

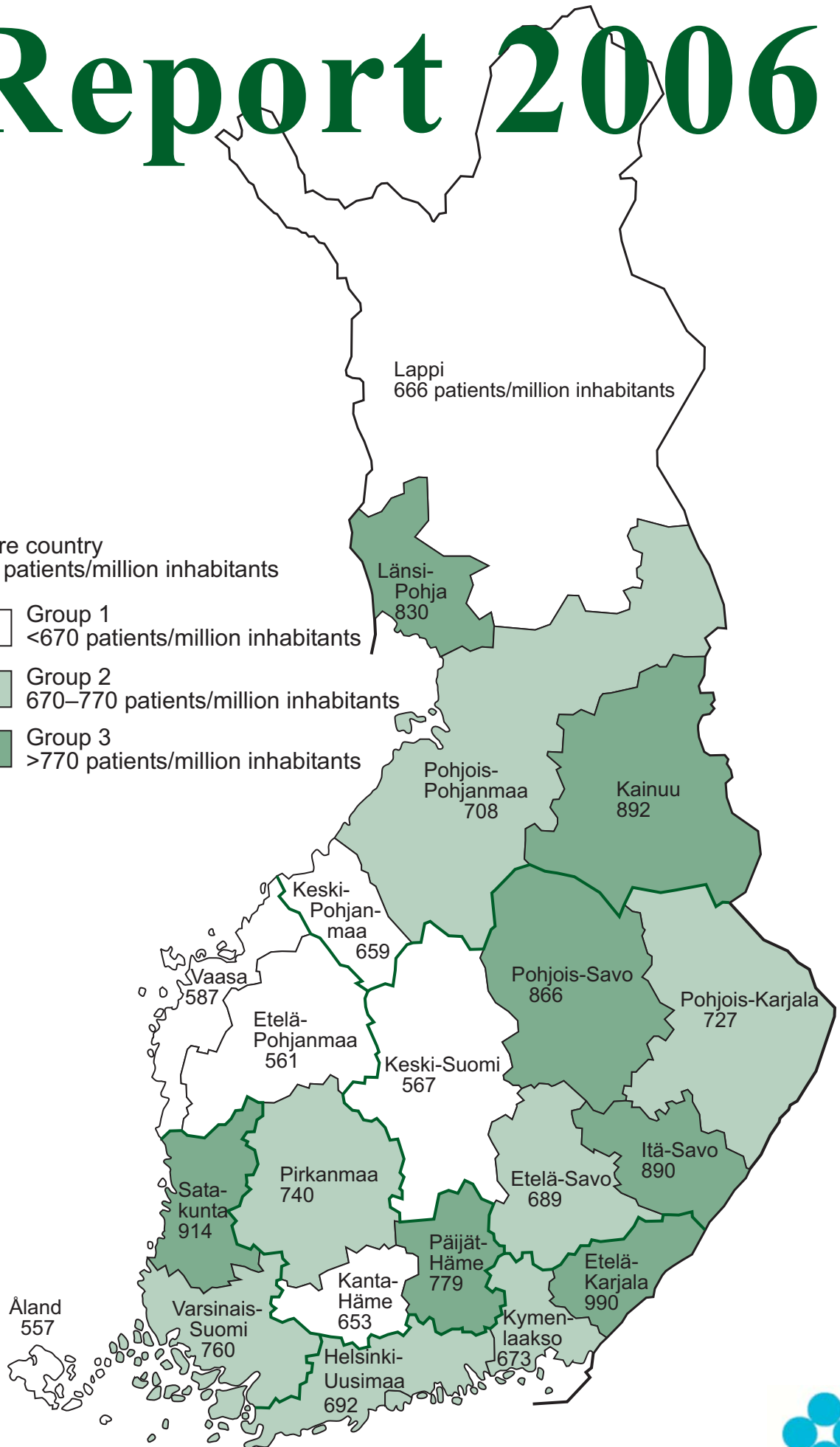
Report 2006

Entire country
722 patients/million inhabitants

Group 1
<670 patients/million inhabitants

Group 2
670–770 patients/million inhabitants

Group 3
>770 patients/million inhabitants



Finnish Registry for Kidney Diseases – Report 2006

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Finnish Registry for Kidney Diseases – Report 2006

Report 2006 presents the latest information on the incidence and prevalence of renal replacement therapy (RRT), as well as on RRT patients' mortality. The Finnish Registry for Kidney Diseases is estimated to cover 97–99% of all Finnish patients receiving RRT since 1964. At the end of 2006, the registry contained data on 10 341 patients, 3809 of whom were still alive.

The incidence of RRT increased continuously until 1999, after which it remained at about 95 new RRT patients per million inhabitants. In 2006, the incidence dropped to 84 new RRT patients per million inhabitants. The most significant decrease since 2005 has occurred among 45–64-year-olds. Among 65–74-year-olds, the incidence has decreased slowly during the past five years. Among inhabitants older than 75 years, the incidence increased until 2005, but declined in 2006. In inhabitants younger than 45 years, the incidence has remained virtually unchanged. RRT incidence has decreased in many diagnostic groups, such as type 1 diabetes, type 2 diabetes, pyelonephritis, and polycystic degeneration, but especially secondary amyloidosis causes less end-stage renal disease than earlier. This may be a consequence of more efficient treatment of rheumatoid arthritis. Overall, the reduced RRT incidence indicates that prevention and treatment of kidney diseases have improved. The decline in incidence of RRT is a rare phenomenon worldwide, but in Sweden and Denmark, the incidence has also decreased in recent years.

The prevalence of RRT, i.e. the number of RRT patients per million inhabitants, continues to increase. However, at the end of 2006, the number of dialysis patients was smaller than the year before. This was due to the low incidence and the large number of kidney transplantations in 2006. During 2006, 210 kidney transplantations were performed, while the typical number is around 170 transplantations a year. In Finland, the proportion of living organ donors is only 2%, which is considerably lower than in most other European countries. If organs from living donors were used more frequently, the number of kidney transplantations performed yearly could increase permanently.

This report includes a special analysis of laboratory variables potentially connected to the quality of nephrological care, and of the distribution of these variables in various healthcare districts. A similar analysis was presented in Report 2004, and this year a comparison has been made with the situation in 2004. For most variables, no improvement was apparent. However, total cholesterol and LDL-cholesterol concentrations were significantly lower in 2006 than in 2004 among both dialysis and kidney transplantation patients. The variable distributions frequently showed significant differences between healthcare districts. To prevent identification, each healthcare district was given a secret code that was sent only to the chief nephrologists in the district.

The Finnish Registry for Kidney Diseases is a national healthcare registry that is 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 Follow-up of Kidney Transplantation Patients, maintained by the Kidney Transplantation Unit of Helsinki University Central Hospital. The Board of the Finnish Registry for Kidney Diseases thanks all supporters and participating hospitals for excellent cooperation.

Helsinki, 17 November 2007

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Administrative Director

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Table 1. The Finnish population and its distribution in healthcare districts.
Finnish Registry for Kidney Diseases 1996–2006

Healthcare district (1000 inhabitants)		Year					Change (%) 1996–2006
		1996	2001	2004	2005	2006	
1	Helsinki-Uusimaa	1322	1404	1432	1445	1460	10.4
3	Varsinais-Suomi	443	455	459	461	463	4.5
4	Satakunta	236	230	228	227	226	-4.2
5	Kanta-Häme	165	166	168	168	170	3
6	Pirkanmaa	438	452	463	465	470	7.3
7	Päijät-Häme	207	207	210	210	211	1.9
8	Kymenlaakso	187	182	181	181	180	-3.7
9	Etelä-Karjala	131	130	129	129	128	-2.3
10	Etelä-Savo	109	106	104	104	103	-5.5
11	Itä-Savo	70	66	63	62	62	-11.4
12	Pohjois-Karjala	178	172	170	170	169	-5.1
13	Pohjois-Savo	258	251	251	250	249	-3.5
14	Keski-Suomi	262	265	267	270	270	3.1
15	Etelä-Pohjanmaa	200	195	195	194	194	-3
16	Vaasa	167	166	166	166	167	0
17	Keski-Pohjanmaa	80	78	77	77	77	-3.8
18	Pohjois-Pohjanmaa	363	372	379	382	384	5.8
19	Kainuu	90	84	82	82	81	-10
20	Länsi-Pohja	71	68	67	67	66	-7
21	Lappi	129	121	120	119	119	-7.8
22	Åland	25	26	27	27	27	8
Region South		1640	1715	1742	1755	1769	7.9
Southwest		705	710	713	714	716	1.6
West		1177	1185	1201	1204	1212	3
East		877	860	855	856	853	-2.7
North		733	723	725	727	727	-0.8
Entire country		5132	5195	5237	5256	5277	2.8

On 31 December 2006, there were 5.277 million inhabitants in Finland (Table 1, Source: Statistics Finland). During the past ten years the population has increased considerably in the southern region. In the eastern and northern regions, the populations have decreased. Since 1996, the populations have increased in eight healthcare districts and decreased in 13.

