large ethnic populations would have an estimated population need (in terms of acceptances for renal replacement therapy per year) of over 90 per million, and overall the need for the Thames regions would be 84 per million (fig 1). If the increase in risk was threefold some districts would have a need of over 140 per million, and the overall need in the Thames regions would be 94 per million.

GEOGRAPHICAL DISTRIBUTION OF ACCEPTANCES AND PREVALENCE

The overall annual acceptance rate in the Thames regions was 74 per million, compared with the national estimate of need of 80 per million for people aged under 80.³ The rate varied from 51 per million in the shires to 82 in outer London, and 110 in inner London (fig 2). The acceptance rate was significantly higher (at the

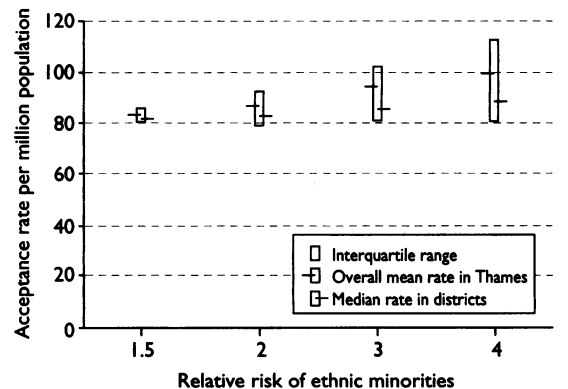


FIG 1—Predicted acceptance rates for renal replacement therapy in Thames district health authorities by relative risk for ethnic minorities

95% confidence level) than 80 per million in five districts—namely, Harrow, Parkside, West Lambeth, Camberwell, and Lewisham and North Southwark—all of which have large ethnic minority populations. Conversely, the rate was significantly lower than 60 per million in four districts in the shires—namely, North

Bedfordshire, North East Essex, Mid Essex, and Maidstone).

The overall prevalence for all Thames regions was 421 per million, and the prevalences per million for the shires, outer London, and inner London were 312, 474, and 580 respectively (fig 3). Prevalences were higher than 700 per million in Harrow, West Lambeth, and Camberwell and lower than 250 in North Bedfordshire and South West Surrey. In comparison, the mean prevalence in the United Kingdom at the end of 1991 was 354 per million.¹¹

A significant positive correlation existed between acceptance rates in districts in Greater London—whose populations were all within 30 minutes' driving time from renal units—and their respective proportions of all ethnic minorities ($r^2=0.61$, $P<0.0001$).

Discussion

This study has shown threefold increases in the acceptance rate and prevalence for the black and Asian populations compared with the white population. The possible explanations for this finding are inaccuracies in numerators or denominators, or both; closer proximity of black and Asian people to renal units and hence higher rates of referral; an increased incidence of end stage renal failure; or combinations of these factors.

The rates for the ethnic groups may be overestimated if underenumeration in the 1991 census was higher in ethnic minorities. The Office of Population Censuses and Surveys' estimate of underenumeration in the total population in inner London was 4% in the white population, 4% in the Asian population, and about 5% in the black population.¹² Even inflating the denominators of ethnic minority populations to take account of this underenumeration does not substantially alter the ethnic groups' acceptance rates or relative risk. The estimates by the Office of Population Censuses and Surveys are based on the assumption that selective underenumeration by ethnic group did not occur and that variation by area arose because of differences in age or sex, or both. It is possible, however, that selective underenumeration by ethnic group did occur, though limited evidence suggests that such underenumeration is largely restricted to young men, so overall and age specific rates should be robust.^{13,14} Moreover, even if the relative risks are lower because of underenumeration the overall demand will be about the same because it is a product of risk and population. Patients were ascribed to ethnic groups by the renal units; this is more likely to have produced occasional misclassification than a selective increase in the numbers of ethnic minority patients so is not likely to have produced an important bias.

The ethnic minority populations live closer to the renal units in central London than the white population and so may have had easier access to them. Three factors, however, might preclude this as an adequate explanation: firstly, the higher acceptance rate in the 16-54 age group, in which most if not all patients should be referred irrespective of distance'; secondly, the high correlation between the ethnic composition of a population and the acceptance rates among districts in Greater London; and, thirdly, the known concern about the poor accessibility of health services to people from ethnic minorities.¹⁵ It is difficult, however, to separate precisely the need of ethnic minorities from factors related to access in these data, and more detailed analysis of district based ethnic group specific rates is needed so that access can be taken into account. Despite the observed higher rates of renal replacement therapy in ethnic minority populations, the need of these populations may not be being met.

