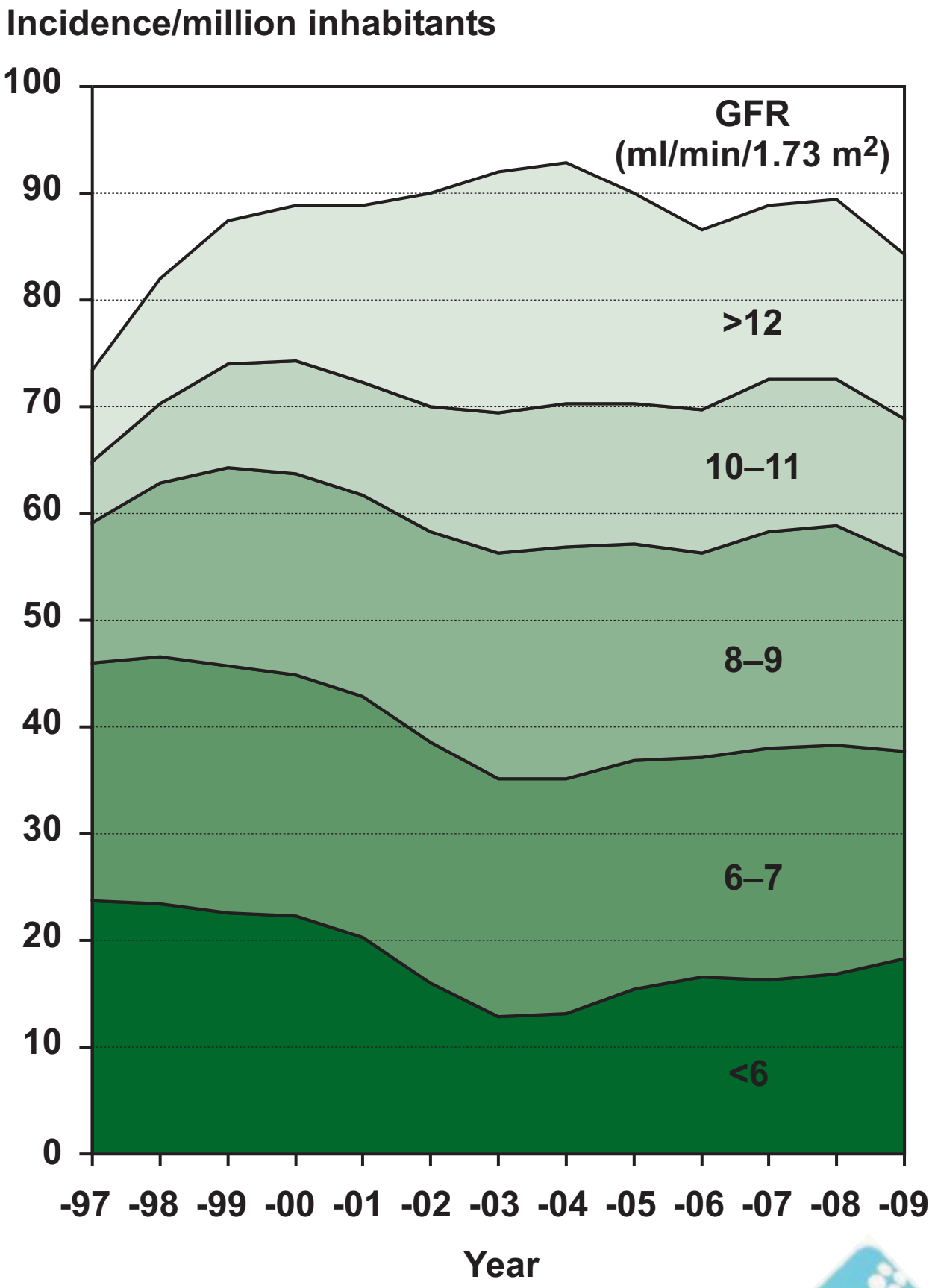
Report 2009

Finnish Registry for Kidney Diseases



Finnish Registry for Kidney Diseases – Report 2009

Contents

The Finnish Registry for Kidney Diseases contains information about dialysis and kidney transplantation patients in Finland since 1964. The coverage of the registry is estimated at 97–99%. Virtually all patients agree to provide their information, and hospitals report patient data very thoroughly. High coverage is vital to obtain an accurate understanding of the situation for dialysis and kidney transplantation patients in Finland. Low coverage can lead to selection bias, which hampers the interpretation of the statistics. Consequently, it is important that coverage of the registry remain high.

Report 2009 presents up-to-date information on the incidence and prevalence of renal replacement therapy (RRT) in Finland. In 2009, incidence was on average 10% lower than in 2005–2008. Although this may be due to normal variation, it is also possible that incidence is actually falling. The figure on the cover page shows that the estimated glomerular filtration rate before the start of RRT is lower nowadays than a few years earlier. This indicates that patients enter RRT at a later stage, which may explain the decreased incidence. Improved predialytic treatment may have enabled postponing the start of RRT. On the other hand, a recent randomized trial showed that late initiation of dialysis does not impair patient survival (Cooper et al, N Engl J Med 2010;363: 609–619).

This report contains a special analysis of patient survival by region. Our reports annually present patient mortality (number of deaths per 1000 patient-years) by region. Another way to study mortality is survival analysis, which provides a probability estimate of patient survival as a function of time from the start of RRT. According to an unadjusted analysis, patients in southern and western regions of Finland had the highest probability of survival. Regional differences decreased when adjusting for age, gender, and comorbidities, although these did not explain all the survival differences between regions. The effectiveness of RRT may differ slightly between regions, but it is also possible that some regional differences in patient characteristics could not be adjusted for.

The European ERA-EDTA Registry and the American USRDS Registry annually publish data on the incidence and prevalence of RRT in various countries. Mortality or survival data, however, have not been published by country. Nevertheless, an estimate of the average survival time of RRT patients can be obtained by calculating the prevalence/incidence ratio for RRT. According to such an analysis, presented on page 27, the survival of Finnish RRT patients is among the best in the world.

The Finnish Registry for Kidney Diseases is a national healthcare registry maintained by the Finnish Kidney and Liver Association and financed by Finland's Slot Machine Association (RAY). Statistics in this report were updated using data obtained from the Registry for the Follow-up of Kidney Transplantation Patients, maintained by the Kidney Transplantation Unit of the Helsinki University Central Hospital. The Board of the Finnish Registry for Kidney Diseases thanks all supporters and participating hospitals for their excellent cooperation.

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Table 1. The Finnish population and its distribution in healthcare districts.
Finnish Registry for Kidney Diseases 1999–2009

Healthcare district		Year					Change (%) 1999–2009
		1999	2004	2007	2008	2009	
1	Helsinki-Uusimaa	1376	1435	1480	1497	1514	10.0
3	Varsinais-Suomi	449	457	463	465	466	3.8
4	Satakunta	234	229	227	226	226	–3.5
5	Kanta-Häme	165	168	171	173	174	5.2
6	Pirkanmaa	444	461	475	479	482	8.7
7	Päijät-Häme	209	210	211	212	212	1.7
8	Kymenlaakso	181	178	176	176	176	–3.1
9	Etelä-Karjala	137	135	134	134	133	–2.4
10	Etelä-Savo	113	110	108	107	107	–5.8
11	Itä-Savo	50	48	47	46	46	–8.5
12	Pohjois-Karjala	177	173	171	170	170	–4.1
13	Pohjois-Savo	255	251	249	248	248	–2.8
14	Keski-Suomi	265	269	271	272	273	2.9
15	Etelä-Pohjanmaa	202	199	199	199	198	–1.7
16	Vaasa	161	162	163	164	165	2.4
17	Keski-Pohjanmaa	75	74	75	75	75	–0.5
18	Pohjois-Pohjanmaa	370	382	390	393	396	6.9
19	Kainuu	87	82	80	80	79	–8.9
20	Länsi-Pohja	69	67	66	66	65	–5.6
21	Lappi	125	120	119	118	118	–5.4
22	Åland	26	27	27	27	28	7.9
Region	South	1693	1749	1790	1807	1822	7.6
	Southwest	709	713	717	718	720	1.5
	West	1181	1199	1219	1226	1232	4.3
	East	861	851	845	844	843	–2.1
	North	726	725	729	731	733	1.0
Entire country		5171	5237	5300	5326	5351	3.5

On 31 December 2009, the population of Finland was 5.351 million (Table 1, Source: Statistics Finland). During the past ten years, the population of the country overall has increased by 3.5%, with the fastest increase occurring in the southern region. In the eastern region, the population has actually decreased. Since 1999, the population has increased in nine healthcare districts and decreased in twelve. The decrease has been especially rapid in the healthcare districts of Kainuu and Itä-Savo, while the fastest increase occurred in the healthcare district of Helsinki-Uusimaa.

The numbers in Figure 1 refer to the healthcare districts listed in Table 1. In this report, “region” refers to a university hospital region.

Figure 1. Healthcare districts and regions in Finland.
Finnish Registry for Kidney Diseases 2009

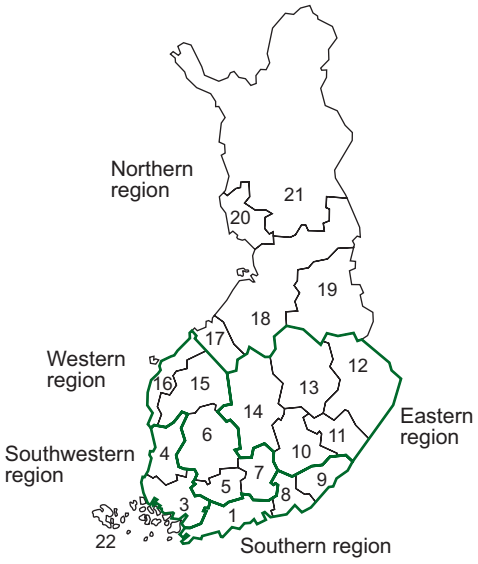


Table 2. The Finnish population according to region, age group, and gender.
Finnish Registry for Kidney Diseases 1999–2009

Region	1999					2009				
	0–19 y (%)	20–64 y (%)	65–74 y (%)	≥75 y (%)	Entire country	0–19 y (%)	20–64 y (%)	65–74 y (%)	≥75 y (%)	Entire country
South										
Men	207 (25)	529 (65)	52 (6)	27 (3)	816 (100)	211 (24)	565 (64)	67 (8)	41 (5)	884 (100)
Women	200 (23)	543 (62)	70 (8)	65 (7)	878 (100)	204 (22)	575 (61)	81 (9)	78 (8)	938 (100)
Total	407 (24)	1072 (63)	122 (7)	92 (5)	1693 (100)	415 (23)	1140 (63)	148 (8)	119 (7)	1822 (100)
Southwest										
Men	85 (25)	214 (62)	28 (8)	16 (5)	344 (100)	80 (23)	215 (61)	33 (9)	23 (7)	351 (100)
Women	81 (22)	211 (58)	36 (10)	36 (10)	365 (100)	76 (21)	213 (58)	37 (10)	42 (11)	369 (100)
Total	167 (23)	426 (60)	65 (9)	52 (7)	709 (100)	157 (22)	428 (59)	70 (10)	65 (9)	720 (100)
West										
Men	147 (26)	355 (62)	47 (8)	27 (5)	576 (100)	144 (24)	370 (61)	54 (9)	38 (6)	606 (100)
Women	141 (23)	345 (57)	60 (10)	59 (10)	605 (100)	137 (22)	357 (57)	62 (10)	70 (11)	627 (100)
Total	288 (24)	700 (59)	107 (9)	86 (7)	1181 (100)	281 (23)	727 (59)	116 (9)	108 (9)	1232 (100)
East										
Men	108 (25)	260 (61)	36 (9)	19 (4)	423 (100)	94 (23)	254 (61)	40 (10)	28 (7)	416 (100)
Women	103 (24)	247 (56)	46 (11)	41 (9)	438 (100)	90 (21)	241 (56)	45 (11)	51 (12)	427 (100)
Total	211 (24)	507 (59)	83 (10)	60 (7)	861 (100)	184 (22)	495 (59)	85 (10)	79 (9)	843 (100)
North										
Men	104 (28)	220 (60)	27 (7)	13 (4)	364 (100)	95 (26)	221 (60)	31 (8)	21 (6)	368 (100)
Women	99 (27)	204 (56)	32 (9)	27 (7)	362 (100)	91 (25)	206 (56)	34 (9)	35 (10)	365 (100)
Total	203 (28)	424 (58)	60 (8)	40 (6)	726 (100)	186 (25)	427 (58)	64 (9)	56 (8)	733 (100)
Entire country										
Men	651 (26)	1579 (63)	190 (8)	102 (4)	2523 (100)	624 (24)	1625 (62)	224 (9)	152 (6)	2625 (100)
Women	624 (24)	1550 (59)	245 (9)	229 (9)	2648 (100)	599 (22)	1593 (58)	260 (10)	276 (10)	2726 (100)
Total	1275 (25)	3129 (61)	436 (8)	331 (6)	5171 (100)	1223 (23)	3218 (60)	483 (9)	427 (8)	5351 (100)

Table 2 shows the distribution of the Finnish population according to region, age, and gender at the end of 1999 and 2009. The proportion of the Finnish population over the age of 65 has increased from 15% to 17%. At the end of 2009, 14% of Finnish men and 20% of Finnish women were 65 or older. In the southern region, the proportion of inhabitants over 65 is the smallest (14%), and the proportion of 20- to 64-year-olds is the largest (63%). In the northern region, the proportion of 0- to 19-year-olds is the largest (25%).