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 2006

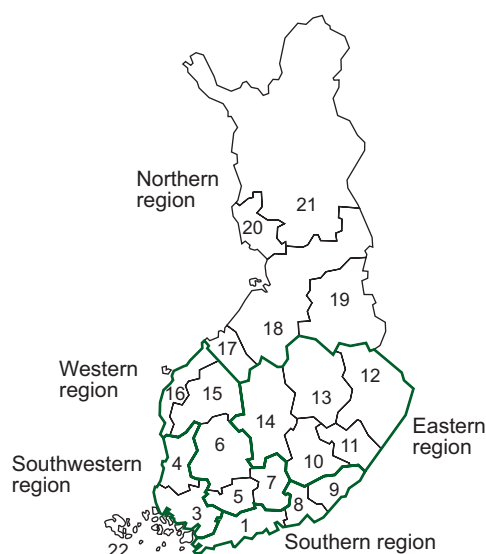


Table 2. The Finnish population according to region, age group, and gender.
Finnish Registry for Kidney Diseases 1996–2006

Region	1996					2006				
	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	205 (26)	510 (65)	49 (6)	25 (3)	788 (100)	208 (24)	550 (64)	61 (7)	36 (4)	856 (100)
Women	196 (23)	525 (62)	70 (8)	62 (7)	852 (100)	202 (22)	562 (62)	76 (8)	74 (8)	913 (100)
Total	400 (24)	1035 (63)	119 (7)	86 (5)	1640 (100)	410 (23)	1112 (63)	137 (8)	110 (6)	1769 (100)
Southwest										
Men	86 (25)	213 (62)	28 (8)	15 (4)	341 (100)	81 (23)	215 (62)	31 (9)	21 (6)	348 (100)
Women	83 (23)	209 (58)	38 (10)	34 (9)	363 (100)	77 (21)	213 (58)	36 (10)	41 (11)	368 (100)
Total	169 (24)	422 (60)	65 (9)	49 (7)	705 (100)	158 (22)	428 (60)	68 (9)	62 (9)	716 (100)
West										
Men	150 (26)	353 (62)	46 (8)	24 (4)	573 (100)	143 (24)	365 (61)	51 (9)	35 (6)	594 (100)
Women	143 (24)	343 (57)	63 (10)	56 (9)	604 (100)	137 (22)	352 (57)	61 (10)	68 (11)	618 (100)
Total	293 (25)	696 (59)	109 (9)	80 (7)	1177 (100)	280 (23)	717 (59)	112 (9)	103 (9)	1212 (100)
East										
Men	113 (26)	266 (62)	36 (8)	17 (4)	432 (100)	98 (23)	257 (61)	40 (9)	26 (6)	421 (100)
Women	108 (24)	251 (56)	48 (11)	39 (9)	446 (100)	94 (22)	244 (56)	46 (11)	50 (11)	432 (100)
Total	220 (25)	517 (59)	84 (10)	56 (6)	877 (100)	191 (22)	501 (59)	85 (10)	76 (9)	853 (100)
North										
Men	108 (29)	221 (60)	26 (7)	12 (3)	367 (100)	96 (26)	220 (60)	30 (8)	19 (5)	365 (100)
Women	103 (28)	205 (56)	33 (9)	25 (7)	366 (100)	91 (25)	204 (56)	34 (9)	33 (9)	363 (100)
Total	211 (29)	426 (58)	59 (8)	37 (5)	733 (100)	187 (26)	424 (58)	64 (9)	52 (7)	727 (100)
Entire country										
Men	661 (26)	1562 (62)	185 (7)	93 (4)	2501 (100)	626 (24)	1606 (62)	213 (8)	138 (5)	2584 (100)
Women	633 (24)	1533 (58)	251 (10)	214 (8)	2632 (100)	600 (22)	1575 (58)	252 (9)	265 (10)	2693 (100)
Total	1294 (25)	3095 (60)	436 (8)	308 (6)	5132 (100)	1227 (23)	3182 (60)	465 (9)	404 (8)	5277 (100)

Table 2 shows the distribution of the Finnish population according to region, age, and gender at the end of 1996 and 2006. The proportion of inhabitants older than 65 years in the entire country has increased from 14% to 16%. In the southern region, the proportion of inhabitants older than 65 years is the smallest (13%) and the proportion of 20–64-year-olds is the largest (63%). In the northern region, the proportion of 0–19-year-olds is the largest (26%).

The age of the Finnish population has increased considerably during the past ten years. The number of inhabitants younger than 20 years has decreased by 5%, whereas the number of inhabitants older than 75 years has increased by 31%.

Table 3. Number of new RRT patients and incidence of RRT by healthcare district and region.
Finnish Registry for Kidney Diseases 1996–2006

Healthcare district	Number of new RRT patients							Incidence of RRT/million inhabitants						
	1996	2001	2004	2005	2006	2002–2006 on average		1996	2001	2004	2005	2006	2002–2006 on average	
1	Helsinki-Uusimaa	99	100	109	110	90	110	75	71	76	76	62	76	
3	Varsinais-Suomi	34	45	46	39	47	44	77	99	100	85	102	97	
4	Satakunta	23	24	26	20	20	24	97	105	114	88	88	104	
5	Kanta-Häme	10	18	21	20	8	16	61	109	125	119	47	94	
6	Pirkanmaa	40	45	43	39	55	43	91	100	93	84	117	94	
7	Päijät-Häme	10	20	29	35	20	29	48	97	138	166	95	140	
8	Kymenlaakso	21	14	15	27	20	20	112	77	83	149	111	113	
9	Etelä-Karjala	8	9	19	23	12	17	61	69	148	179	94	134	
10	Etelä-Savo	5	11	4	8	9	7	46	104	38	77	87	63	
11	Itä-Savo	5	4	5	7	10	7	72	61	80	112	162	114	
12	Pohjois-Karjala	12	16	24	18	11	18	67	93	141	106	65	103	
13	Pohjois-Savo	31	38	23	21	22	24	120	151	92	84	88	95	
14	Keski-Suomi	27	25	28	22	21	23	103	94	105	82	78	87	
15	Etelä-Pohjanmaa	13	17	12	18	17	18	65	87	62	93	88	93	
16	Vaasa	11	7	21	13	7	14	66	42	126	78	42	85	
17	Keski-Pohjanmaa	5	6	11	7	10	8	63	77	142	90	129	101	
18	Pohjois-Pohjanmaa	28	49	39	43	30	34	77	132	103	113	78	90	
19	Kainuu	3	8	18	15	13	13	33	95	219	184	161	163	
20	Länsi-Pohja	6	7	4	10	10	8	84	103	60	150	151	114	
21	Lappi	2	7	11	9	8	10	15	58	92	75	67	80	
22	Åland	2	2		2	1	2	79	77	0	75	37	45	
Region South		128	123	143	160	122	147	78	72	82	91	69	84	
Southwest		59	71	72	61	68	69	84	100	101	85	95	97	
West		84	107	126	125	107	121	71	90	105	104	88	101	
East		80	94	84	76	73	78	91	109	98	89	86	92	
North		44	77	83	84	71	72	60	106	115	116	98	100	
Entire country		395	472	508	506	441	488	77	91	97	96	84	93	
Children <15 y		4	11	7	10	6	8	4	12	8	11	7	9	

The number of new RRT patients and the incidence of RRT are presented according to healthcare district and region in Table 3. In 2006, the incidence was 13% lower than the year before and 9% higher than ten years earlier. In 2002–2006, the average incidence was largest in the western

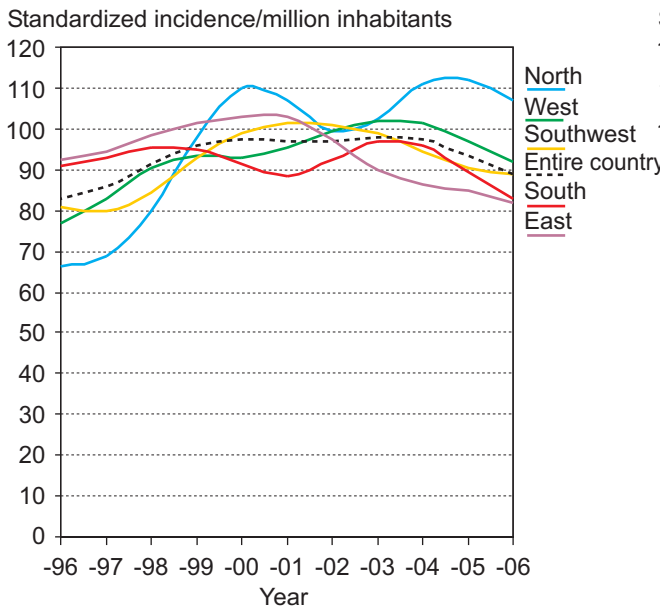
region and smallest in the southern region. Since 2001, the incidence in different regions has decreased by 2–22%. In the healthcare districts, the average incidence in 2002–2006 was 45–163 new RRT patients/million inhabitants.

