Chapter 17: Social Deprivation on Renal Replacement Therapy

Summary

- Acceptance rates for renal replacement therapy (RRT) appeared to be higher in more deprived areas. Whilst this is partly due to patients on RRT from ethnic minorities being from more socially deprived areas, White patients with ERF were also from more socially deprived areas.

- Patients from the most deprived areas are younger and have more co-morbidity.

- There appears to be no difference in timing of referral to a nephrologist between the deprivation quintiles.

- Patients commencing RRT on PD have significantly lower Townsend scores (i.e. are less socially deprived) than those commencing on HD. Similarly patients receiving a pre-emptive renal transplant have significantly lower Townsend scores ($p \geq 0.0001$).

- Social deprivation was a significant factor associated with 1 year survival on RRT after adjusting for age and primary renal diagnosis, but it was not significant after adjusting for cardiovascular co-morbidity.

Introduction

A strong relationship exists between social deprivation and all-cause mortality in the UK general population, with higher mortality rates observed in areas of higher social deprivation than in more affluent areas.[1] The increasing mortality with increasing deprivation remains clear even within individual diseases such as ischaemic heart disease (IHD) and cancer. For example, in men with IHD living in more deprived areas, there is a 2.7-fold increase in death rate relative to those with IHD and from more affluent areas.[1]

Lower socio-economic status (SES) has been shown to be associated with reduced survival for several types of cancer, over and above any effect on incidence.[2,3] Explanations for such an effect include:

- Disease severity at presentation (e.g. delay in presentation or referral);
- Quality of care (surgery, adjuvant therapies);
- Host factors altering the responses to the treatment and cancer, e.g. co-morbidity at start, compliance with therapy, lifestyle factors affecting risk (e.g. smoking, diet), psychosocial factors.[4]

Considering the relationship with renal disease, annual household income and education-based socio-economic status have been shown to correlate with the development of established renal failure (ERF) in the North American general population[5] and ethnic minorities.[6] Although not all studies concur,[7] there is some evidence that in the USA socio-economic status influences survival on RRT.[8,9] In the more recent of these two US studies, rising levels of neighbourhood income were associated with reduced mortality on RRT, suggesting that personal or environmental factors that differ by social group effect survival.[9] It is likely that rates of co-morbidity, including smoking differ by socio-economic status though this has not been adequately investigated.[10] Patients in lower socio-economic groups may also have reduced compliance with medication.[11]

The National Health Service in the UK provides health care for all which is free-at-the-point-of-use. This includes primary care, secondary care and prescription medicines, contrasting with the US where many people in lower socio-economic groups lack access to both primary health care and medications. Care must therefore be exercised in extrapolating from US data to the UK. When social deprivation of prevalent patients was examined in the 2000 UK Renal Registry report, it was not found to have a significant influence on survival (n = 2874, p = 0.4). One flaw in analysing a prevalent cohort is that it assumes that a large number of patients in one subgroup have not died early on in the RRT programme leaving a biased subset of survivors in different deprivation groups. The 1998 cohort of 1500 incident patients was considered too small to analyse trends in social deprivation and survival and the Registry had been waiting for the new 2001 Census data before repeating these analyses on the much larger incident cohort now available.

In the intervening years data from Trent, Scotland and North-West England have been examined. Junor analysed the combined 20 year incident cohort from 1980–1999 in Scotland and demonstrated a trend to lower survival in the most socially deprived patients under 55 years of age but no difference in those over 55 years.[12] Further, a prospective study in North-West England (n = 620) found that the most socially deprived dialysis patients were significantly less likely to achieve the Renal Association targets for haemoglobin and phosphate and had higher hospitalisation rates, although these data were not adjusted for diabetes.[13]

The effect of socio-economic status on access to the different modes of renal replacement therapy also requires consideration. Data, again from the US, have shown that socially deprived individuals are less likely to receive peritoneal dialysis as their initial mode of treatment.[14] Although these patients had an equal opportunity of receiving a renal transplant once wait-listed, their chance of getting onto the renal transplant waiting list was significantly less than those of more affluent patients.[15] Maheswaran analysed social deprivation using the Townsend score in prevalent patients on renal replacement therapy in the Trent Region, and found an increased prevalence in patients from more deprived backgrounds. This effect was most marked for haemodialysis and least marked for transplantation.[16]

The aim of this chapter is to describe the area-level social deprivation characteristics of a cohort of incident and prevalent RRT patients in the UK, examine how clinical characteristics vary by deprivation group and evaluate the impact of deprivation on initial and 90-day mode of RRT and patient survival.

Methods

Study sample

All patients commencing RRT between 1997 and 2002 in centres reporting to the Registry were included. Patients in Scotland and Northern Ireland could not be included because of time pressures and anticipated difficulties linking postcodes to 2001 Census data in these countries.