The age of the Finnish population has increased considerably during the past ten years. The number of inhabitants under 20 has decreased by 4%. The number of inhabitants aged 65–74 years has increased by 11%, and the number of inhabitants over 75 has increased by 29%. Altogether, the number of inhabitants aged 65 years or older has increased by 19% or 143 273 persons.

Table 3. Number of new RRT patients and incidence of RRT by healthcare district and region. Finnish Registry for Kidney Diseases 1999–2009

Healthcare district		Number of new RRT patients						Incidence of RRT/million inhabitants					
		1999	2004	2007	2008	2009	2005–2009 on average	1999	2004	2007	2008	2009	2005–2009 on average
1	Helsinki-Uusimaa	118	109	99	119	107	105	86	76	67	79	71	71
3	Varsinais-Suomi	44	46	44	57	32	44	98	101	95	123	69	95
4	Satakunta	19	26	30	24	25	24	81	113	132	106	111	107
5	Kanta-Häme	15	21	14	16	17	15	91	125	82	92	98	88
6	Pirkanmaa	49	44	65	39	52	51	110	95	137	81	108	107
7	Päijät-Häme	19	29	20	27	14	23	91	138	95	127	66	110
8	Kymenlaakso	16	15	28	23	13	23	88	84	159	131	74	128
9	Etelä-Karjala	13	20	16	23	13	18	95	148	119	172	98	133
10	Etelä-Savo	6	5	10	5	13	9	53	46	93	47	122	85
11	Itä-Savo	9	3	3	4	9	6	180	62	64	87	196	132
12	Pohjois-Karjala	15	24	17	14	14	15	85	139	99	82	82	90
13	Pohjois-Savo	27	23	30	26	25	25	106	92	121	105	101	100
14	Keski-Suomi	27	28	23	28	19	23	102	104	85	103	70	85
15	Etelä-Pohjanmaa	17	12	17	12	15	16	84	60	85	60	76	81
16	Vaasa	9	21	17	15	13	13	56	130	104	91	79	79
17	Keski-Pohjanmaa	8	11	4	6	13	8	106	148	54	80	174	107
18	Pohjois-Pohjanmaa	35	39	31	38	28	34	95	102	79	97	71	87
19	Kainuu	12	18	10	4	5	10	138	219	125	50	63	119
20	Länsi-Pohja	7	4	7	14	6	10	101	60	106	213	92	146
21	Lappi	7	11	7	6	7	8	56	92	59	51	59	64
22	Åland	1	0	2	5	3	3	39	0	74	182	108	95
Region	South	147	144	143	165	133	145	87	82	80	91	73	81
	Southwest	64	72	76	86	60	71	90	101	106	120	83	98
	West	109	127	133	109	111	118	92	106	109	89	90	97
	East	84	83	83	77	80	79	98	98	98	91	95	93
	North	69	83	59	68	59	69	95	115	81	93	80	94
Entire country		473	509	494	505	443	481	91	97	93	95	83	91
	Children <15 y	17	7	11	3	5	7	18	8	12	3	6	8

Table 3 shows the number of new RRT patients and the incidence of RRT according to healthcare district and region. In 2009, the incidence was lower than during the past few years. Compared to the average incidence in 2005–2008, the incidence in 2009 was more than 30% percent lower in the healthcare districts of Kainuu, Kymenlaakso, Päijät-Häme, Länsi-Pohja, Varsinais-Suomi, and Etelä-Karjala. The incidence in the healthcare districts of Pohjois-Pohjanmaa and Keski-Suomi were also clearly lower than in previous years. Nationwide, the incidence in 2009 was 9% lower than in 1999 and 15% lower than in 2004.

In 2005–2009, the average incidence was highest in the southwestern region and lowest in the southern region. In the healthcare districts, the average incidence in 2005–2009 was 64–146 new RRT patients/million inhabitants, which suggests rather large regional differences.

Table 4. Incidence of RRT by age group and gender.
Finnish Registry for Kidney Diseases 1999–2009

Year		Number of new RRT patients						Incidence/million inhabitants					
		0–19 y	20–44 y	45–64 y	65–74 y	≥75 y	Total	0–19 y	20–44 y	45–64 y	65–74 y	≥75 y	Total
1999	Men	14	52	121	79	30	296	22	58	177	415	293	117
	Women	6	31	54	65	21	177	10	36	78	265	92	67
	Total	20	83	175	144	51	473	16	47	128	330	154	91
2004	Men	9	65	114	65	57	310	14	75	156	319	450	121
	Women	6	25	83	51	34	199	10	30	113	207	134	74
	Total	15	90	197	116	91	509	12	53	134	257	239	97
2007	Men	7	46	138	74	64	329	11	53	183	348	448	127
	Women	7	23	66	35	34	165	12	28	87	140	126	61
	Total	14	69	204	109	98	494	11	41	135	236	238	93
2008	Men	4	51	119	96	57	327	6	59	156	440	387	125
	Women	1	21	70	38	48	178	2	26	91	149	176	66
	Total	5	72	189	134	105	505	4	43	124	283	250	95
2009	Men	5	41	120	76	49	291	8	48	156	340	323	111
	Women	2	24	62	40	24	152	3	29	80	154	87	56
	Total	7	65	182	116	73	443	6	39	118	240	171	83

Table 4 shows the number of new RRT patients and the incidence of RRT according to age group and gender in 1999–2009. In 2009, the incidence was clearly lower than in previous years. During the past few years, the incidence had declined most in the age group over 75, but was still higher than in 1999. In inhabitants over 75, the incidence in 2007 was 2.5-fold that in 1997 and 45% higher than in 2002. In the age groups under 65, the incidences in 2009 were 7–64% lower than in 1999.

In 2009, the incidence of RRT in women was half that in men. During the past years, the incidence has declined similarly in both men and women.

Figure 2. Standardized incidence of RRT in regions. Finnish Registry for Kidney Diseases 1999–2009

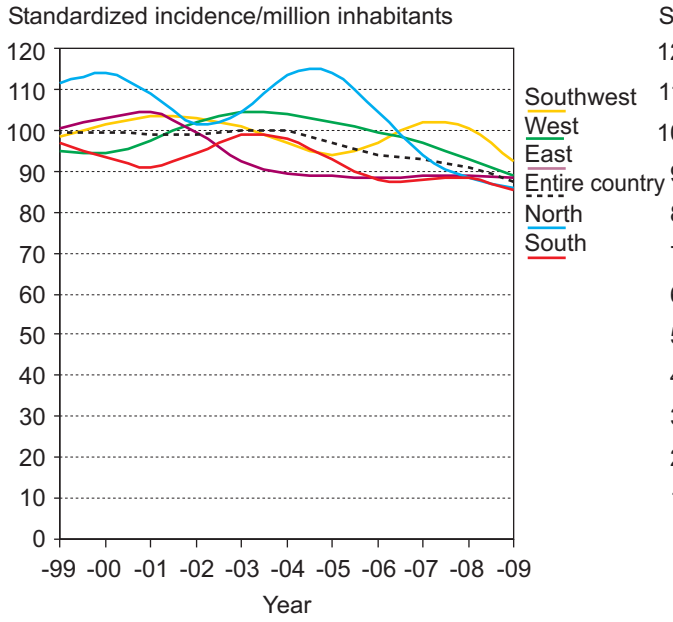


Figure 3. Standardized incidence of RRT in regions 90 days after the start of RRT. Finnish Registry for Kidney Diseases 1999–2009

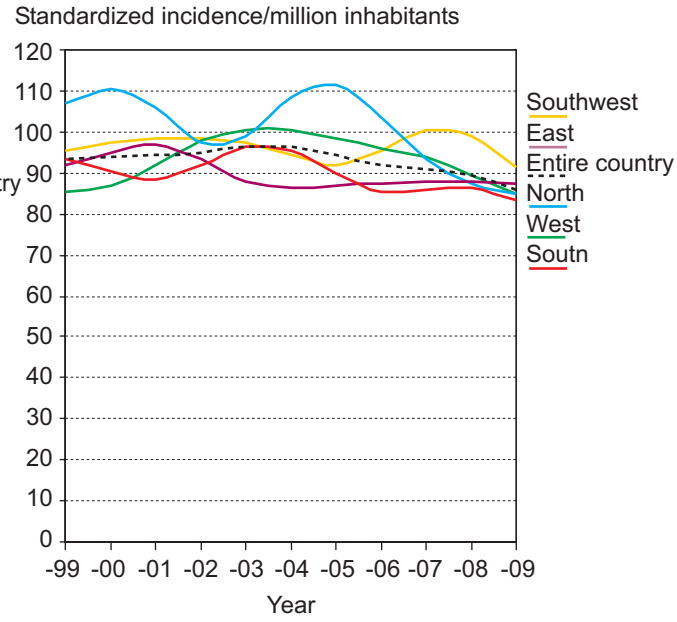


Figure 2 shows the incidence of RRT (i.e. dialysis and kidney transplantation) in 1999–2009 regionally as smoothed averages. The incidence rates are age- and gender-standardized using the Finnish population on 31 December 2009 as the reference population. Population changes in 1999–2009 have been taken into consideration. Standardization removes the effect of age and gender on regional differences in incidence rates. Nationwide, the standardized incidence remained virtually unchanged during 1999–2005, but has been falling since. Regional differences in standardized incidence are negligible.

Figure 3 shows the age- and gender-standardized incidence of RRT 90 days after the start of RRT regionally as smoothed averages. The Finnish Registry for Kidney Diseases does not store data on patients who have regained renal function within 90 days after the start of RRT. The figure excludes data on patients who died or moved abroad within 90 days of the start of RRT.