Table 4. Incidence of RRT by age group and gender
Finnish Registry for Kidney Diseases 1996–2006

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
1996	Men	5	48	108	67	20	248	8	52	168	363	215	99
	Women	2	29	57	45	14	147	3	33	88	179	65	56
	Total	7	77	165	112	34	395	5	43	128	257	111	77
2001	Men	10	46	119	65	34	274	16	52	168	334	306	108
	Women	7	26	74	59	32	198	11	31	104	242	134	75
	Total	17	72	193	124	66	472	13	42	136	283	189	91
2004	Men	9	64	114	65	57	309	14	73	156	319	450	121
	Women	6	25	83	51	34	199	10	30	113	207	134	74
	Total	15	89	197	116	91	508	12	52	134	257	239	97
2005	Men	8	41	150	62	68	329	13	47	202	304	513	128
	Women	5	32	53	49	38	177	8	38	71	201	146	66
	Total	13	73	203	111	106	506	11	43	137	248	270	96
2006	Men	2	42	109	74	56	283	3	49	147	347	405	110
	Women	6	29	53	37	33	158	10	35	71	147	124	59
	Total	8	71	162	111	89	441	7	42	109	239	220	84

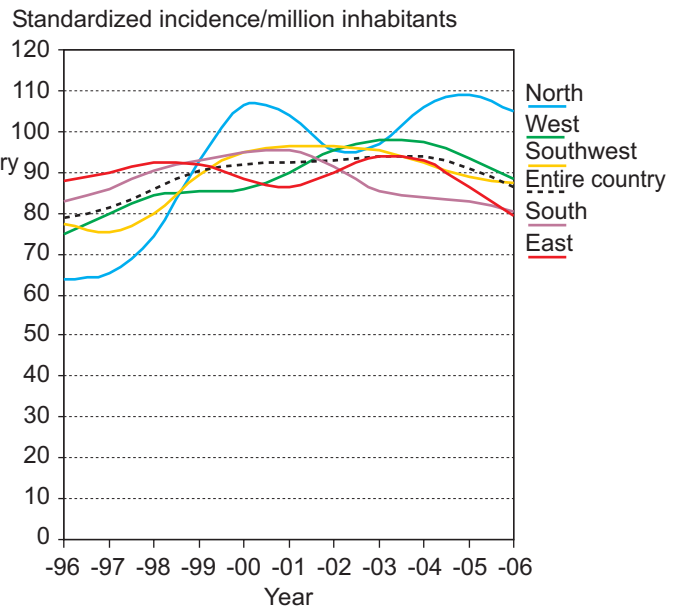
Table 4 shows the number of new RRT patients and the incidence of RRT according to age group and gender in 1996–2006. In 2006, the incidence was 9% higher than in 1996 and 8% lower than in 2001. In inhabitants older than 75 years, the incidence in 2006 was almost twofold that in 1996 and 17% higher than in 2001. In inhabitants younger than 45 years, the incidence has not changed markedly from 2001 to 2006, but in 45–64-year-olds, the incidence decreased by 20% and in 65–74-year-olds by 16%.

Figure 2. Standardized incidence of RRT in regions. Finnish Registry for Kidney Diseases 1996–2006



In Figure 2, the incidence of RRT (i.e. dialysis and kidney transplantation) in 1996–2006 is shown regionally as smoothed averages. The incidence rates are age- and gender-standardized using the Finnish population on 31 December 2006 as the reference population. Population changes in 1996–2006 have been considered. Standardization removes the effect of age and gender on regional differences in incidence rates. In the entire country, the incidence remained virtually unchanged during 1998–2005.

Figure 3. Standardized incidence of RRT in regions 90 days after the start of RRT. Finnish Registry for Kidney Diseases 1996–2006



In 2006, the incidence decreased in all regions except the Southwestern region.

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

Figure 4. Incidence of RRT according to diagnosis.
Finnish Registry for Kidney Diseases 1965–2006

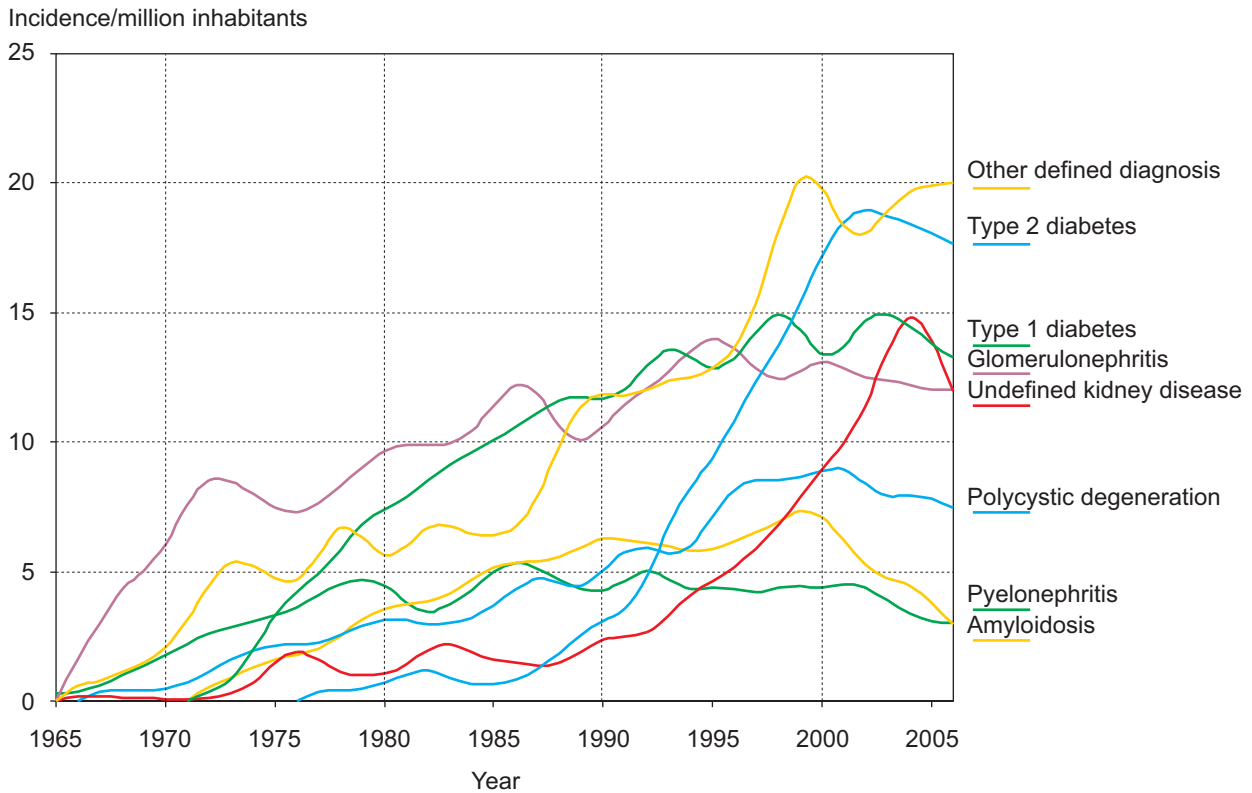
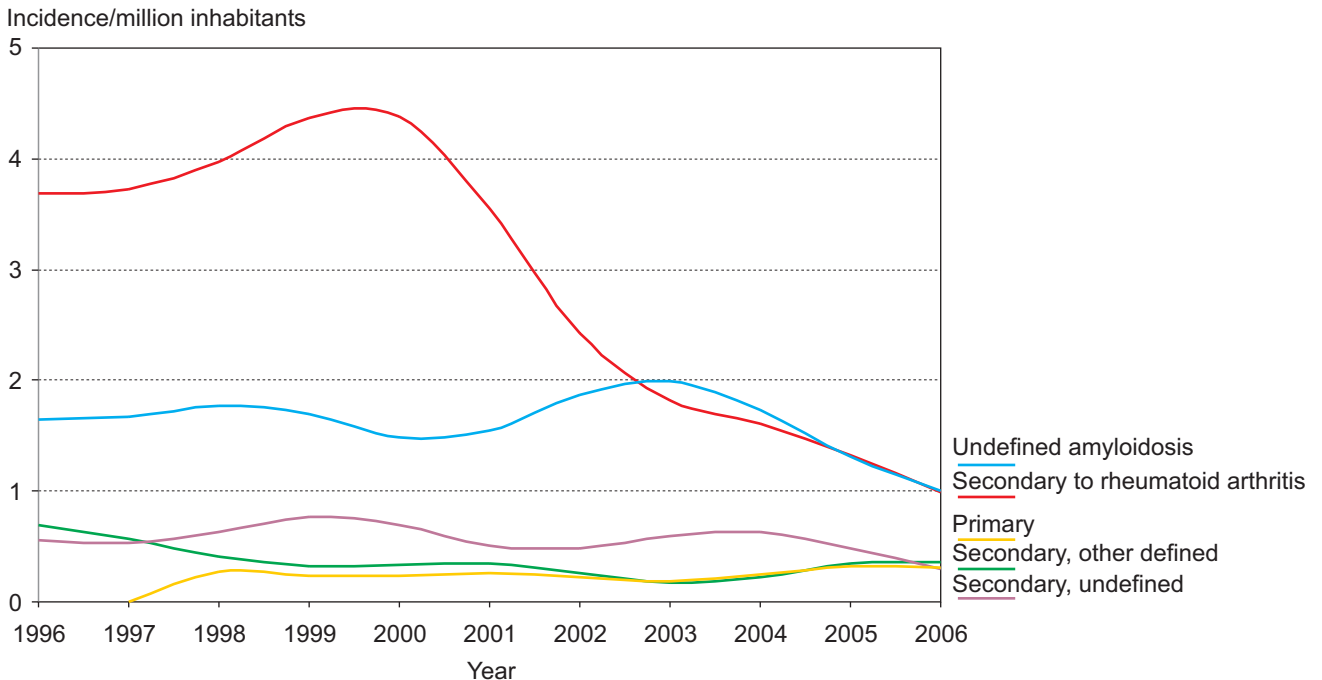


Figure 5. Incidence of RRT according to subgroups, amyloidosis
Finnish Registry for Kidney Diseases 1996–2006



The incidence of RRT according to diagnosis is shown as smoothed averages in Figure 4. Type 1 and type 2 diabetes are the most common diseases causing chronic uremia. The diagnosis “undefined kidney disease” increased greatly until 2005, but in 2006 this incidence decreased. The number of amyloidosis patients entering RRT has clearly decreased

since 2000.