The most likely main explanation for the high

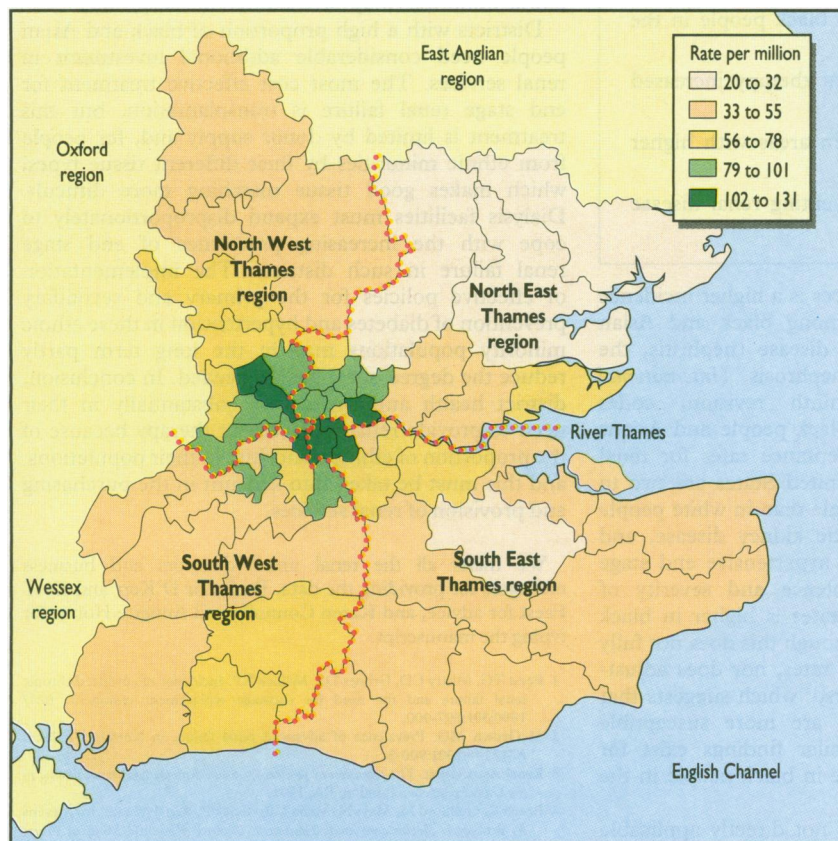


FIG 2—New patients accepted for renal replacement therapy in Thames regions: annual rate per million, 1991-2