Figure 4. Incidence of RRT 90 days after the start of RRT according to age group.
Finnish Registry for Kidney Diseases 1965–2009

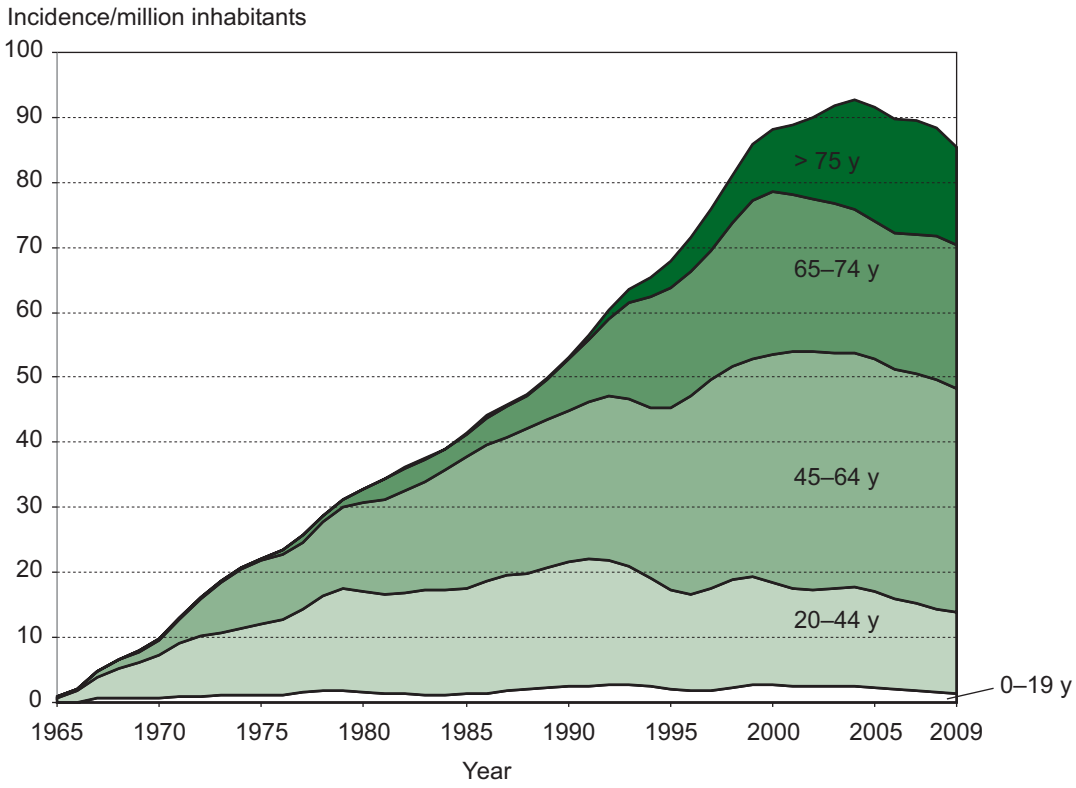
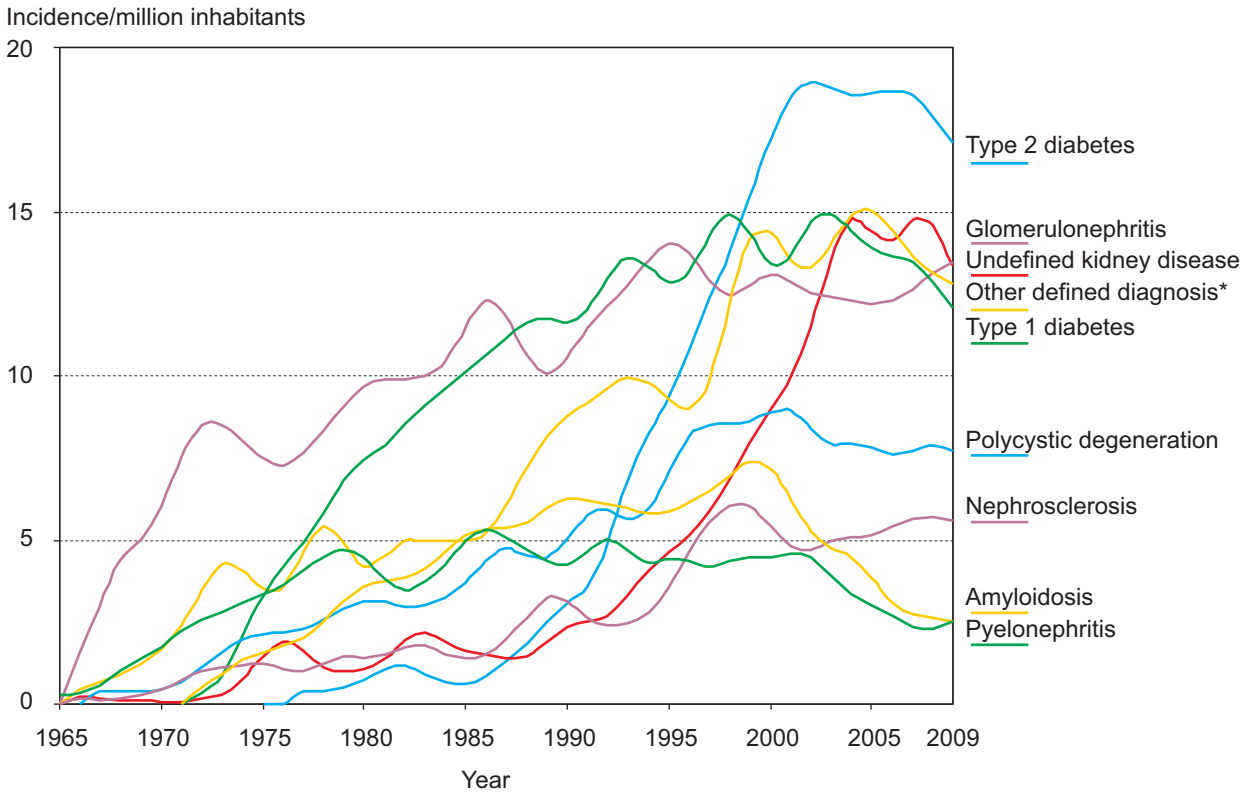


Figure 4 shows the incidence of RRT 90 days after the start of RRT as smoothed averages according to age group. The incidence of RRT in 45- to 74-year-olds increased sharply in the 1980s and 1990s, but has slightly decreased since 2000. Among inhabitants over 75, the incidence stopped increasing a few years later. The incidence of RRT in age groups under 45 has remained virtually unchanged for three decades, except for the slight decrease in incidence in the past few years.

Figure 5. Incidence of RRT according to diagnosis.
Finnish Registry for Kidney Diseases 1965–2009



*other systemic diseases, urinary tract obstruction, congenital diseases, and tubulointerstitial nephritis, among others

The incidence of RRT according to diagnosis appears as smoothed averages in Figure 5. Type 1 and type 2 diabetes as well as glomerulonephritis are the most common diseases causing chronic uremia. The number of patients entering RRT due to type 2 diabetes increased rapidly during the 1990s, but in the 2000s, this increase has subsided. The numbers of amyloidosis patients entering RRT have clearly decreased since 2000.

In earlier reports, nephrosclerosis has been included in the group “other defined diagnosis”. This report presents nephrosclerosis as its own group, which includes the following ICD-10 diagnoses: I12 and I13 (hypertensive renal disease), I70.1 (atherosclerosis of the renal artery), and N28.0 (Ischemia and infarction of the kidney). The diagnoses I15 (secondary hypertension) and N26 (unspecified contracted kidney) still belong to the group “other defined diagnosis”.

Figure 6. Incidence of RRT according to glomerulus filtration rate (GFR)
Finnish Registry for Kidney Diseases 1997–2009

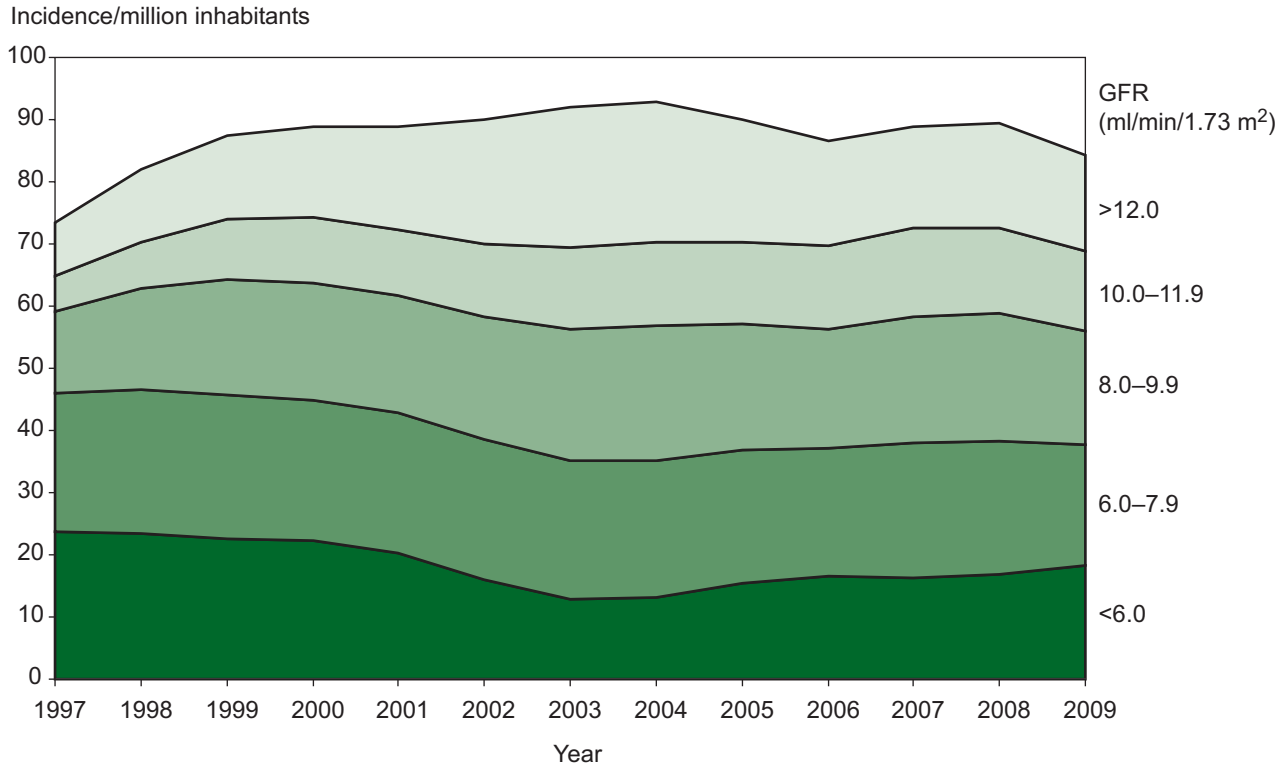


Figure 6 shows as smoothed averages the incidence of RRT in inhabitants aged 20 years and older according to the glomerular filtration rate (GFR). The estimated GFR is based on the serum creatinine concentration measured 0–2 weeks before the start of RRT. GFR was calculated using the Modification of Diet in Renal Disease (MDRD) formula: GFR = 32788 x serum creatinine$^{-1.154}$ x age$^{-0.203}$ (x 0.742 for women).

The median GFR was lowest in 1997 (6.8 ml/min/1.73 m^2) and increased continuously until 2003 (9.3 ml/min/1.73 m^2). Since then, median GFR has decreased to 8.4 ml/min/1.73 m^2 in 2009.