Additional data were also obtained from the Manchester based study of Implementation of Renal Standards (SIRS). This study involves Manchester Royal Infirmary, Hope Hospital and Royal Preston Hospital who have kindly provided the Registry with their data to be included in the analysis (A Trehan). The SIRS group have prospectively collected their data from April 2000 onwards, although this analysis includes only the SIRS data for the complete years 2001 and 2002. The Royal Preston Hospital is already part of the UK Renal Registry.

Each individual patient postcode was validated against the address fields using a commercial postcoding software package (QAS systems).

In the Cox model, deaths occurring in the first 90 days were excluded from the analysis as some renal units may have included a number of patients with acute renal failure which would influence early death rates.

Patients were censored at the end of follow up and not at the time of renal transplantation.

Data used in the comparative prevalent cohort were from patients alive on the 31st December 2002.

Calculating the Townsend deprivation score

The Townsend index was used as the scoring system for social deprivation, which was derived from the patient's postcode. The Townsend index (calculated for the Registry from the 2001 Census data, by Hannah Jordan of Southampton University) is a composite measure of deprivation based on total unemployment rate, no-car households, overcrowded households and not owner-occupier households based on the electoral ward as at the 2001 Census. The higher the Townsend index, the greater is the deprivation. A comparison with other UK methods of scoring deprivation is shown at the end of this chapter (Annex A, Table 17.11).

Using 2001 Census data, a profile was created for all 1.25 million postcodes in England and Wales. The postcodes were ordered by Townsend score from lowest to highest and then divided into quintiles of Townsend scores (Table 17.1). For those postcodes with more than one Townsend score (5% of postcode areas cross a census boundary), the mean Townsend score was calculated.

For all patients with a recorded postcode it was therefore possible to allocate;

1. A Townsend score for the postcode area in which they lived; and
2. A national Townsend quintile, the lowest quintile representing the least deprived one fifth of postcodes.

This approach was based on the assumption that each area with a postcode covers approximately the same number of residents.

Statistical analysis

ANOVA (Wilcoxon for non-parametric data) and chi-squared tests were performed to look for differences in continuous and categorical variables between the Townsend quintiles.

Differences in survival between the Townsend deprivation quintiles were studied using Kaplan–Meier survival curves.

To analyse the relationship between Townsend score and risk of death, two Cox Proportional Hazard models were created. All variables were entered into the model regardless of whether they had an independent effect on survival or not.

1. The first model included all patients with postcode data. Variables included in this model were limited to age, Townsend score (both as linear variables) and primary renal diagnosis (PRD), as these variables have high levels of completeness in all centres.
2. The second model included only patients in centres with >85% completeness of data for co-morbidity and ethnicity in the year they began RRT. As well as age, Townsend score (both as linear variables) and PRD, this model included the ethnicity and co-morbidity variables.

Table 17.1. Townsend scores by postcode quintile

Townsend quintile	1	2	3	4	5
	Least deprived			Most deprived	
Townsend score range	≤–3.35	–3.36 to –1.95	–1.96 to –0.14	–0.15 to 2.59	>2.60

Results

Townsend scores were available for 13,454 (97%) of the 13,859 patients commencing RRT in England and Wales between 1st January 1997 and the 31st December 2002 in centres reporting to the Registry. The SIRS database also contributed 412 patients (382 with Townsend data).

Socio-economic status of the renal replacement therapy population

In Figure 17.1, the distribution of Townsend score for the Registry incident and prevalent cohort was compared with that of the England & Wales general population. It has not been possible to derive the Townsend distribution for general population in areas just covered by the Registry. The figure shows that prevalent cohort patients have an identical Townsend distribution to that of the incident cohort. There appears to be an increased incidence of RRT in patients within the more deprived areas. This may be due to:

1. The Registry not being fully representative of the UK general population. However this is unlikely to explain these differences. The 20% of the E&W population missing from this analysis are from mixed deprivation areas. The South East of England, which is less deprived overall, is more than balanced in numbers by those cohorts missing from the more deprived areas of Birmingham, Stoke and inner London.
2. Confounding by ethnicity, if ethnic minorities with a higher incidence of renal replacement therapy live in more deprived areas than the general population.
3. A true increase in ERF in deprived areas for both diabetic ERF (accounting for 18% of incident patients) and non diabetic causes.
4. A confounding effect of different incident cohorts over the period of 1997–2002, with early renal units deriving from a more deprived area and submitting 5 annual cohorts compared with a less deprived renal unit joining in 2002 and submitting only one cohort.

Item four was addressed by separately analysing the incident cohorts for the individual years. All the annual cohorts showed a similar distribution of patients, with an excess of ERF patients from the more deprived population.

The figure was re-calculated separately for the Whites only and the ethnic minorities (Figure 17.2). The ethnic minorities were from a more socially deprived group than the Whites. But even after this adjustment there still appeared to be an excess of patients from those with a Townsend score of 1–5.