Figure 5 displays the “amyloidosis” group shown in Figure 4 separately according to subgroups. Secondary amyloidosis caused by rheumatoid arthritis leads to end-stage renal disease less frequently than earlier.

Figure 6. Incidence of RRT according to diagnosis, other defined diagnoses.
Finnish Registry for Kidney Diseases 1965–2006

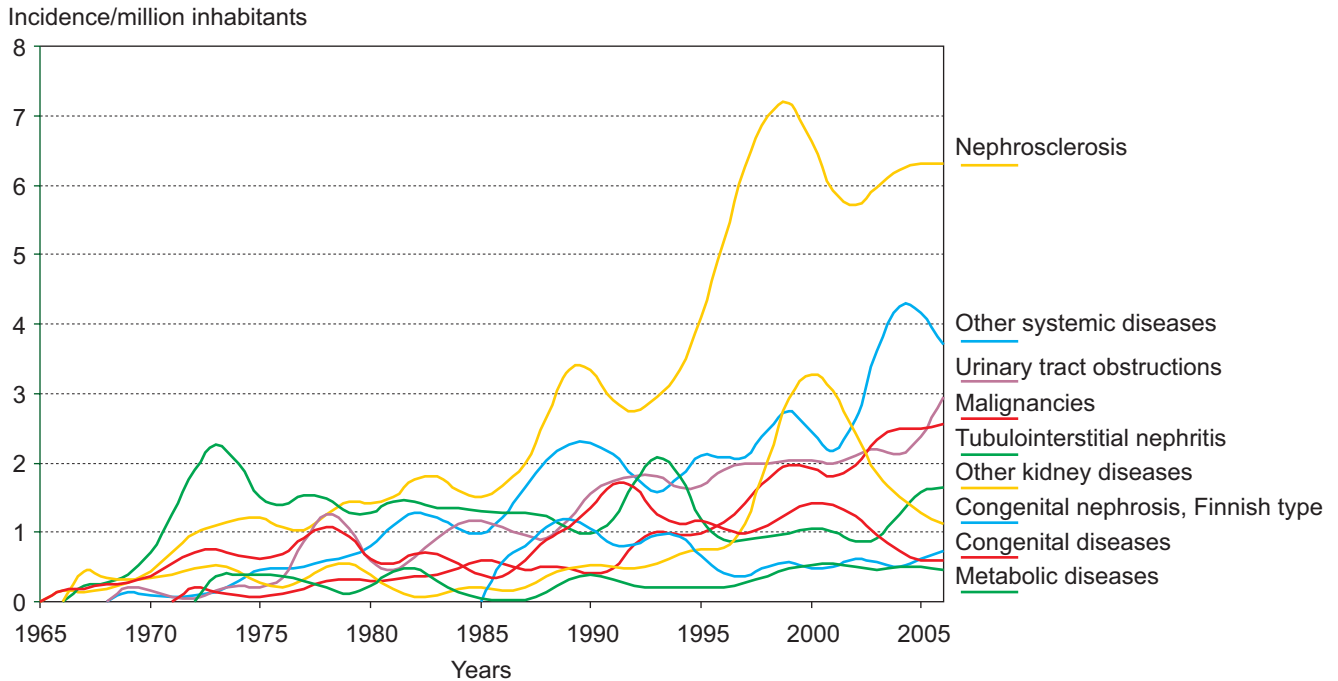


Figure 7. Incidence of RRT according to diagnosis, systemic diseases
Finnish Registry for Kidney Diseases 1996–2006

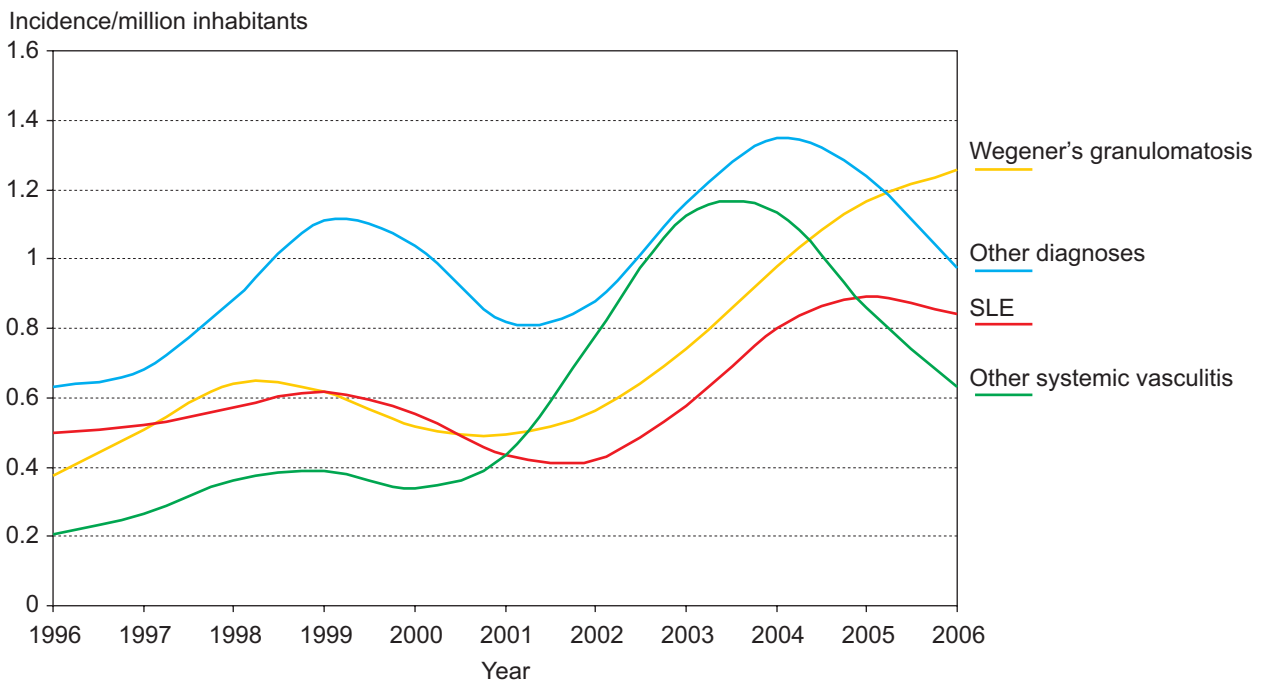


Figure 6 divides the category “other defined diagnosis” presented in Figure 4 into specific diagnostic groups. Nephrosclerosis gained ground in the 1990s, after which the incidence of RRT caused by this diagnosis has been about 6 new patients per million inhabitants annually. The incidence of RRT caused by nephrosclerosis is lower in Finland than in most other European countries (ERA-EDTA Registry 2005 Annual Report, <http://www.era-edta-reg.org>).

The incidence of RRT caused by systemic diseases has increased since 2000.

Figure 7 shows the most common systemic diseases leading to RRT. Wegener's granulomatosis is the most common diagnosis, followed by systemic lupus erythematosus (SLE). Three diagnoses comprise 60% of the group “Other diagnoses”: Goodpasture's syndrome, Henoch-Schönlein purpura, and hemolytic-uremic syndrome.