Figure 7. International comparison of incidence of RRT in 2008.
Finnish Registry for Kidney Diseases 2008

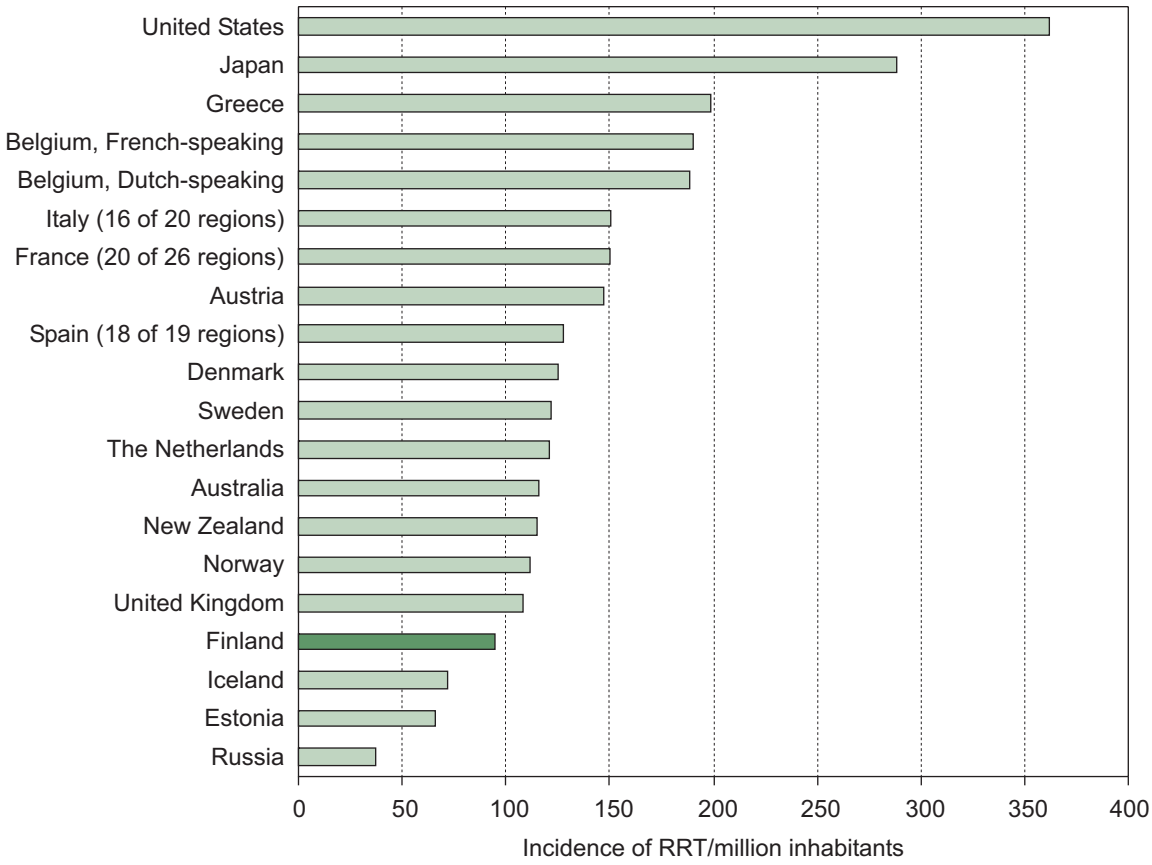


Figure 7 shows the incidence of RRT in 2008 in countries reporting to the ERA-EDTA Registry (Annual Report 2008, http://www.era-edta-reg.org) and in the United States, Australia, New Zealand, and Japan (The 2010 USRDS Annual Data Report Atlas, http://www.usrds.org). In 2008, the incidence of RRT in Finland was the fourth lowest in this comparison. In Sweden, the incidence was 28% higher, in Norway 18% higher, and in Denmark 32% higher than in Finland.

Table 5. Patients in RRT at end of year according to healthcare district and region.
Finnish Registry for Kidney Diseases 1999–2009

Healthcare district		Number of RRT patients					Prevalence of RRT/million inhabitants				
		1999	2004	2007	2008	2009	1999	2004	2007	2008	2009
1	Helsinki-Uusimaa	795	960	1028	1065	1084	578	669	695	711	716
3	Varsinais-Suomi	265	346	368	389	395	590	757	795	837	847
4	Satakunta	133	200	219	231	233	568	872	964	1021	1030
5	Kanta-Häme	66	110	115	120	129	400	656	671	693	742
6	Pirkanmaa	277	336	384	393	408	624	729	809	821	846
7	Päijät-Häme	103	143	164	173	173	493	681	776	816	815
8	Kymenlaakso	94	103	132	143	143	519	578	748	814	815
9	Etelä-Karjala	73	117	134	144	140	535	867	1001	1077	1051
10	Etelä-Savo	50	65	81	81	90	442	592	752	756	845
11	Itä-Savo	32	36	42	41	46	639	749	898	887	1003
12	Pohjois-Karjala	94	124	136	132	138	530	717	796	776	812
13	Pohjois-Savo	198	223	221	221	229	775	888	888	890	923
14	Keski-Suomi	125	152	167	174	174	471	565	617	640	638
15	Etelä-Pohjanmaa	87	97	110	114	113	431	487	553	574	569
16	Vaasa	75	101	105	107	106	465	625	643	651	641
17	Keski-Pohjanmaa	31	43	49	51	57	412	580	657	683	762
18	Pohjois-Pohjanmaa	169	247	268	275	281	457	647	687	700	710
19	Kainuu	50	61	73	67	63	575	742	910	841	795
20	Länsi-Pohja	31	46	59	66	68	448	691	896	1006	1040
21	Lappi	62	80	77	76	74	496	668	649	642	625
22	Åland	15	15	16	21	23	584	565	589	765	829
Region	South	962	1180	1294	1352	1367	568	675	723	748	750
	Southwest	413	561	603	641	651	582	787	841	892	904
	West	608	787	878	907	929	515	656	720	740	754
	East	499	600	647	649	677	579	705	766	769	803
	North	343	477	526	535	543	472	658	721	732	740
Entire country		2825	3605	3948	4084	4167	546	688	745	767	779

Table 5 shows the number of RRT patients and the prevalence of RRT on 31 December 1999–2009 . In the entire country, the prevalence has increased by 43% since 1999 and by 13% since 2004, which indicates that the increase in prevalence has slowed. On 31 December 2009, the prevalence was higher in the southwestern region than in the other regions. Since 1999, the prevalence has increased the most in the northern region (57%) and the southwestern region (55%), and the least in the southern region (32%). The prevalence has also increased in all healthcare districts (by 19–132%).

Table 6. Patients in RRT according to age group and gender.
Finnish Registry for Kidney Diseases 1999–2009

Year		Number of RRT patients						Prevalence of RRT/million inhabitants					
		0–19 y	20–44 y	45–64 y	65–74 y	≥75 y	Total	0–19 y	20–44 y	45–64 y	65–74 y	≥75 y	Total
1999	Men	73	412	816	284	91	1676	112	460	1195	1491	889	664
	Women	36	322	484	227	80	1149	58	374	703	925	349	434
	Total	109	734	1300	511	171	2825	85	418	948	1173	516	546
2004	Men	83	459	1014	399	222	2177	132	527	1387	1956	1752	850
	Women	51	294	629	291	163	1428	85	351	856	1180	642	534
	Total	134	753	1643	690	385	3605	109	441	1121	1532	1012	688
2007	Men	77	442	1162	442	299	2422	123	514	1539	2079	2092	933
	Women	58	284	701	285	198	1526	97	345	922	1140	734	564
	Total	135	726	1863	727	497	3948	110	431	1230	1571	1205	745
2008	Men	68	457	1199	496	309	2529	109	532	1573	2274	2100	968
	Women	52	270	720	316	197	1555	87	329	938	1241	724	573
	Total	120	727	1919	812	506	4084	98	433	1254	1717	1207	767
2009	Men	67	456	1222	540	309	2594	107	532	1592	2413	2039	988
	Women	51	271	723	324	204	1573	85	331	934	1248	740	577
	Total	118	727	1945	864	513	4167	96	434	1262	1787	1201	779

Figure 8. Standardized prevalence of RRT in regions.
Finnish Registry for Kidney Diseases 1999–2009

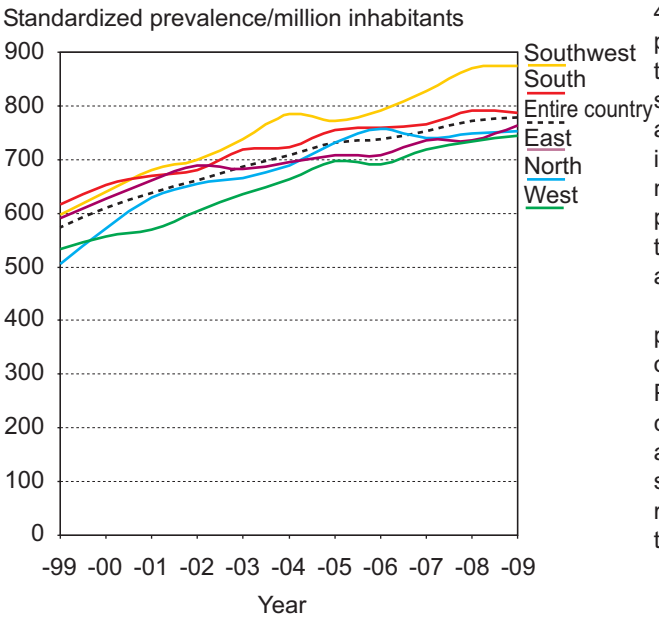
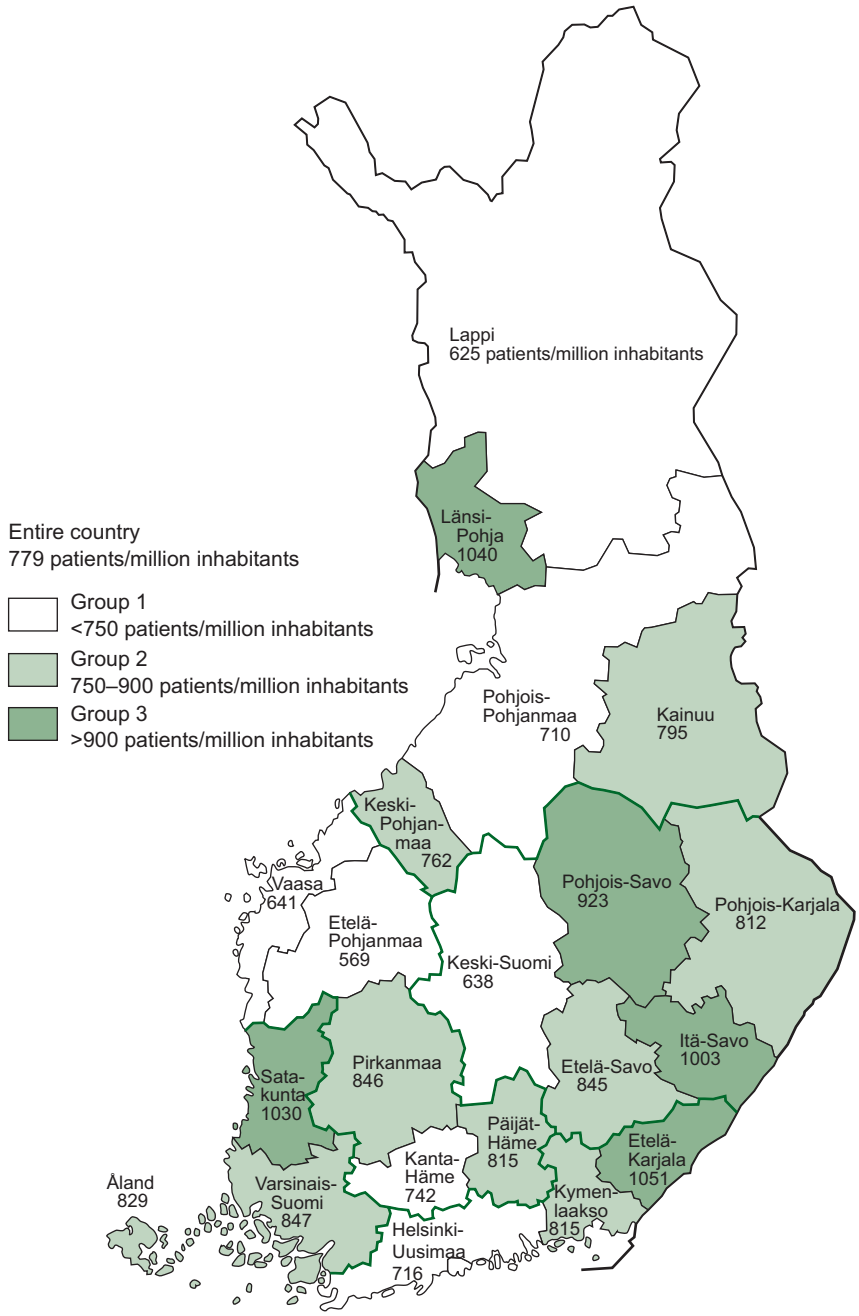


Table 6 shows the number of RRT patients and the prevalence of RRT on 31 December 1999–2009 according to age group and gender. The prevalence has increased by 43% since 1999. In the age group 75 years and older, the prevalence of RRT has more than doubled during the past ten years, but during the past few years the increase has stopped. The highest prevalence was observed among men aged 65–74 years at the end of 2009, 2413 cases per million inhabitants, which means that approximately every 400th man in this age group is on RRT. At the end of 2009, the prevalence was 71% greater among men than women, and the gender difference was even greater among inhabitants aged 75 years or older.