To investigate whether this effect was due to an effect of diabetics coming from a more

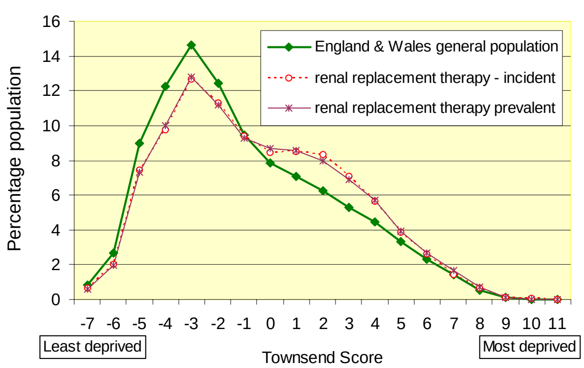

Figure 17.1 Population distribution of Townsend scores

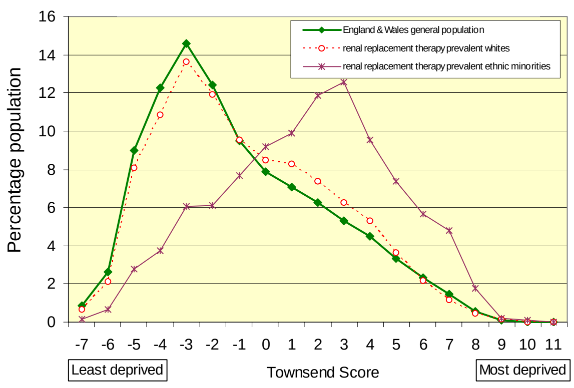

Figure 17.2. Population distribution of Townsend scores, effect of ethnicity

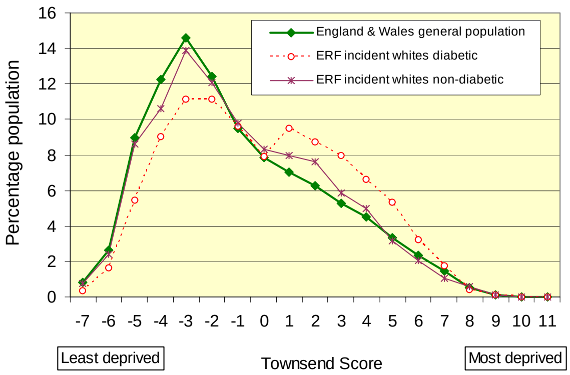

Figure 17.3. Population distribution of Townsend scores, effect of diabetes

deprived background, the figure was recalculated for Whites excluding diabetic patients and the White diabetics separately (Figure 17.3). This confirmed that there was an increased incidence of diabetics with renal failure from socially deprived backgrounds when compared with the general population. Type 1 and Type 2 diabetics were included together in this analysis. It was not possible to say to what extent this reflected a difference in incident rates of diabetes or progression rates or a combination of these two between areas. There still remained a small increased rate for non-diabetic White patients in deprived areas.

Centre

The mean Townsend deprivation score for incident renal replacement therapy patients in England & Wales is 0.08 (95% CI 0.03 to 0.14). This is more deprived than the UK general population mean Townsend score of –0.448. Patients starting RRT in Wales have a lower mean Townsend score (i.e. are less socially deprived) than those in England (–0.15, 95% CI –0.31 to 0.01 v 0.11, 95% CI 0.05 to 0.17 respectively). These values mask considerable variation in mean Townsend score between centres (Figure 17.4).

Although the sample size for some of the individual centres was small, the overall trend was for centres in the South tending to be less deprived (i.e. towards the left hand side of the graph), and those in the North and in London tending to be more deprived (i.e. towards the right hand side of the graph).

Modality and deprivation

Patients commencing RRT on PD have significantly lower Townsend scores (i.e. are less socially deprived) than those commencing on HD (Figure 17.5). Similarly, patients receiving a pre-emptive renal transplant have significantly lower Townsend scores (p 0.0001).

This finding persists when modality is considered at 90 days, indeed the difference is slightly increased – the mean Townsend score for HD patients increases slightly and the mean score for PD patients and trans-