Figure 8. International comparison of incidence of RRT in 2005.
Finnish Registry for Kidney Diseases 2005

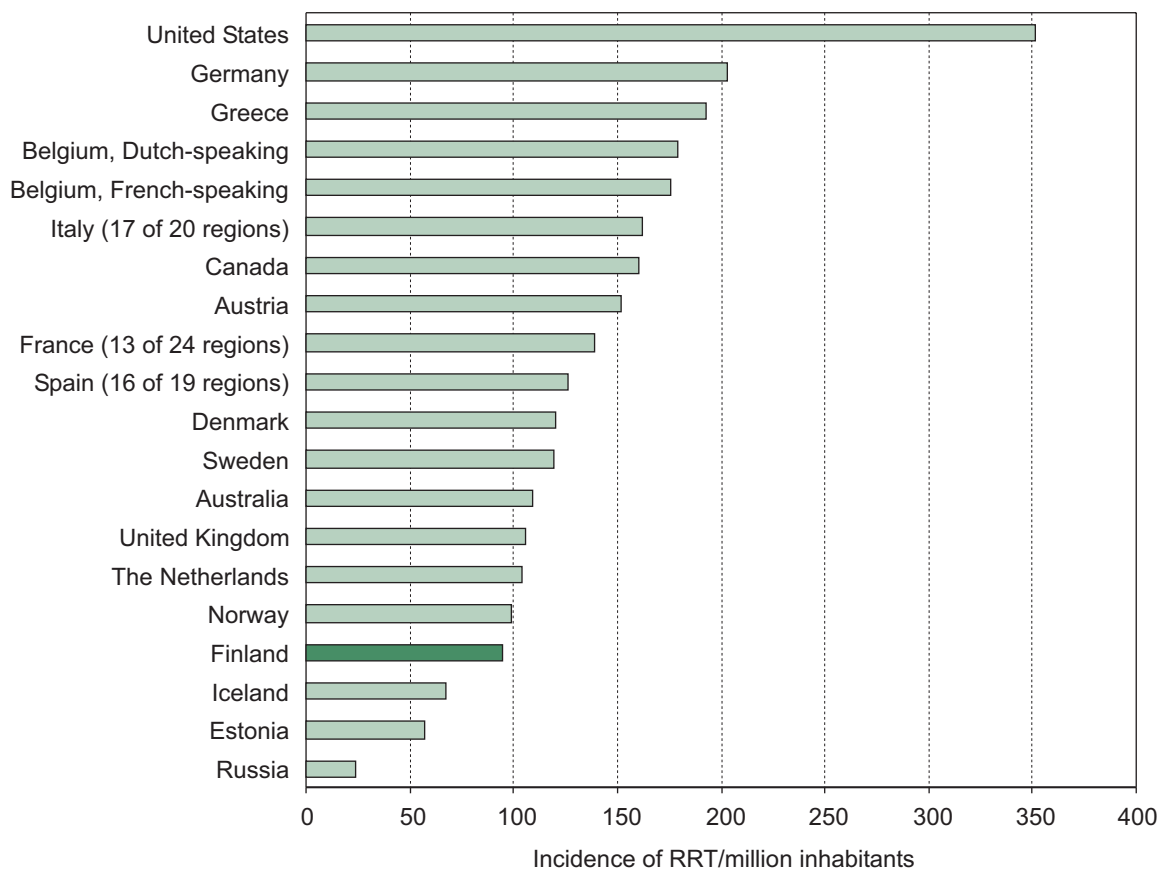


Figure 8 shows the incidence of RRT in 2005 in countries reporting to the ERA-EDTA Registry (<http://www.era-edta-reg.org>) and in the United States, Canada, and Australia (The 2007 USRDS Annual Data Report Atlas, <http://www.usrds.org>). The incidence of RRT in Finland was

the fourth lowest. In Sweden, the incidence was 27% greater, in Norway 5% greater, and in Denmark 27% greater than in Finland. Since 2001, the incidence had remained virtually unchanged in Finland and Norway. In Sweden, the incidence had decreased by 6% and in Denmark by 14%.

Table 5. Patients in RRT at end of year according to healthcare district and region.
Finnish Registry for Kidney Diseases 1996–2006

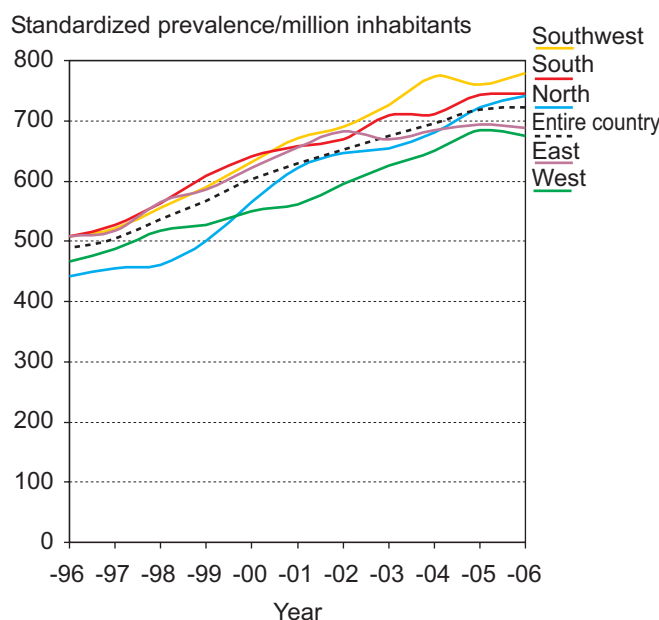
Healthcare district		Number of RRT patients					Prevalence of RRT/million inhabitants				
		1996	2001	2004	2005	2006	1996	2001	2004	2005	2006
1	Helsinki-Uusimaa	640	862	958	998	1010	484	614	669	691	692
3	Varsinais-Suomi	218	295	346	344	352	492	649	754	747	760
4	Satakunta	114	164	201	197	207	483	715	883	868	914
5	Kanta-Häme	58	83	109	118	111	352	501	650	701	653
6	Pirkanmaa	230	308	334	340	348	525	681	722	731	740
7	Päijät-Häme	96	102	143	160	164	463	493	681	761	779
8	Kymenlaakso	80	102	104	116	121	428	560	574	641	673
9	Etelä-Karjala	57	87	112	120	127	435	671	870	933	990
10	Etelä-Savo	40	60	63	69	71	366	566	605	666	689
11	Itä-Savo	32	44	46	51	55	458	668	733	819	890
12	Pohjois-Karjala	84	108	120	128	123	471	626	705	753	727
13	Pohjois-Savo	170	223	224	221	216	660	888	892	884	866
14	Keski-Suomi	108	134	151	150	153	412	506	565	556	567
15	Etelä-Pohjanmaa	81	91	97	106	109	405	467	498	545	561
16	Vaasa	67	73	101	107	98	401	440	608	644	587
17	Keski-Pohjanmaa	26	35	43	48	51	327	451	556	619	659
18	Pohjois-Pohjanmaa	149	226	247	266	272	411	608	652	697	708
19	Kainuu	33	55	61	69	72	367	651	742	846	892
20	Länsi-Pohja	34	43	46	49	55	476	634	691	736	830
21	Lappi	55	67	80	78	79	426	551	668	654	666
22	Åland	15	18	15	14	15	594	692	565	523	557
Region	South	777	1051	1174	1234	1258	474	613	674	703	711
	Southwest	347	477	562	555	574	492	672	788	777	801
	West	532	657	784	831	830	452	554	653	690	685
	East	434	569	604	619	618	495	661	706	724	724
	North	297	426	477	510	529	405	589	658	702	727
Entire country		2387	3180	3601	3749	3809	465	612	688	713	722

The number of RRT patients and the prevalence of RRT on 31 December 1996–2006 are presented in Table 5. In the entire country, the prevalence has increased by 55% since 1996 and by 18% since 2001. On 31 December 2006, the prevalence was higher in the southwestern region than in the other regions. Since 1996, the prevalence has increased the most in the northern region (80%) and the least in the eastern region (46%). In 20 healthcare districts, the prevalence has increased by 31–143% during the past ten years. In one healthcare district, the prevalence has remained virtually unchanged.

Table 6. Patients in RRT according to age group and gender.
Finnish Registry for Kidney Diseases 1996–2006

Year		Number of RRT patients						Prevalence of RRT/million inhabitants					
		0–19 y	20–44 y	45–64 y	65–74 y	≥ 75y	Total	0–19 y	20–44 y	45–64 y	65–74 y	≥ 75y	Total
1996	Men	62	390	643	224	58	1377	94	424	1003	1213	623	551
	Women	27	330	425	183	45	1010	43	373	656	729	210	384
	Total	89	720	1068	407	103	2387	69	399	828	934	335	465
2001	Men	78	411	915	344	124	1872	121	467	1293	1770	1116	738
	Women	41	313	559	280	115	1308	66	370	785	1150	482	492
	Total	119	724	1474	624	239	3180	94	419	1039	1426	683	612
2004	Men	84	456	1014	400	221	2175	133	524	1387	1961	1745	849
	Women	51	293	628	291	163	1426	85	350	855	1180	642	533
	Total	135	749	1642	691	384	3601	110	439	1120	1534	1009	688
2005	Men	83	441	1100	396	265	2285	132	508	1484	1939	1999	888
	Women	53	304	636	285	186	1464	88	365	853	1168	714	546
	Total	136	745	1736	681	451	3749	111	438	1168	1519	1148	713
2006	Men	77	440	1107	413	282	2319	123	510	1490	1939	2040	898
	Women	53	299	664	288	186	1490	88	361	888	1143	701	553
	Total	130	739	1771	701	468	3809	106	437	1188	1507	1159	722