Figure 8 shows the age- and gender-standardized prevalence rates for 1999–2009 using the Finnish population on 31 December 2009 as the reference population. Population changes during this period have been taken into consideration. Standardization removes the effect of age and gender on regional differences in prevalence rates. The standardized prevalence is also greatest in the southwestern region. The differences in prevalence are smaller between the other regions.

Figure 9. Prevalence of RRT in healthcare districts on 31 December 2009.
Finnish Registry for Kidney Diseases 2009



The healthcare districts shown on the map are grouped according to the prevalence of RRT at the end of 2009 (Figure 9). The prevalence was <750 in seven districts, 750–900 in nine districts, and >900 patients/million inhabitants in five districts. The borders of the regions are indicated with thick lines.

Figure 10. Prevalence of RRT at end of year according to type of treatment.
Finnish Registry for Kidney Diseases 1965–2009

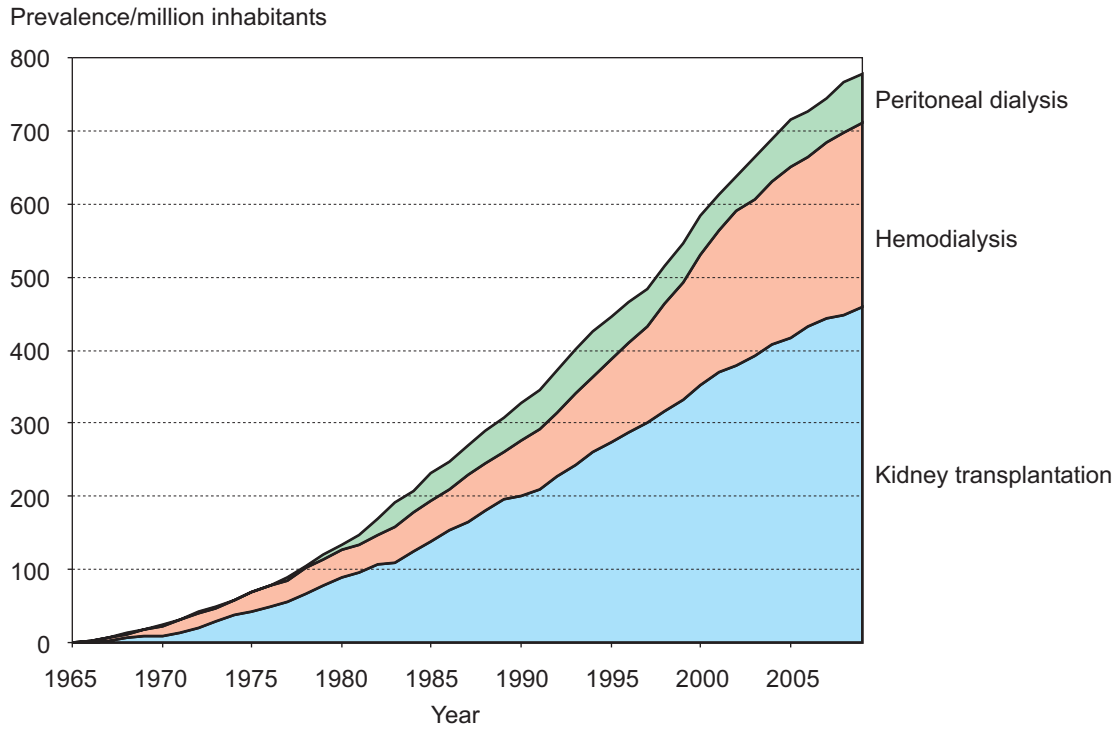
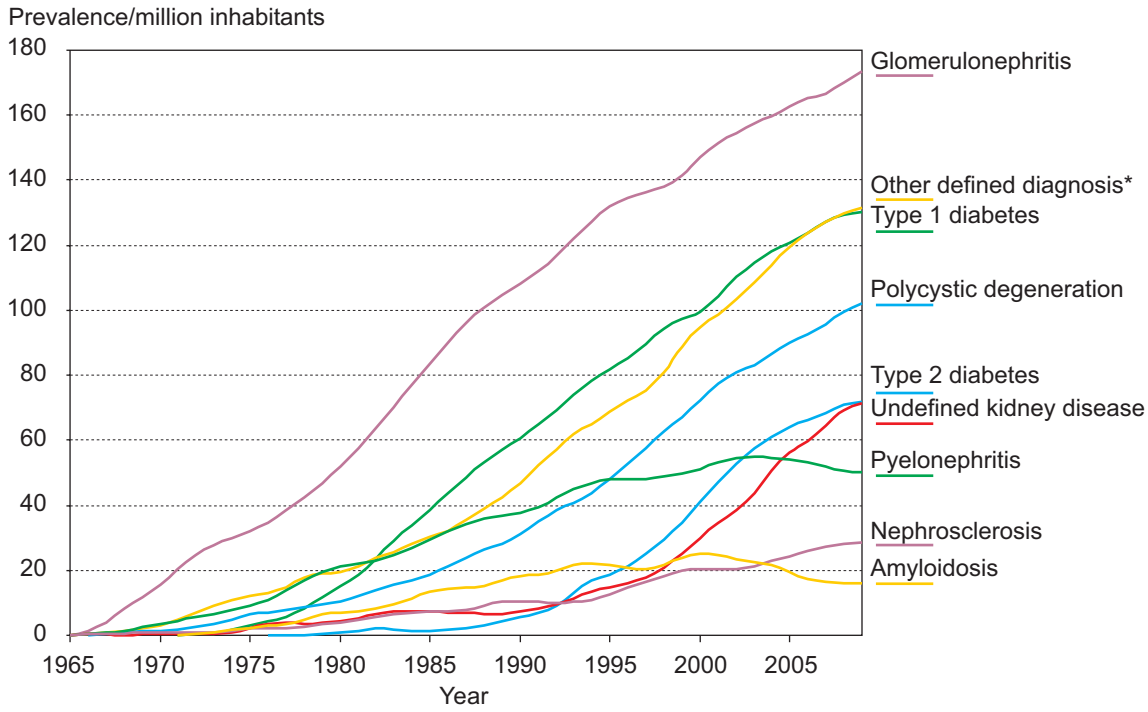


Figure 10 displays the prevalence of RRT according to the type of treatment. During the 2000s, the prevalence of peritoneal dialysis increased by 29% and that of hemodialysis by 55%. The prevalence of kidney transplantations has increased by 38%. In the 1990s, the prevalence increased respectively by 13%, 151%, and 70%, which means that, in particular, the increase in the number of hemodialysis patients has slowed At the end of 2009, the proportion of hemodialysis patients of all RRT patients was 32% and that of peritoneal dialysis patients was 9%. These proportions remained virtually unchanged during the 2000s. The proportion of kidney transplantation patients has varied between 58% and 62% during the past 25 years.

Figure 11. Prevalence of RRT at end of year according to diagnosis.
Finnish Registry for Kidney Diseases 1965–2009



*other systemic diseases, urinary tract obstruction, congenital diseases, and tubulointerstitial nephritis, among others

Figure 11shows as smoothed averages the prevalence of RRT according to diagnosis. Glomerulonephritis has remained the most common kidney disease diagnosis among RRT patients, and at the end of 2009, the prevalence rate was 175/million inhabitants. Type 1 diabetes has remained the second most common diagnosis among RRT patients for more than 25 years. Although type 2 diabetes is the most common kidney disease diagnosis of patients entering RRT, it ranks fourth in prevalence among type 2 diabetes patients due to high mortality in this group. The prevalence of end-stage renal disease caused by pyelonephritis and amyloidosis has decreased somewhat in recent years.

Although earlier reports have included nephrosclerosis in the group ”other defined diagnosis”, this report places nephrosclerosis in its own group, which includes the following ICD-10 diagnoses: I12 and I13 (hypertensive renal disease), I70.1 (atherosclerosis of the renal artery), and N28.0 (Ischemia and infarction of the kidney). The diagnoses I15 (secondary hypertension) and N26 (unspecified contracted kidney) still belong to the group ”other defined diagnosis”.

Figure 12. International comparison of prevalence of RRT on 31 December 2008.
Finnish Registry for Kidney Diseases 2008

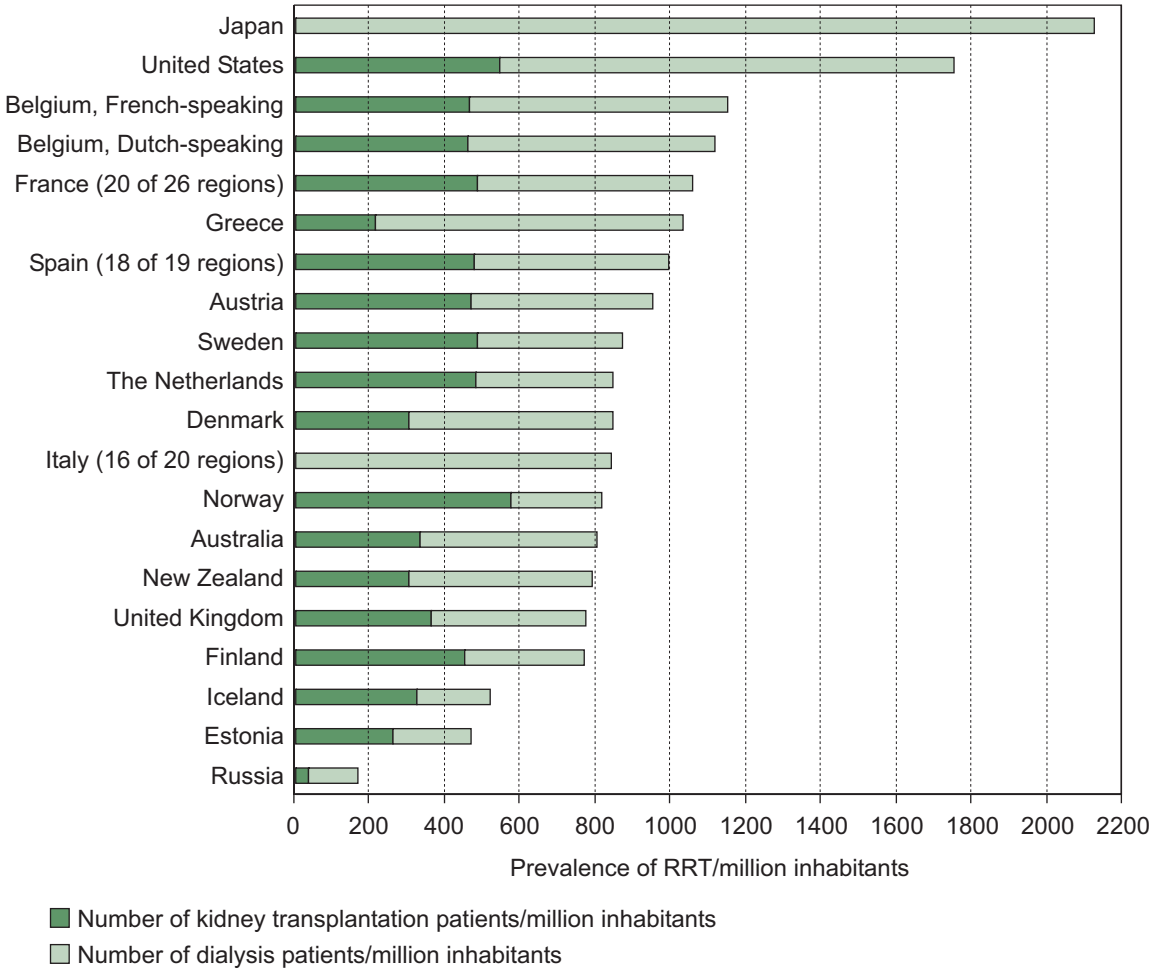


Figure 12 displays the prevalence of RRT on 31 December 2008 in countries reporting to the ERA-EDTA Registry (Annual Report 2008, http://www.era-edta-reg.org), and in the United States, Australia, New Zealand, and Japan (The 2010 USRDS Annual Data Report Atlas, http://www.usrds.org). The prevalence rate in Finland was the fourth lowest. In Sweden, the prevalence was 14% higher, in Norway 6% higher, and in Denmark 10% higher than in Finland. The prevalence rates differed less than did the incidence rates between the Scandinavian countries. Figure 7 shows international incidence rates.