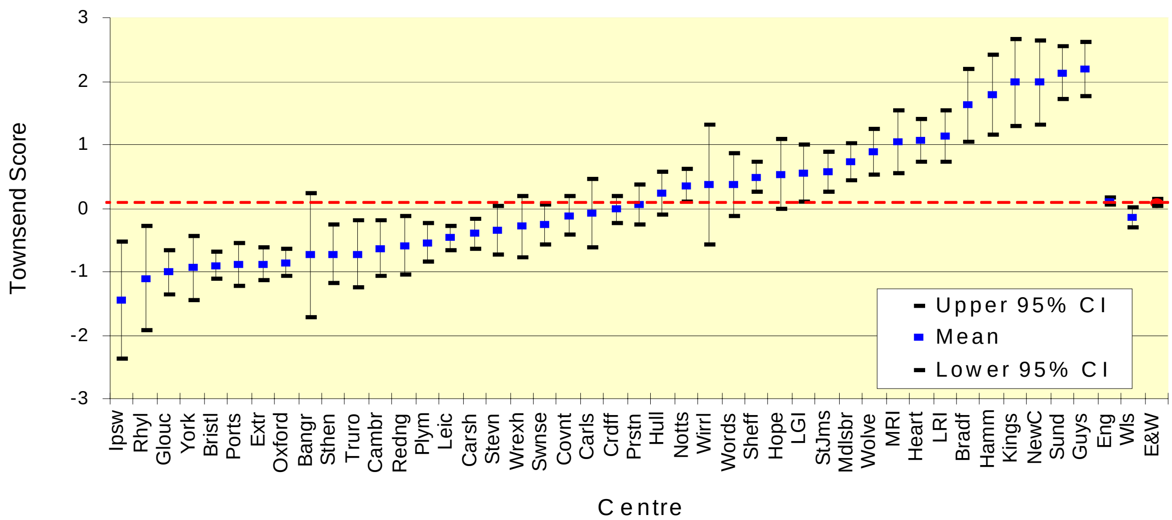

Figure 17.4 Mean Townsend score by renal unit

Table 17.2. Mean Townsend score by renal unit and numbers of invalid postcodes

Centre	Valid postcodes	Invalid postcodes	Mean Townsend	Townsend 95% CI
Ipsw	19	2	–1.44	–2.36 to –0.52
Rhyl	19	0	–1.11	–1.93 to –0.28
Glouc	283	16	–1.01	–1.36 to –0.66
York	144	1	–0.94	–1.45 to –0.43
Bristl	736	29	–0.9	–1.11 to –0.69
Ports	273	14	–0.89	–1.22 to –0.56
Extr	403	4	–0.88	–1.14 to –0.61
Oxford	742	29	–0.86	–1.06 to –0.65
Bangr	28	1	–0.74	–1.72 to 0.24
Sthend	152	2	–0.72	–1.19 to –0.26
Truro	93	3	–0.72	–1.24 to –0.2
Cambrid	178	1	–0.63	–1.07 to –0.19
Redng	156	2	–0.59	–1.05 to –0.13
Plym	375	11	–0.55	–0.85 to –0.24
Leic	972	16	–0.47	–0.67 to –0.27
Carsh	649	13	–0.4	–0.65 to –0.16
Stevn	219	3	–0.35	–0.73 to 0.03
Wrexh	171	13	–0.29	–0.78 to 0.19
Swnse	300	11	–0.26	–0.58 to 0.05
Covnt	459	7	–0.12	–0.42 to 0.18
Carls	139	7	–0.07	–0.62 to 0.47
Crdff	694	17	–0.02	–0.24 to 0.2
Prstn	464	7	0.06	–0.26 to 0.37
Hull	392	5	0.24	–0.11 to 0.58
Notts	673	17	0.35	0.09 to 0.61
Wirrl	39	1	0.37	–0.58 to 1.32
Words	185	1	0.37	–0.13 to 0.86
Sheff	788	27	0.49	0.25 to 0.72
Hope	147	19	0.53	–0.02 to 1.08
LGI	205	2	0.56	0.11 to 1.01
StJms	472	24	0.57	0.25 to 0.89
Mdlsbr	561	14	0.73	0.44 to 1.02
Wolve	313	14	0.89	0.53 to 1.25
MRI	235	11	1.04	0.54 to 1.54
Heart	440	24	1.07	0.73 to 1.41
LRI	318	13	1.14	0.74 to 1.55
Bradf	120	1	1.62	1.05 to 2.2
Hammers	95	2	1.79	1.15 to 2.42
Kings	110	7	1.98	1.29 to 2.66
NewC	103	2	1.98	1.32 to 2.65
Sund	224	4	2.12	1.71 to 2.54
Guys	366	8	2.19	1.77 to 2.61
Eng	12242	363	0.11	0.05 to 0.17
Wls	1212	42	–0.15	–0.31 to 0.01
E&W	13454	405	0.08	0.03 to 0.14

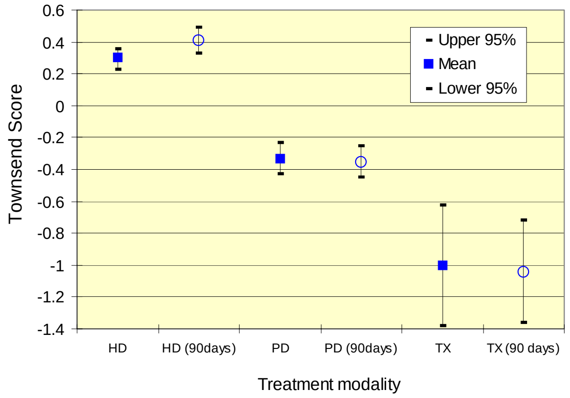

Figure 17.5. Townsend score by treatment modality at day 0 and day 90

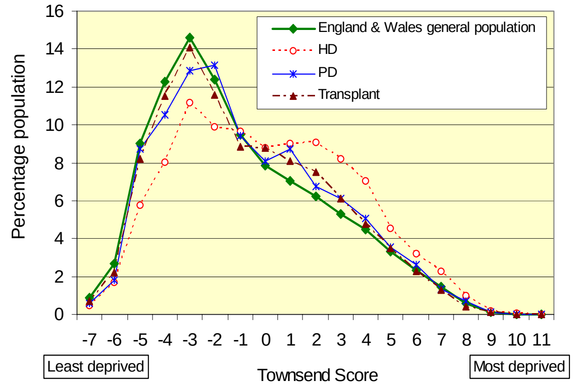

Figure 17.6. Population distribution of Townsend scores in prevalent patients, by modality