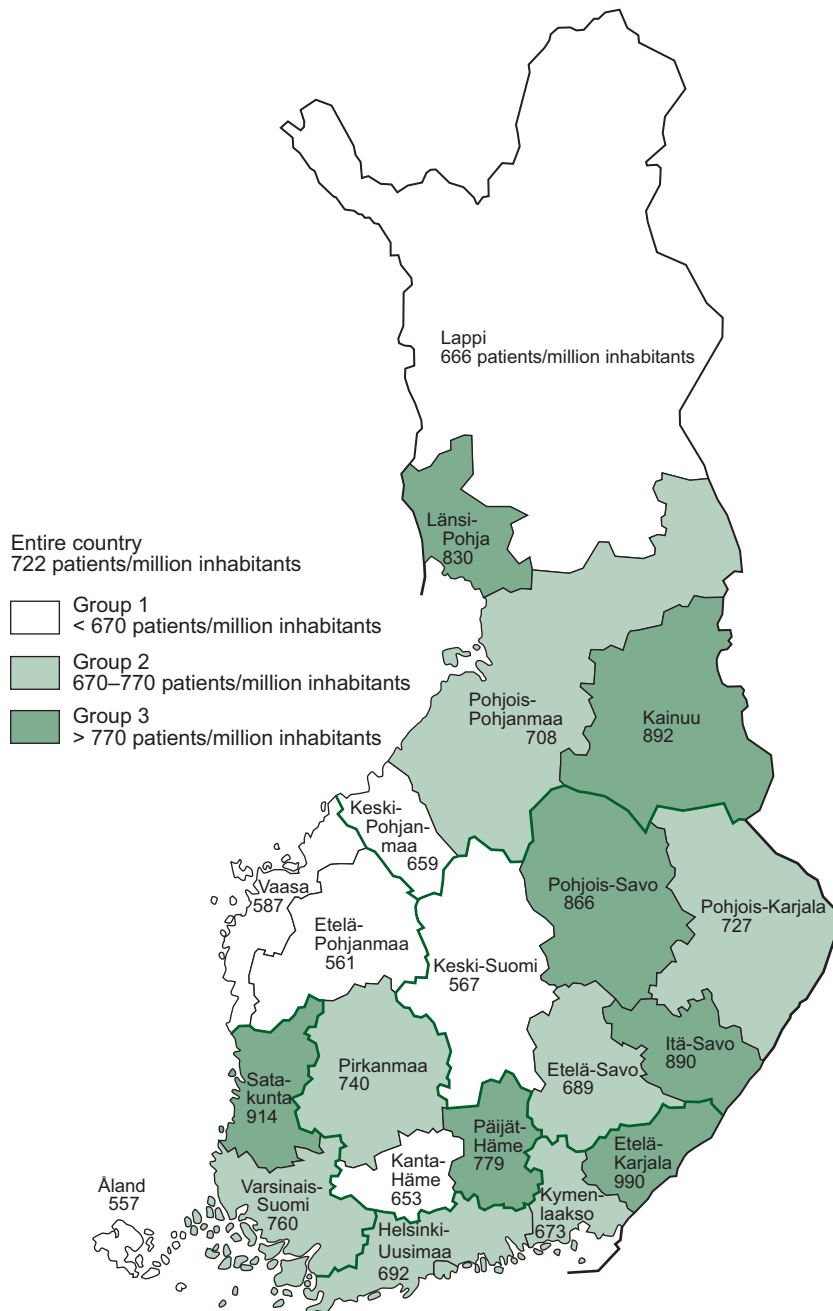
Figure 9. Standardized prevalence of RRT in regions.
Finnish Registry for Kidney Diseases 1996–2006



In Table 6, the number of RRT patients on 31 December 1996–2006 is shown according to age group and gender. In the age group 75 years and older, the prevalence of RRT has increased by almost 250% during the past ten years and by 70% during the past five years. In the younger age groups, the prevalence has increased by 10–61% in ten years and by 4–14% in five years. Since 1996, the prevalence of RRT has increased faster among men (63%) than among women (44%).

In Figure 9, the prevalence rates for 1996–2006 are age- and gender-standardized using the Finnish population on 31 December 2006 as the reference population. Population changes during this period have been considered. Standardization removes the effect of age and gender on regional differences in prevalence rates. In 2006, the increase in prevalence was smaller than in earlier years.

Figure 10. Prevalence of RRT in healthcare districts on 31 December 2006
Finnish Registry for Kidney Diseases 2006



The healthcare districts shown on the map are grouped according to the prevalence of RRT at the end of 2006 (Figure 10). The prevalence was <670 in seven districts, 670–770 in seven districts, and >770 patients/million inhabitants in seven districts. The borders of the regions are indicated with thick lines.

Figure 11. Prevalence of RRT at end of year according to type of treatment.
Finnish Registry for Kidney Diseases 1965–2006

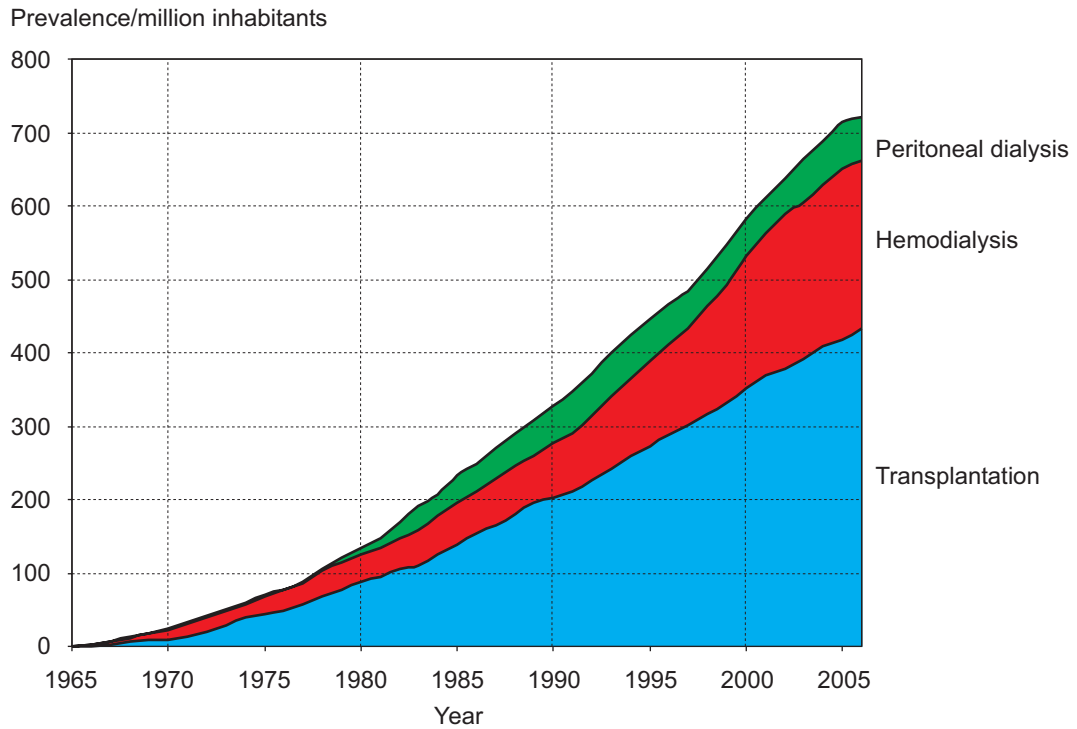


Figure 11 displays the prevalence of RRT according to type of treatment. During the past ten years the prevalence of peritoneal dialysis has increased by 13% and that of hemodialysis by 83%. The prevalence of kidney transplantations has increased by 51%. The proportion of hemodialysis patients of all RRT patients was 27% in 1996

and 31% in 2006. The proportion of peritoneal dialysis patients had correspondingly decreased from 12% to 8%. The proportion of kidney transplantation patients has remained virtually unchanged (59–62%) during the past ten years.