At the end of 2008, there were 450 kidney transplantation patients per million inhabitants in Finland (ranking tenth in the comparison). The proportion of kidney transplantation patients was the third largest in Finland (59%) after Norway (70%) and Iceland (62%). The prevalence rates of Italy and Japan include only dialysis patients.

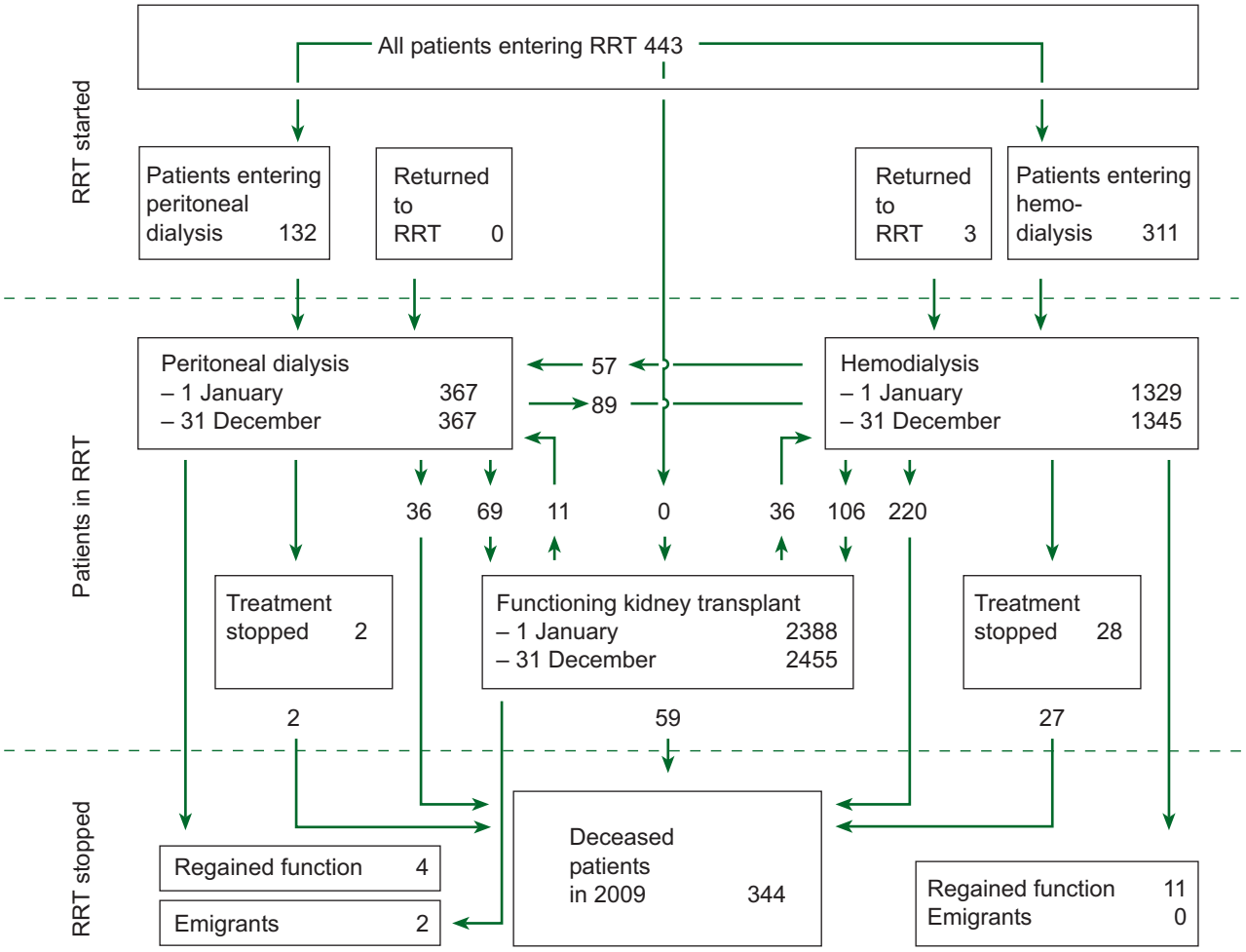
Table 7. Number of patient-years of all RRT patients according to diagnosis and type of treatment. Finnish Registry for Kidney Diseases 1999–2009

Diagnosis	Number of patient-years in 1999 (%)				Number of patient-years in 2009 (%)			
	Peritoneal dialysis	Hemo-dialysis	Trans-plantation	Total	Peritoneal dialysis	Hemo-dialysis	Trans-plantation	Total
Glomerulonephritis	49 (17.1)	156 (19.6)	520 (31.2)	725 (26.4)	71 (18.7)	203 (15.3)	646 (26.6)	920 (22.3)
Type 1 diabetes	86 (30.3)	93 (11.7)	324 (19.4)	503 (18.3)	91 (24.1)	150 (11.3)	462 (19.0)	702 (17.0)
Polycystic degeneration	20 (7.1)	87 (10.9)	229 (13.7)	336 (12.2)	22 (5.9)	113 (8.5)	407 (16.8)	542 (13.1)
Undefined kidney disease	16 (5.7)	66 (8.3)	38 (2.3)	120 (4.4)	55 (14.6)	220 (16.6)	107 (4.4)	383 (9.3)
Type 2 diabetes	21 (7.5)	120 (15)	15 (0.9)	157 (5.7)	54 (14.4)	266 (20.1)	58 (2.4)	379 (9.2)
Pyelonephritis	20 (7.2)	47 (5.9)	187 (11.2)	255 (9.3)	9 (2.4)	58 (4.4)	201 (8.3)	268 (6.5)
Other systemic diseases	4 (1.3)	32 (4.0)	49 (2.9)	85 (3.1)	20 (5.3)	58 (4.4)	80 (3.3)	158 (3.8)
Nephrosclerosis	15 (5.3)	53 (6.6)	34 (2.0)	102 (3.7)	23 (6.2)	75 (5.7)	55 (2.3)	154 (3.7)
Urinary tract obstruction	8 (3.0)	21 (2.7)	66 (3.9)	95 (3.5)	7 (1.9)	42 (3.2)	94 (3.9)	143 (3.5)
Congenital diseases	8 (2.8)	4 (0.5)	74 (4.5)	87 (3.2)	6 (1.6)	17 (1.3)	99 (4.1)	122 (2.9)
Amyloidosis	9 (3.1)	66 (8.3)	40 (2.4)	115 (4.2)	5 (1.3)	39 (2.9)	40 (1.6)	84 (2.0)
Other kidney diseases	13 (4.5)	17 (2.2)	12 (0.7)	42 (1.5)	7 (2.0)	26 (1.9)	50 (2.1)	83 (2.0)
Congenital nephrosis, Finnish type	7 (2.6)	0 (0)	42 (2.5)	49 (1.8)	2 (0.5)	4 (0.3)	70 (2.9)	76 (1.8)
Tubulointerstitial nephritis	4 (1.5)	15 (1.9)	31 (1.8)	50 (1.8)	2 (0.5)	14 (1.1)	39 (1.6)	55 (1.3)
Malignancies	2 (0.7)	17 (2.1)	0 (0.0)	19 (0.7)	1 (0.3)	34 (2.6)	7 (0.3)	42 (1.0)
Metabolic diseases	1 (0.3)	3 (0.4)	6 (0.3)	9 (0.3)	2 (0.5)	6 (0.4)	12 (0.5)	20 (0.5)
All	284 (100)	797 (100)	1667 (100)	2748 (100)	378 (100)	1327 (100)	2427 (100)	4132 (100)

Table 7 shows the number of patient-years according to diagnosis of kidney disease and type of treatment in 1999 and 2009. The number of patient-years indicates the time patients spent in RRT during the year. Overall, the number of patient-years has increased by 50% since 1999. The number of patient-years has increased the most (67%) in hemodialysis. Although glomerulonephritis is the most common diagnosis among all RRT patients and kidney transplantation patients, the proportion of patient-years due to glomerulonephritis has decreased to 22% as of 2009. Type 1 diabetes is the second most common diagnosis among all RRT patients and the most common diagnosis among peritoneal dialysis patients. The number of patient-years due to type 2 diabetes has more than doubled during the past decade, and in 2009, type 2 diabetes was the most common kidney disease diagnosis among hemodialysis patients. Among kidney transplantation patients, however, type 2 diabetes is still a rare cause of end-stage renal disease. The proportion of patient-years due to ”undefined kidney disease” has increased markedly. Amyloidosis is the only diagnosis for which the number of patient-years has decreased (by 27%) since 1999.

In this report, nephrosclerosis includes only the following ICD-10 diagnoses: I12 and I13 (hypertensive renal disease), I70.1 (atherosclerosis of the renal artery), and N28.0 (Ischemia and infarction of the kidney). The diagnoses I15 (secondary hypertension) and N26 (unspecified contracted kidney) have been moved to the group ”other kidney diseases”.

Figure 13. Net changes in type of treatment.
Finnish Registry for Kidney Diseases 2009



During 2009, 443 new patients entered RRT for the first time (Figure 13), and three patients returned to RRT. In all, 4084 patients were receiving RRT at the beginning of the year. Altogether 344 patients died and dialysis was discontinued for 15 patients because the patients' own kidney function resumed. Of those who died, 59 had a functioning transplant, 36 were receiving peritoneal dialysis, and 220 were on hemodialysis. RRT was discontinued for 30 uremic patients, and the treatment of one patient who died in 2009 was discontinued in 2008. A total of 175 patients received a kidney transplant, of whom one received a combined liver and kidney transplantation (source: Kidney Transplantation Unit, Helsinki University Central Hospital).