Table 17.3. First mode of treatment

Treatment	N Obs	N	Mean	95% CI
HD	9465	9163	0.3	0.23 to 0.36
PD	4125	4031	–0.33	–0.43 to –0.23
Transplant	265	256	–1	–1.38 to –0.62
Missing	4	4		

Table 17.4. Day 90 mode of treatment

Treatment	N Obs	N	Mean	CL for Mean
HD	6962	6786	0.41	0.33 to 0.49
PD	4320	4234	–0.35	–0.45 to –0.25
Transplant	340	329	–1.04	–1.36 to –0.72
Transfer out	63	60	0.55	–0.3 to 1.4
Treat stop	35	34	0.87	–0.4 to 2.15
Died	1226	1126	0.01	–0.18 to 0.21
Missing	913	885		

plant patients decreases slightly ($p \leq 0.0001$).

The prevalent group was used to compare the effect of modality and age, as few patients were transplanted in the incident group.

Similar to the incident cohort, prevalent transplant patients came from the least socially deprived group, then PD patients and then HD in increasing order of deprivation. The differences in the Townsend distributions are shown in Figure 17.6.

Figure 17.7 demonstrates that across all

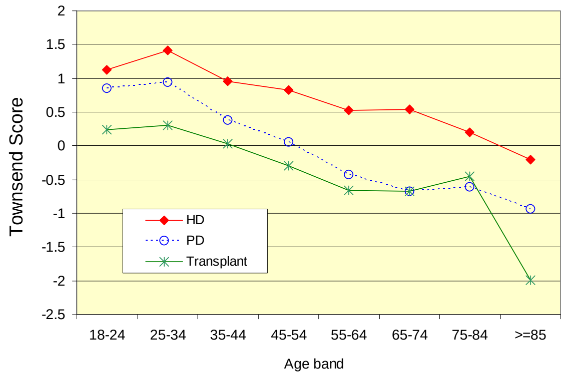

Figure 17.7. Townsend score by treatment modality and age band

the three modalities, Townsend scores decreased with age. Further analyses will look at the effect of deprivation on mode of renal replacement therapy after adjusting for other factors such as age, ethnicity and primary renal disease.

Patient characteristics

Univariate analysis reveals that patients from the most deprived quintile are significantly younger than those in the least deprived quintile (62.2 years v 65.4 years, $p < 0.0001$).

There were also significant differences in ethnicity across the deprivation quintiles, with a greater proportion of those in the most deprived quintile being of South Asian or African-Caribbean origin. Primary renal disease differs significantly ($p < 0.0001$), with

Table 17.5. Patient characteristics of the incident cohort

	1	2	3	4	5	Total included	No. missing	p-value
Age								
Median age	65.4	65.2	64.6	64.7	62.2	13453	405	<0.0001
Primary Renal Disease								
Diabetes	11	14	18	24	33	2316	55	<0.0001
Glomerulonephritis	17	18	19	24	22	1630	55	
Polycystic kidney disease	22	18	19	22	19	861	15	
Pyelonephritis	16	17	20	24	24	1091	25	
Reno-vascular disease	15	17	19	23	26	1661	53	
Other	19	19	18	24	21	1797	58	
Uncertain	16	15	19	24	26	2743	99	
Missing diagnosis	16	19	19	25	21	1355	45	
Ethnicity								
Asian	6.9	5.7	10.3	30.4	46.7	668	17	<0.0001
Black	3.0	5.7	7.8	22.8	60.7	333	11	
Chinese	14.9	17.0	14.9	17.0	36.2	47	1	
White	17.0	17.9	19.5	23.2	22.4	8906	226	
Other	8.0	16.0	14.4	18.4	43.2	125	1	
Missing	15.9	16.7	19.7	25.3	22.3	3375	149	

more diabetes, pyelonephritis, reno-vascular disease and uncertain diagnosis in the more deprived groups than the more affluent groups.

Despite their younger age, the more socially deprived groups also have higher rates of co- morbid illnesses than the more affluent groups, with more diabetes, circulatory problems and COPD. They were also significantly more likely to be current smokers (21.5% v 14.8%, $p < 0.0001$). The incidence of malignancy was reduced in the more socially deprived groups.

There appears to be no difference in timing of referral to a nephrologist between the deprivation quintiles, but patients in the most deprived quintile have significantly lower haemoglobin prior to starting renal replacement therapy than those in the most affluent quintile (9.7g/dl v 10.1g/dl, $p < 0.0001$).