Figure 12. Prevalence of RRT at end of year according to diagnosis
Finnish Registry for Kidney Diseases 1965–2006

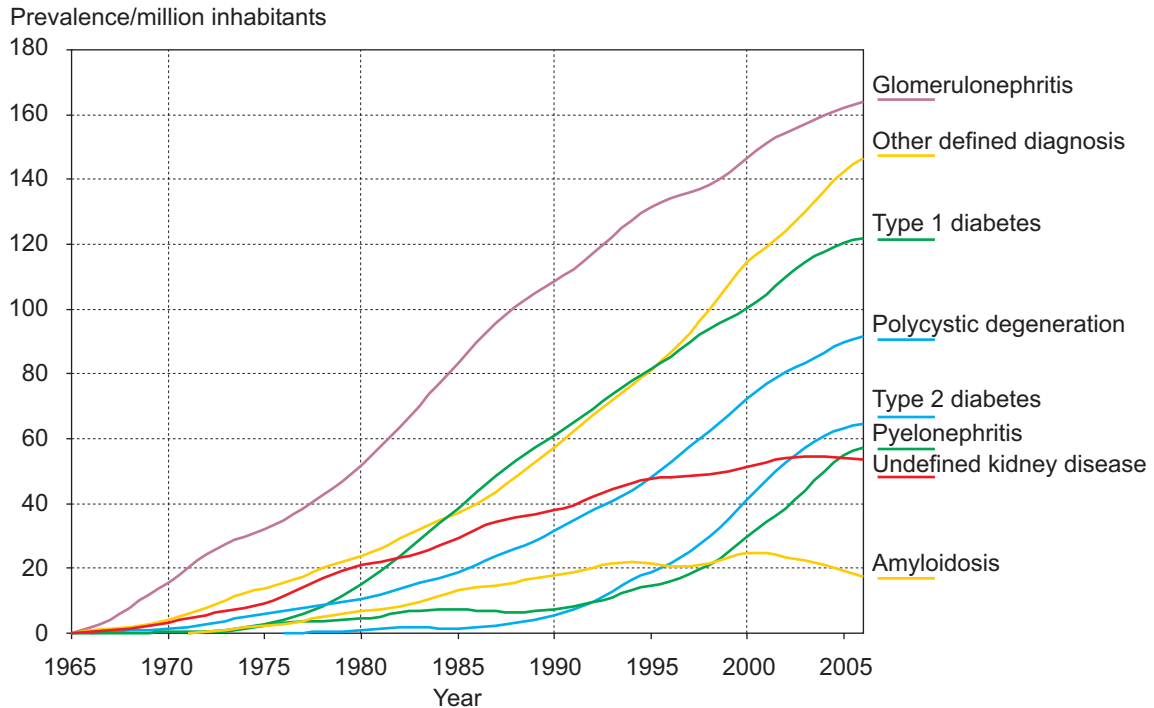
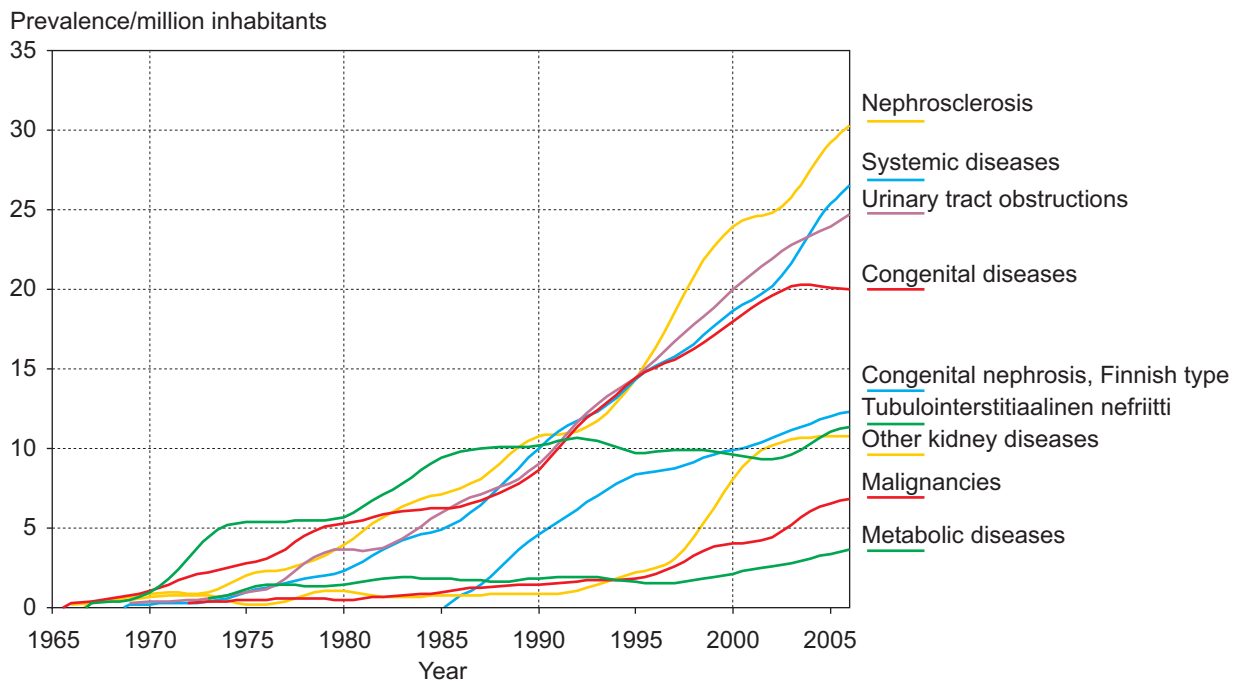


Figure 13. Prevalence of RRT at end of year according to diagnosis, other defined diagnoses
Finnish Registry for Kidney Diseases 1965–2006



The prevalence of RRT according to diagnosis is shown as smoothed averages in Figure 12. At the end of 2006, the most common kidney diagnosis of RRT patients was glomerulonephritis (prevalence rate 165/million inhabitants), with 23% of all RRT patients having glomerulonephritis. Type 1 diabetes was the second most common diagnosis (prevalence rate 123/million inhabitants) and polycystic

degeneration the third most common diagnosis (prevalence rate 92/million inhabitants).

Figure 13 divides the category “other defined diagnosis” presented in Figure 12 into specific diagnostic groups. In this category, nephrosclerosis, systemic diseases, urinary tract obstructions and congenital diseases are the most common leading to end-stage renal disease.

Figure 14. International comparison of prevalence of RRT on 31 December 2005.
Finnish Registry for Kidney Diseases 2005

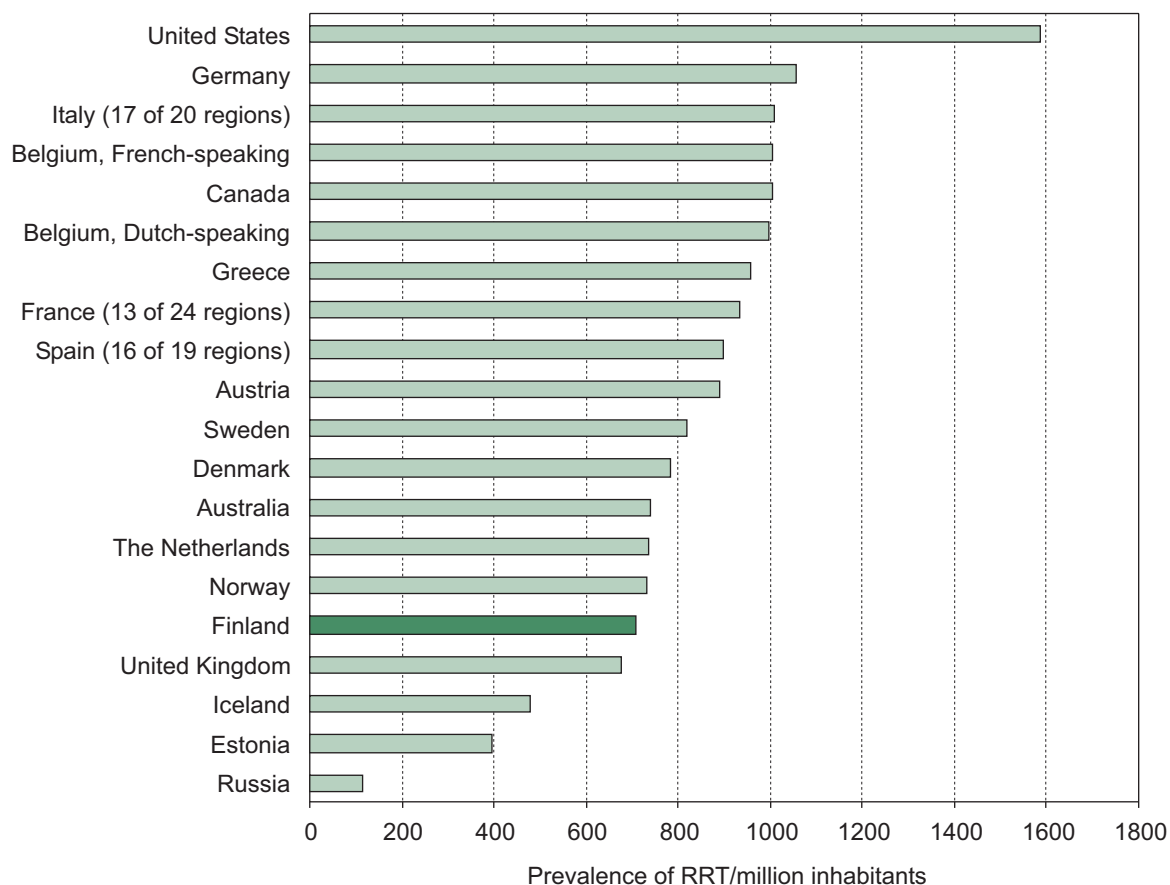


Figure 14 displays the prevalence of RRT on 31 December 2005 in countries reporting to the ERA-EDTA Registry (<http://www.era-edta-reg.org>), and in the United States, Canada, and Australia (The 2007 USRDS Annual Data Report Atlas, <http://www.usrds.org>). The prevalence rate in Finland was the fifth lowest. In Sweden, the prevalence was 10% higher, in Norway 3% higher, and in Denmark 15%

higher than in Finland. Since 2001, the prevalence had increased by 16% in Finland, by 11% in Sweden, by 20% in Norway, and by 14% in Denmark. The prevalence rates differed less than the incidence rates between the Scandinavian countries. International incidence rates are shown in Figure 8.