Table 8. Mortality of RRT patients by region.
Finnish Registry for Kidney Diseases 1999–2009

Region	Deaths/1000 patient-years						Deaths/1000 patient-years[1)]					
	1999	2004	2007	2008	2009	2005–2009	1999	2004	2007	2008	2009	2005–2009
South	78	103	92	76	79	80	73	99	88	76	77	78
Southwest	98	69	77	82	71	86	90	65	77	77	71	84
West	156	111	95	93	97	102	135	103	89	92	92	98
East	113	114	91	111	82	98	97	111	91	109	80	97
North	121	118	118	110	86	101	103	109	118	106	86	100
Entire country	110	103	94	91	83	92	97	98	91	89	81	89

[1)]patients who died within 90 days of start of RRT were excluded

Figure 14. Standardized mortality of RRT patients in regions.
Finnish Registry for Kidney Diseases 1999–2009

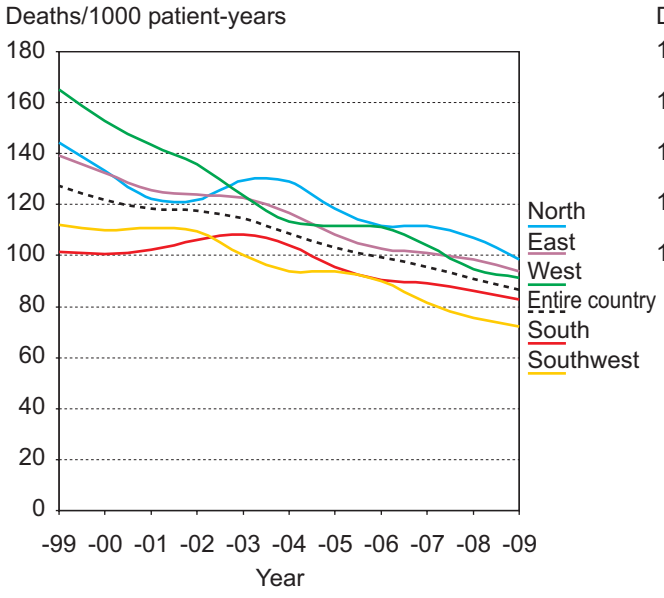


Figure 15. Standardized mortality of RRT patients in regions (patients who died within 90 days of start of RRT were excluded).
Finnish Registry for Kidney Diseases 1999–2009

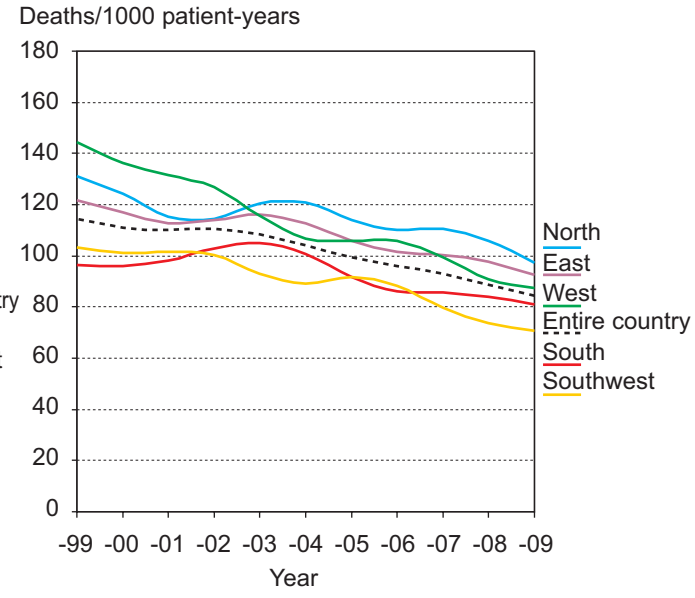


Table 8 shows RRT patient mortality in 1999–2009 according to region. The mortality of patients who have been in RRT for at least 90 days appears separately. The average mortality in 2005–2009 was highest in the northern region and lowest in the southwestern and southern regions.

Figures 14 and 15 show regional mortality as smoothed averages. The regional mortality rates for 1999–2009 have been age- and gender-standardized using all patient-years in 2009 as the reference. Changes in age and gender distribution during this ten-year period have been taken into consideration. Patients who died within 90 days of the start of RRT were excluded from Figure 15. The standardized mortality rate has decreased in all regions over the past ten years.

Figure 16. Prevalence/incidence ratio of RRT according to region.
Finnish Registry for Kidney Diseases 2009

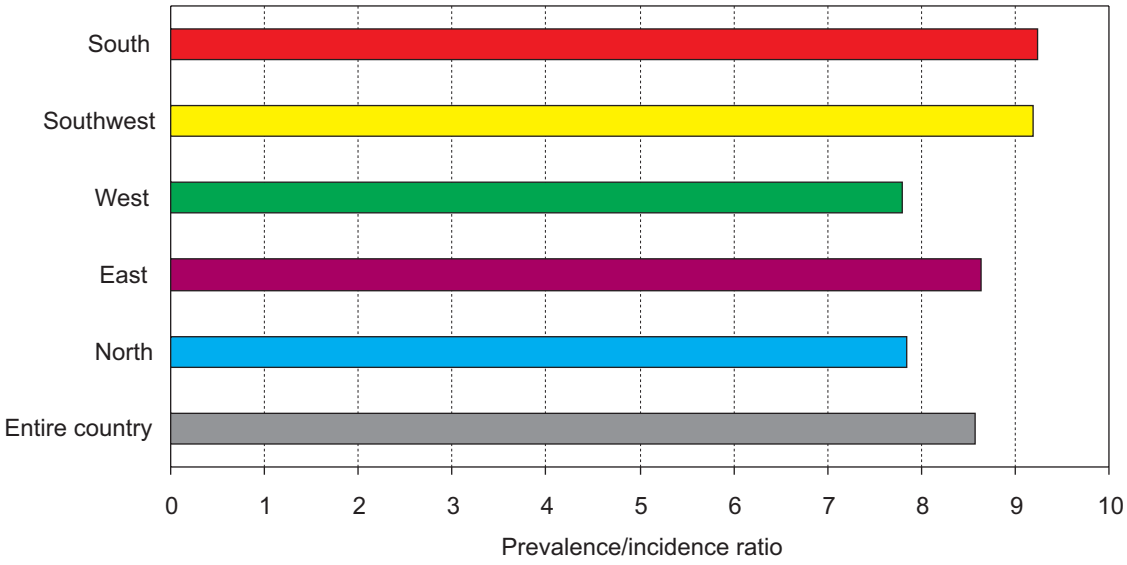


Figure 17. Prevalence/incidence ratio of RRT according to region (patients who died within 90 days of start of RRT were excluded).
Finnish Registry for Kidney Diseases 2009

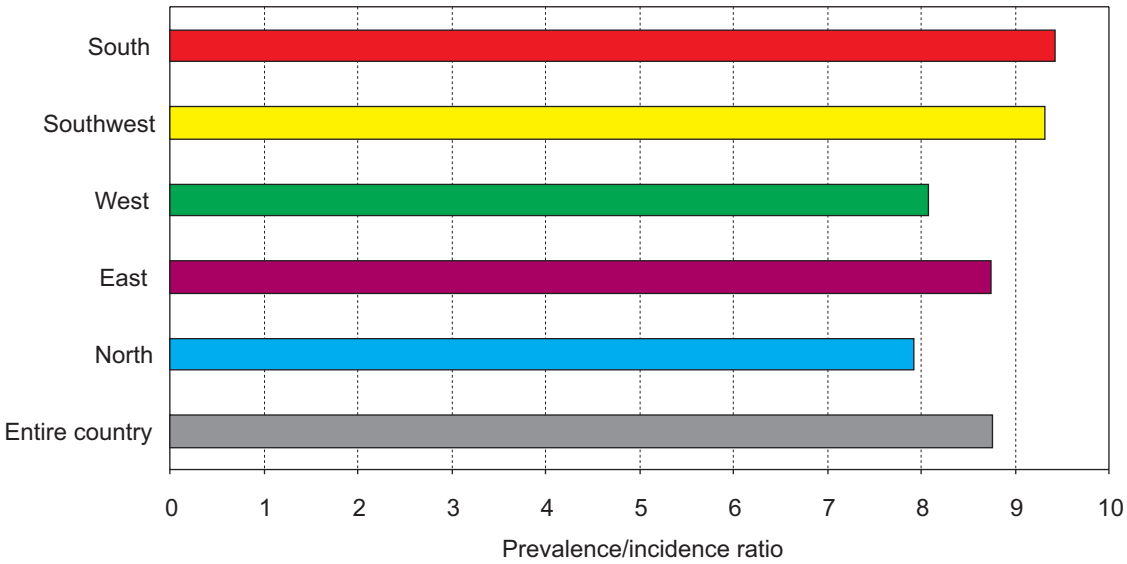


Figure 16 shows the relationship between the prevalence of RRT in 2009 (see Table 5 on page 14) and the average incidence of RRT in 2005–2009 (see Table 3 on page 7) according to regions. The prevalence/incidence ratio provides an estimate of the average duration of a disease. For RRT patients, the duration of the disease is virtually the same as survival time because kidney function is rarely regained. Thus, the prevalence/incidence ratio provides an estimate of average survival time. The prevalence/incidence ratio was highest in the southern and southwestern regions and lowest in the western and northern regions.

In Figure 17, patients who had died within 90 days of the start of RRT were excluded when calculating the incidence rates. This raised the prevalence/incidence by 2% on average. Regional differences remained unchanged.

Figure 18. Probability of survival of RRT patients according to region
Finnish Registry for Kidney Diseases 2000–2009

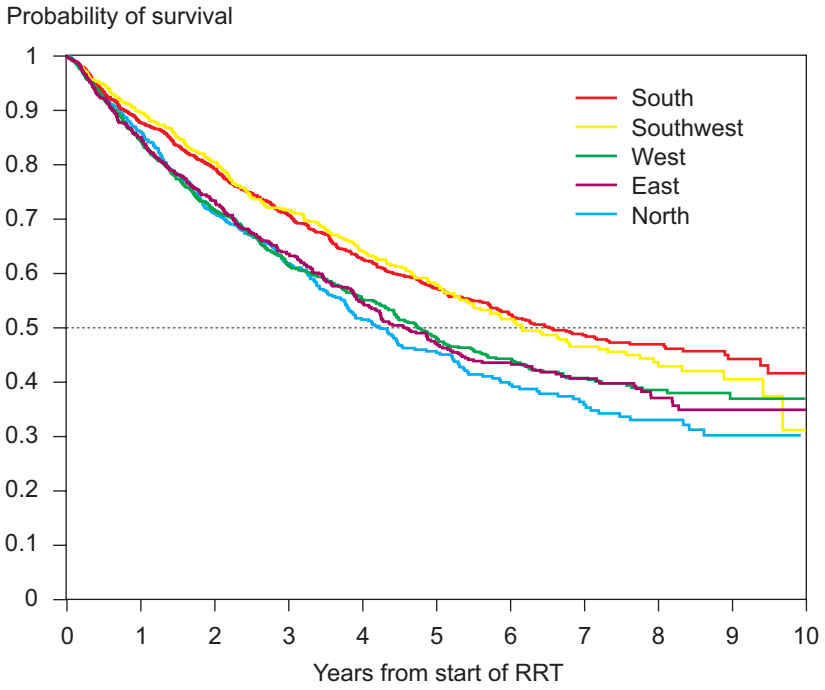


Figure 19. Probability of survival of RRT patients according to region
(patients who died within 90 days of start of RRT were excluded)
Finnish Registry for Kidney Diseases 2000–2009

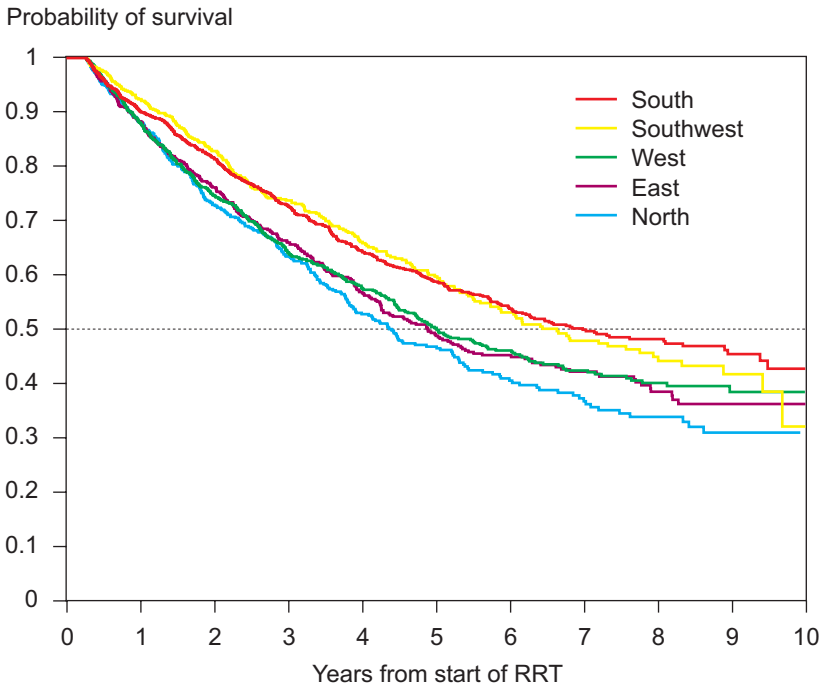


Figure 18 presents the survival of patients who entered RRT in 2000–2009 according to region. In 2000–2009, 4868 patients entered RRT, 2046 of whom died by 31 December 2009. Survival probability was calculated using the Kaplan-Meier method in which death was the event and patients were censored when they regained their own kidney function or at end of follow-up on 31 December 2009. In this unadjusted analysis, patient survival was longer in the southern and southwestern regions than elsewhere.