Survival

Patients were followed for a median of 482 days beyond day 90. Unadjusted survival according to the Kaplan–Meier survival graph (Figure 17.8) does not seem to differ between the five deprivation groups ($p = 0.3$), although, four and five years into renal replacement therapy the groups seem to be separating, with slightly better survival in the more affluent groups. The various effects of age, ethnicity (e.g. African-Caribbeans have better survival) and co-morbidity are all operating.

In the first Cox Proportional Hazard Model, (Table 17.8) age and PRD appear to be significant independent predictors of patient mortality. In this model, knowing a patient’s Townsend score significantly improves the ability of the model to predict mortality ($p = 0.027$). The effect of being socially deprived appears small, with a one unit increase in

Table 17.6. Co-morbidity

	1	2	3	4	5	Total included	No. missing	p-value
Cardio-vascular disease								
No	17	17	20	23	24	3129	91	0.2417
Yes	14	17	19	25	24	1029	20	
Missing	16	17	18	24	25	9296	294	
Peripheral vascular disease								
No	17	16	20	23	24	3232	88	0.0429
Yes	14	18	18	25	25	926	23	
Missing	16	17	18	24	25	9296	294	
Diabetes (co-morbidity, not PRD)								
No	17	16	20	23	24	3780	99	0.0141
Yes	11	21	17	27	25	322	9	
Missing	16	17	18	24	25	9352	297	
Diabetes (co-morbidity or PRD)								
No	18	17	20	23	21	3094	84	<0.0001
Yes	11	16	17	25	31	1064	27	
Missing	16	17	18	24	25	9296	294	
Smoker								
No	18	18	20	23	21	3099	79	<0.0001
Yes	12	13	19	25	32	809	22	
Missing	16	17	18	24	25	9546	304	
Liver disease								
No	16	17	19	23	24	4032	107	0.9115
Yes	16	15	17	26	27	94	1	
Missing	16	17	18	24	25	9328	297	
Malignancy								
No	16	16	19	24	24	3673	93	0.0023
Yes	19	22	20	19	21	448	15	
Missing	16	17	18	24	25	9333	297	
Chronic obstructive pulmonary disease								
No	17	17	19	23	23	3813	100	<0.0001
Yes	9	13	19	27	32	317	10	
Missing	16	17	18	24	25	9324	295	

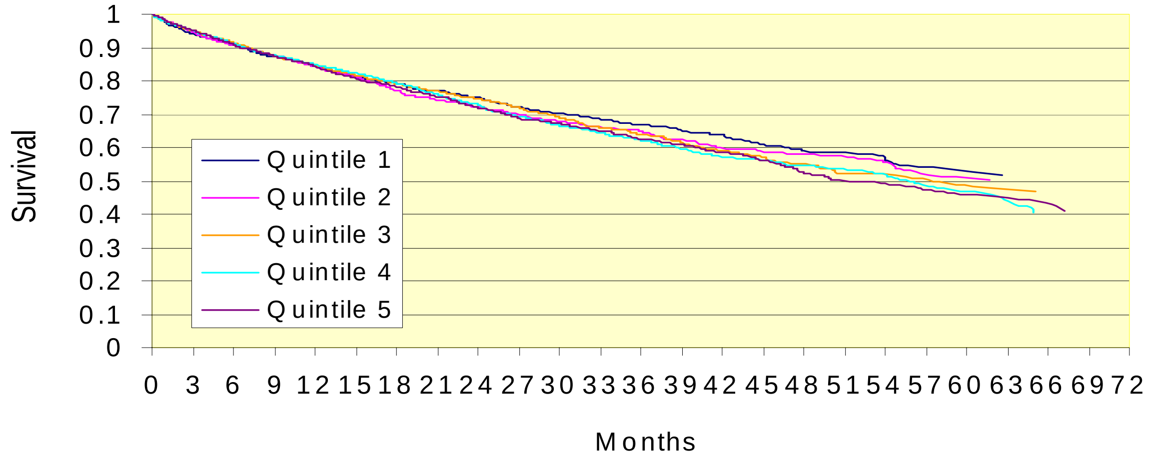

Figure 17.8 KM survival by deprivation

Table 17.7 Late referral and haemoglobin

	1	2	3	4	5	Total included	No. missing	p-value
0–89	14	16	18	25	27	1772	66	0.3409
90–179	16	19	18	22	25	399	8	
180–364	15	16	18	25	27	556	19	
365+	16	17	19	24	24	2018	47	
Missing	16	17	19	24	24	8709	265	
Haemoglobin								
Mean Hb before start	10.1	10.0	10.0	10.0	9.7	10630	230	<0.0001
Missing						2824	175	

Table 17.8. Cox model 1

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq	Hazard Ratio	95% Confidence Limits
Age	0.046	0.0015	966	<.0001	1.05	1.05–1.05
Diabetes	0.860	0.0774	123	<.0001	2.36	2.03–2.75
PKD	–0.660	0.1417	22	<.0001	0.52	0.39–0.68
Pyelonephritis	0.084	0.0985	0.7	0.3904	1.09	0.90–1.32
RVD	0.338	0.0841	16	<.0001	1.40	1.19–1.65
Other	0.839	0.0810	107	<.0001	2.31	1.97 -2.71
Uncertain	0.346	0.0778	20	<.0001	1.41	1.21–1.65
Missing	0.682	0.0866	62	<.0001	1.98	1.68 -2.34
GN	0					
Townsend	0.012	0.00561	4.9	0.0267	1.013	1.00–1.02

Townsend score (more deprived) being associated with only a 1% increase in mortality and this could be partly due to the reesidual effect of co-morbidity.