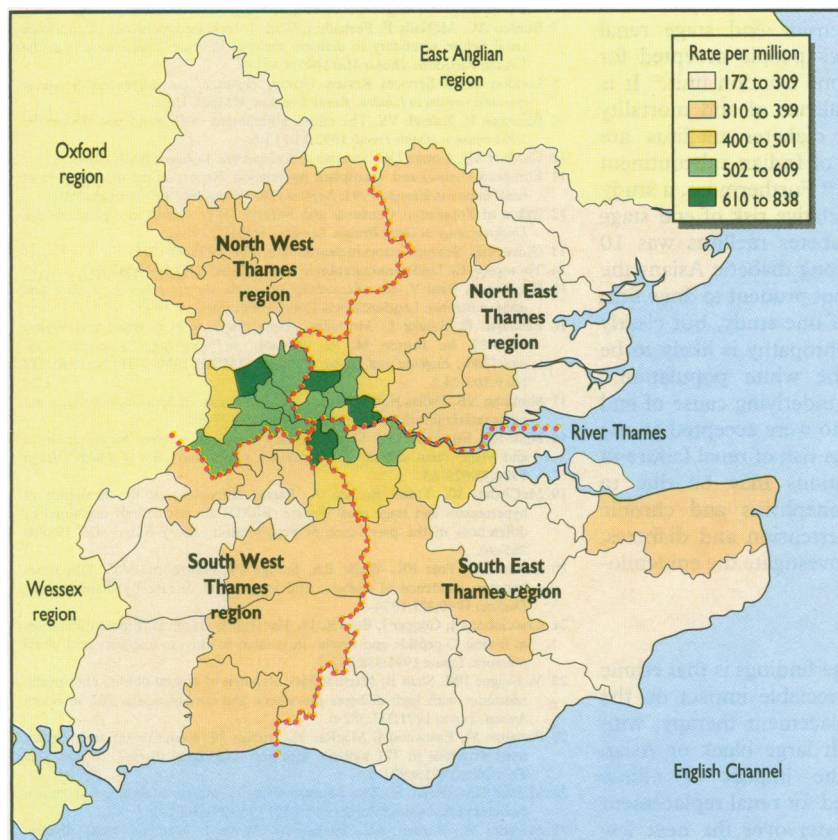


FIG 3—Patients already receiving renal replacement in Thames regions: annual rate per million, February 1993

Clinical implications

- Certain causes of end stage renal failure, such as diabetes mellitus and hypertension, are more common in Asians and black people
- This study shows threefold increases in the acceptance rates and prevalences of renal replacement therapy among Asians and black people in the Thames regions
- The relative risk of acceptance for renal replacement therapy increased with age
- The need for renal replacement therapy is greater in areas with higher proportions of ethnic minorities
- Health authorities should identify the scope for preventing renal disease when planning provision of renal services

acceptance rates and prevalences is a higher incidence of end stage renal failure among black and Asian people. Mortality from renal disease (nephritis, the nephrotic syndrome, and nephrosis (*International Classification of Diseases*, ninth revision, codes 580-589)) is higher in both black people and Asians in England and Wales.¹⁶ Acceptance rates for renal replacement therapy in the United States are two to four times higher in black people than in white people for all causes except polycystic kidney disease, and rates are particularly high for hypertensive end stage renal failure.^{5 6 17 18} The prevalence and severity of hypertension in the United States is higher in black people than in white people, though this does not fully explain the higher acceptance rates, nor does adjustment for socioeconomic factors,¹⁹ which suggests that the kidneys of black people are more susceptible to hypertensive damage. Similar findings exist for diabetic end stage renal failure in black people in the United States.²⁰

Although these findings are not directly applicable to Britain, black people in England and Wales are known to have a higher mortality from hypertension and stroke,¹⁶ and some evidence suggests a higher prevalence of hypertension in black people.^{21 22} A greater proportion of hypertensive end stage renal failure was found among black people accepted for renal replacement therapy at one London unit.²³ It is well established that the prevalence of and mortality from non-insulin dependent diabetes mellitus are several times higher in people of Indian subcontinent origin than in white people.^{16 22 24} Furthermore, a study in Leicester showed that the relative risk of end stage renal failure secondary to diabetes mellitus was 10 times higher in Asians and among diabetic Asians the risk was 13 times higher.⁷ It is not prudent to draw firm conclusions from the results of one study, but clearly the prevalence of diabetic nephropathy is likely to be higher in Asians than in the white population.²⁵ Diabetes was the commonest underlying cause of end stage renal failure in Asians who were accepted at one London renal unit.²³ The excess risk of renal failure in the black and Asian populations may be due to conditions such as glomerulonephritis and chronic pyelonephritis, as well as hypertension and diabetes, and further work is needed to investigate the epidemiology of renal disease.

IMPLICATIONS

The main implication of these findings is that ethnic composition can have an appreciable impact on the population need for renal replacement therapy, with consequences for districts with large black or Asian populations. Furthermore, the impact of ethnic composition on population need for renal replacement therapy will become even greater over the next few decades for two reasons. Firstly, black and Asian populations have a comparatively young age structure

at present and the incidence of end stage renal failure increases with age. Secondly, our analysis suggests that the relative risks of these ethnic groups increase with age so the impact of aging will be disproportionately enhanced compared with that in the white population, although second generation British born members of ethnic minorities may have a different risk profile.

Districts with a high proportion of black and Asian people need considerable additional investment in renal services. The most cost effective treatment for end stage renal failure is transplantation, but this treatment is limited by donor supply and, for people from ethnic minorities by their different tissue types, which makes good tissue matching more difficult. Dialysis facilities must expand disproportionately to cope with the increasing prevalence of end stage renal failure in such districts. The implementation of effective policies for the primary and secondary prevention of diabetes and hypertension in these ethnic minority populations may in the long term partly reduce the degree of expansion needed. In conclusion, district health authorities vary substantially in their need to provide renal replacement therapy because of the proportion of ethnic minorities in their populations, and this must be taken into account in the purchasing and provision of renal services.

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