In Figure 19, patients who had died within 90 days of the start of RRT (n=148) were excluded from the analysis, although this did not affect the regional differences in patient survival.

Table 9. Relative risk of death among RRT patients according to region
Finnish Registry for Kidney Diseases 2000–2009

Region	Unadjusted relative risk (95% confidence interval)	Adjusted[1)] relative risk (95% confidence interval)	Adjusted[2)] relative risk (95% confidence interval)
South (reference group)	1	1	1
Southwest	1.01 (0.88–1.17)	0.94 (0.81–1.08)	0.89 (0.75–1.06)
West	1.29 (1.15–1.46)	1.16 (1.03–1.31)	1.10 (0.95–1.27)
East	1.31 (1.14–1.49)	1.23 (1.08–1.41)	1.11 (0.95–1.30)
North	1.40 (1.22–1.60)	1.31 (1.14–1.50)	1.23 (1.04–1.45)

[1)]Adjusted for age and gender
[2)]Adjusted for age, gender, kidney disease diagnosis and comorbidities (angina pectoris, myocardial infarction, coronary bypass, left ventricular hypertrophy, heart failure, arterial disease other than coronary disease, amputation, stroke)

Figure 20. Adjusted probability of survival among RRT patients
Finnish Registry for Kidney Diseases 2000–2009

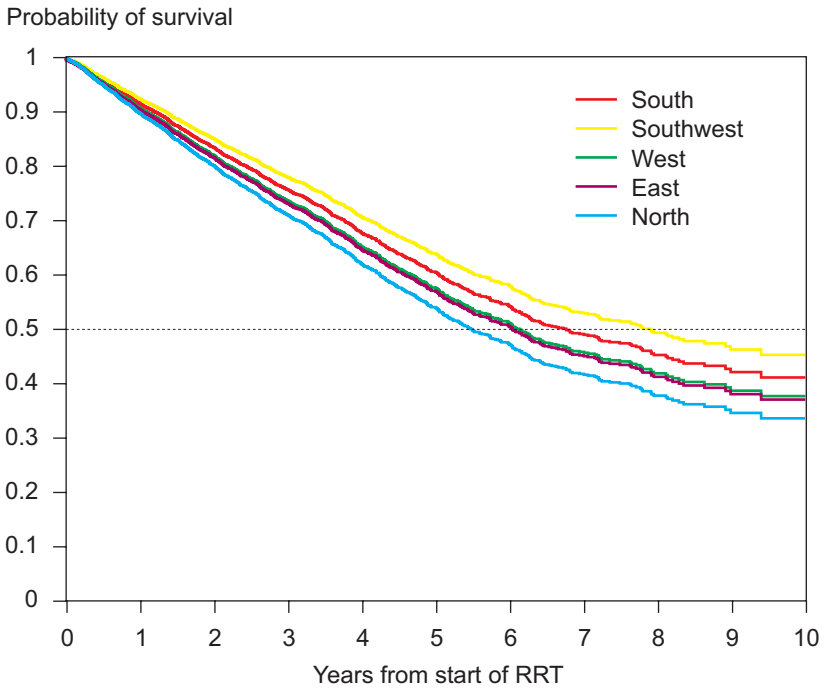


Table 9 shows RRT patients' relative risk of death according to region. The analysis includes all RRT patients who entered RRT in 2000–2009. The relative risks were calculated using Cox regression. Regional differences in patient survival decreased when adjusting for age, gender, kidney diseases diagnosis, and comorbidities. After adjusting for kidney transplantation (performed within two years of RRT start or not), in addition to the aforementioned, the result remained unchanged.

Figure 20 shows the survival probabilities of patients who entered RRT in 2000–2009 according region with adjustment for age, gender, kidney disease diagnosis, and comorbidities using Cox regression, as in Table 9.

Table 10. Relative risk of death among RRT patients according to region
(patients who died within 90 days of start of RRT were excluded)
Finnish Registry for Kidney Diseases 2000–2009

Region	Unadjusted relative risk (95% confidence interval)	Adjusted[1)] relative risk (95% confidence interval)	Adjusted[2)] relative risk (95% confidence interval)
South (reference group)	1	1	1
Southwest	1.01 (0.87–1.17)	0.93 (0.8–1.08)	0.88 (0.73–1.06)
West	1.28 (1.13–1.45)	1.15 (1.01–1.30)	1.09 (0.94–1.26)
East	1.30 (1.13–1.49)	1.22 (1.06–1.40)	1.13 (0.96–1.33)
North	1.44 (1.25–1.65)	1.34 (1.17–1.55)	1.28 (1.07–1.52)

[1)]Adjusted for age and gender
[2)]Adjusted for age, gender, kidney disease diagnosis and comorbidities (angina pectoris, myocardial infarction, coronary bypass, left ventricular hypertrophy, heart failure, arterial disease other than coronary disease, amputation, stroke)

Figure 21. Adjusted probability of survival among RRT patients
(patients who died within 90 days of start of RRT were excluded)
Finnish Registry for Kidney Diseases 2000–2009

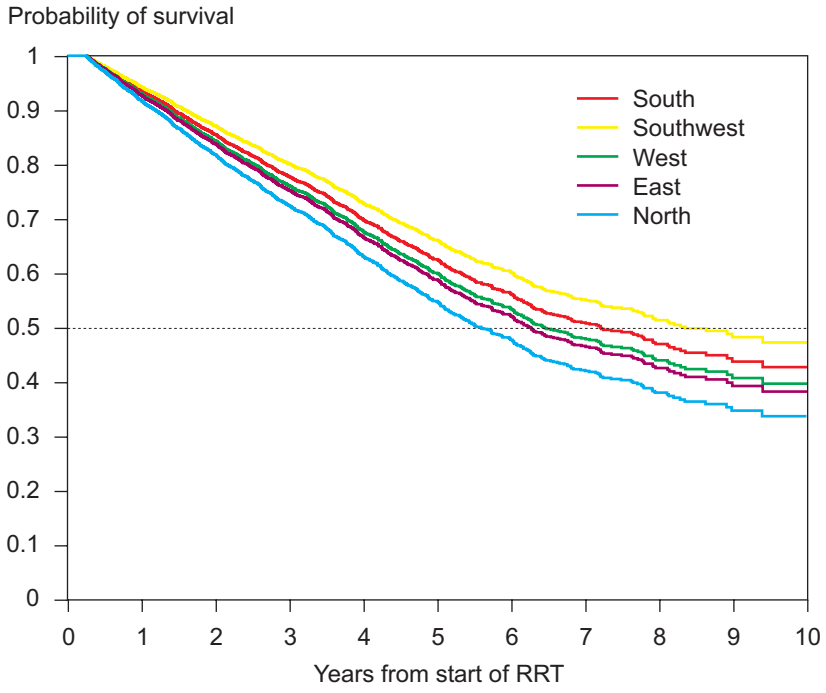


Table 10 shows RRT patients' relative risk of death according to region. The analysis is similar to that in Table 9, except that patients who died within 90 days of the start of RRT were excluded. This did not, however, significantly change the results.

Figure 21 shows the survival probabilities of patients who entered RRT in 2000–2009 according to region with adjustment for age, gender, kidney disease diagnosis and comorbidities similar to that in Figure 20, except that in this analysis, patients who died within 90 days of the start of RRT were excluded.

Figure 22. Prevalence/incidence ratio in 2008. International comparison.
Finnish Registry for Kidney Diseases 2008

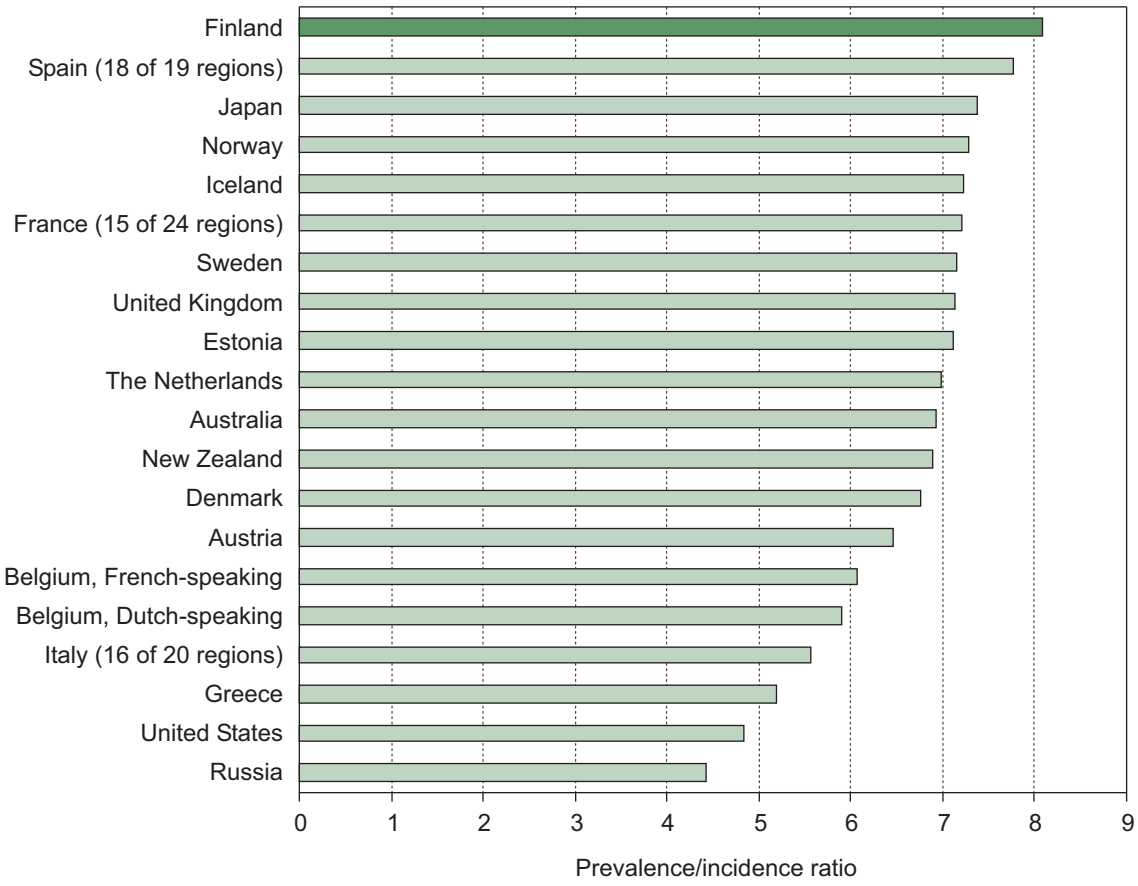


Figure 22 shows the ratio of the prevalence of RRT (see Figure 12 on page 19) and the incidence of RRT (see Figure 7 on page 13) in various countries in 2008. Generally, the prevalence/incidence ratio provides an estimate of the average duration of a disease. As RRT patients seldom regain kidney function, the prevalence/incidence ratio provides an estimate of average patient survival time. According to this comparison, Finnish RRT patients have the highest prevalence/incidence ratio and the longest estimated survival.

Finnish Registry for Kidney Diseases

Report 2009

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