The second Cox Proportional Hazard Model in Table 17.9, is based only on patients commencing RRT in centres whose data completeness for ethnicity and co-morbidity was >85% in that year (*n* = 1,086). These data cover only twelve centre years. In this model, age and several of the primary renal diseases continue to be independent predictors of mortality. From the co-morbidity and ethnicity variables, only cardiovascular disease and malignancy independently predict mortality. A relationship between social deprivation and mortality is not observed in this model (p = 0.97).

Table 17.10. Centres with both >85% ethnicity and >85% co-morbidity

Year					
1999	Bristl				
2000	Bristl	StJms			
2001	Bristl	Hope	Leic	MRI	Sheff
2002	Hope	Hammers	MRI	Notts	

Discussion

This report demonstrates regional differences in levels of social deprivation of patients commencing RRT in the UK. The North–South pattern of this variation reflects that found in the UK general population.[17] Even with the caveat that the Registry population coverage is not yet

Table 17.9. Cox model 2

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq	Hazard Ratio	95% Confidence Limits
Age	0.0434	0.0065	45	<.0001	1.04	1.03–1.06
Diabetes	0.6195	0.2891	4	0.0321	1.86	1.05–3.27
PKD	-2.3035	1.0265	5.	0.0248	0.10	0.01–0.75
Pyelonephritis	0.0525	0.3616	0.02	0.8846	1.05	0.52–2.14
RVD	0.2389	0.3156	0.57	0.4490	1.27	0.68–2.36
Other	1.0689	0.2724	15	<.0001	2.91	1.71–4.67
Uncertain	-0.0216	0.2871	0.005	0.9401	0.98	0.56–1.72
Missing	0.9718	0.6442	2	0.1315	2.64	0.75–9.3
GN	0					
Cardio-vascular	0.4627	0.1679	7.	0.0056	1.59	1.15–2.20
PVD	0.2637	0.1749	2	0.1319	1.30	0.92–1.83
Liver disease	0.3733	0.3923	0.9	0.3413	1.45	0.67–3.13
Malignancy	0.5346	0.1826	8	0.0034	1.71	1.19–2.44
COPD	0.2573	0.2336	1	0.2707	1.29	0.82–2.04
Diabetes not ERF	0.1888	0.2502	0.56	0.4506	1.21	0.74–1.97
Black	-0.5310	0.7198	0.56	0.4531	0.58	0.14–2.39
Asian	-0.3683	0.3775	0.95	0.3292	0.69	0.33–1.45
Chinese	-12.4026	401.9464	0.001	0.9754	0.00	
Other ethnic	-12.6465	449.0557	0.001	0.9775	0.00	
White	0					
Townsend	-0.0344	0.0236	2	0.1442	0.97	0.9–1.01

complete, these data suggest that the acceptance rate of RRT is higher in more deprived areas. Full population coverage will allow more detailed analysis of age, gender, ethnic and deprivation acceptance rates.

A relationship between socio-economic status and health still exists in the UK general population.[1] Although a previous prevalent cohort analysis from the Registry in 2000 did not show a relationship between deprivation and renal replacement therapy survival, other data have suggested that socio-economic status may be related to outcomes in patients on renal replacement therapy in the UK.[12] Interpreting such comparisons at the national level requires an appreciation of some of the weaknesses of the measures being used. Although generic area-measures of deprivation, such as the Townsend index, relate strongly with long term illness and mortality in urban areas, the relation in fringe and rural populations is much weaker.[18] Further, they have been shown to relate less strongly to mortality in the elderly[19,20] and in ethnic minority groups.[21] In the South-West of England it has also been demonstrated that the apparent deprivation of a region can be quite markedly altered by varying the measure of deprivation that is applied.[22] Finally, individuals are being labelled by the characteristics of their area of residence rather than on an individual based measure of socio-economic status. Such limitations must be borne in mind when comparing deprivation in quite disparate regions and populations in the UK, and their impact is likely to reduce the chances of finding significant associations.

The observation that patients in the most deprived quintile are younger than those in the more affluent quintile may be due to one or more of a number of factors:

1. The natural history of CKD in patients from more deprived areas may be that RRT is reached at a younger age because of faster progression;
2. It may reflect the higher rates of ERF in ethnic minority groups with their younger age distribution;
3. A higher incidence of Type 2 diabetes in more deprived areas and these patients may also be younger than type 2 diabetics from more affluent areas.
4. Patients living in more deprived areas tend to have more co-morbidity and therefore may possibly be considered medically unsuitable for dialysis, with this effect increasing with age. Similarly the differences in competing risks of cardiovascular and other mortality, higher in deprived areas, increases with age.

Re-analysis of the Whites-only data indicates that patients in the most deprived quintile are still younger than the most affluent quintile (62.5 and 64.5 years respectively). After exclusion of diabetes in this Whites-only cohort, the median ages were similar (64.5 and 65.2 years respectively). It was not possible to test the effect of the other two hypotheses with the current dataset.

There was no evidence found of a difference in referral pattern (early v late referral) between patients living in the most socially deprived and the most affluent areas. Despite this, a strongly significant difference in the deprivation mix of patients on the three modes of RRT was observed, similar to the prevalent group to those of Maheshwaran *et al.*,[16] with patients on HD generally being from more deprived areas. This may partly reflect the greater access to HD in urban areas, with most main renal units being based in cities or large towns. The observation that patients having a pre-emptive transplant and in the prevalent patients of having a transplant were likely to live in more affluent areas may reflect differences in co-morbidity affecting suitability for transplantation, and ethnic minority origin influencing allocation of kidneys. It is also possible, that as has been described in North

America,[15,23] patients from more affluent areas are progressing through the various stages of the renal transplant workup more rapidly than those from more deprived areas, and/or that they have a greater probability overall of being placed on the transplant waiting list. This is the subject of an ongoing combined analysis with UK Transplant.

For this year's report the evaluation of social deprivation and outcomes on RRT was restricted to survival, although relationships with other intermediate outcome measures are being examined. From the larger dataset of all incident patients, the deprivation score of a patient's home address did predict mortality, but the effect was small. To allow adjustment for confounding by ethnicity and co-morbidity, a second smaller dataset was defined which included only patients going onto RRT in centres whose co-morbidity and ethnicity data were more than 85% complete in that year. Although this provided a more robust dataset, the sample size was greatly reduced (1,086 v 11,314 patients) and the finding of no relationship between social deprivation and mortality in this second model is open to type 2 error. In support of the possibility of a type 2 error is the lack of effect of ethnicity on survival in this model. This variable is examined in Chapter 20 of this report, in a larger cohort (patients in centres with >85% ethnicity data, n = 6,000), where African-Caribbean had an improved survival at 1 year after 90 days (HR 0.575, 95%CI 0.349–0.947, p = 0.03).

These initial analyses suggest that there is no strong relationship between the deprivation score of a patient's home address and their outcome on RRT, once factors such as differences in co-morbidity are taken into account. This agrees with the conclusions on survival of prevalent patients in the UK Renal Registry Report 2000, social deprivation chapter.[24] Any effect of social deprivation on health outcomes is complex and consideration needs to be given to not only factors such as age, co-morbidity and ethnicity, but also compliance with therapy, lifestyle factors (smoking and diet), psychosocial factors and access to and quality of health care. In this chapter the results of a first analysis of the relationship between social deprivation and incident RRT patient's characteristics and outcomes have been presented, with many more analyses and contemplation planned for the months ahead.

In summary, these early data demonstrate differences in social deprivation of patients entering renal replacement therapy programmes in England and Wales which suggest an increased incidence of RRT in more deprived populations. Patients in the most socially deprived group were significantly younger than those in the most affluent group, but had more diabetes, co-morbidity and were more likely to be smokers. There are differences between renal units in the social deprivation of their patients, which together with the associated increased co-morbidity may add to the burden on resources within these renal units. Patients of lower socio-economic status were considerably less likely to be receiving peritoneal dialysis or have a renal transplant at 90 days. Any effect of social deprivation on survival on RRT appears to be small, but these interim results are the subject of ongoing subgroup analyses of survival that will explore for example interactions between social deprivation, age and ethnicity.

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Annex A Comparison of UK Deprivation Scores

Table 17.11. Comparative UK deprivation scoring systems

Indicator	DoE (1983)	Townsend	Jarman	Carstairs	LWT	DoE, ILC (1994)
Total unemployment rate	*	*	*		*	All levels
Male unemployment rate				*		
Overcrowded households	*	*	*	*		All levels
Households lacking amenities	*					All levels
Not owner-occupier households		*			*	
No-car households		*		*	*	All levels
Low social class (4&5 or SEG 11)			*	*	*	
Lone-parent household	*		*		*	
Lone-pensioner households	*		*			
Under 5s			*			
Children in unsuitable accom.						All levels
Children in low-earning h/h						All levels
Moving with previous year			*			
Limiting long-term illness					*	
Born New Commonwealth	*		*			
17 yr olds not in full time ed.						ward/district
Non-census data						
Standard mortality ratio						district
Long-term unemployment						district
Income support recipients						district
House contents insurance						district
Low GCSE attainment						district
Derelict land						district

* included in the calculation of the scoring system.