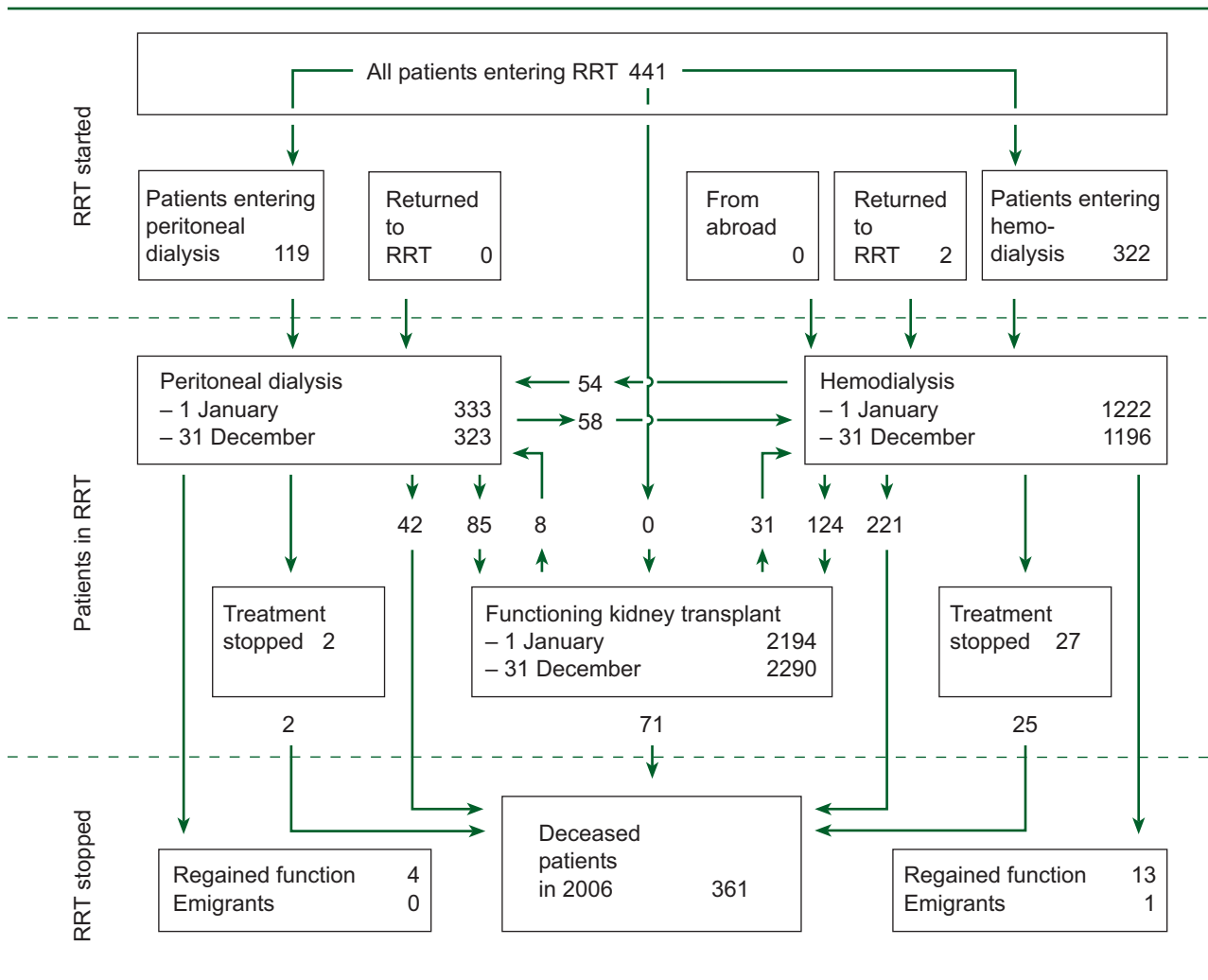
Table 7. Number of patient-years of all RRT patients according to diagnosis and type of treatment. Finnish Registry for Kidney Diseases 1996–2006

Diagnosis	Number of patient-years in 1996 (%)				Number of patient-years in 2006 (%)			
	Peritoneal dialysis	Hemo-dialysis	Trans-plantation	Total	Peritoneal dialysis	Hemo-dialysis	Trans-plantation	Total
Glomerulonephritis	68 (23.9)	144 (23.6)	478 (33.1)	690 (29.5)	51 (15.2)	194 (16.3)	619 (27.6)	864 (22.9)
Type 1 diabetes	80 (28.2)	70 (11.4)	280 (19.4)	430 (18.4)	91 (27.4)	115 (9.7)	438 (19.5)	645 (17.1)
Polycystic degeneration	19 (6.7)	74 (12.1)	167 (11.6)	260 (11.1)	16 (4.9)	112 (9.4)	357 (15.9)	485 (12.9)
Type 2 diabetes	24 (8.6)	64 (10.5)	8 (0.5)	97 (4.1)	47 (14.2)	234 (19.7)	51 (2.2)	332 (8.8)
Undefined kidney disease	13 (4.4)	37 (6.0)	28 (1.9)	77 (3.3)	35 (10.6)	176 (14.8)	86 (3.8)	298 (7.9)
Pyelonephritis	21 (7.3)	49 (8.0)	175 (12.2)	245 (10.5)	21 (6.2)	61 (5.1)	198 (8.8)	280 (7.4)
Nephrosclerosis	11 (3.8)	36 (5.9)	29 (2.0)	76 (3.2)	23 (6.9)	77 (6.5)	58 (2.6)	159 (4.2)
Other systemic diseases	8 (2.8)	27 (4.4)	43 (3.0)	78 (3.3)	18 (5.3)	47 (3.9)	72 (3.2)	137 (3.6)
Urinary tract obstruction	5 (1.8)	13 (2.2)	57 (4.0)	76 (3.2)	9 (2.8)	36 (3.0)	86 (3.8)	131 (3.5)
Congenital diseases	8 (2.9)	8 (1.3)	61 (4.3)	77 (3.3)	2 (0.7)	11 (0.9)	92 (4.1)	105 (2.8)
Amyloidosis	11 (3.8)	61 (10)	37 (2.6)	110 (4.7)	4 (1.1)	53 (4.4)	40 (1.8)	98 (2.6)
Congenital nephrosis, Finnish type	7 (2.4)	0 (0.0)	36 (2.5)	44 (1.9)	6 (1.7)	3 (0.3)	57 (2.5)	65 (1.7)
Tubulointerstitial nephritis	6 (1.9)	13 (2.2)	31 (2.1)	50 (2.1)	0 (0.0)	20 (1.7)	40 (1.8)	60 (1.6)
Other kidney diseases	2 (0.6)	6 (0.9)	5 (0.3)	12 (0.5)	3 (0.8)	19 (1.6)	36 (1.6)	57 (1.5)
Malignancies	3 (0.9)	7 (1.2)	1 (0.1)	11 (0.5)	4 (1.1)	28 (2.3)	6 (0.3)	37 (1.0)
Metabolic diseases	0 (0.0)	2 (0.4)	6 (0.4)	8 (0.3)	4 (1.1)	5 (0.4)	10 (0.5)	19 (0.5)
All	284 (100)	612 (100)	1442 (100)	2339 (100)	333 (100)	1190 (100)	2248 (100)	3773 (100)

Table 7 shows the number of patient-years according to diagnosis of kidney disease and type of treatment in 1996 and 2006. The number of patient-years indicates patients' time in RRT during the year. Overall, the number of patient-years has increased by 61% since 1996. In hemodialysis, the number of patient-years has increased the most, 94%. Glomerulonephritis was the most common diagnosis in both 1996 and 2006 among all RRT patients and among kidney transplantation patients. The proportion of patient-years due to glomerulonephritis has, however, decreased, being 23%.

The proportion of type 1 diabetes has remained virtually unchanged, and is the most common diagnosis in peritoneal dialysis patients. The proportion of type 2 diabetes has increased considerably (244%), and in 2006 was the most common diagnosis among hemodialysis patients. The proportion of patient-years due to "undefined kidney disease" has also increased markedly. Amyloidosis is the only diagnosis for which the number of patient-years has decreased (11%) since 1996.

Figure 15. Net changes in type of treatment.
Finnish Registry for Kidney Diseases 2006



During 2006, 441 new patients entered RRT (Figure 15). In addition, two patients returned to RRT. In all, 3749 patients were receiving RRT at the beginning of the year. Altogether 361 patients died and dialysis for 17 patients was discontinued because patients' own kidney function resumed. Of those who died, 71 had a functioning transplant, 42 were receiving peritoneal dialysis, and 221 were on hemodialysis.

The RRT of 29 uremic patients was discontinued, and of these patients two were alive at the end of 2006. A kidney transplant was received by 210 patients; six received combined liver and kidney transplantations (source: Kidney Transplantation Unit of Helsinki University Central Hospital). Three kidney transplantation patients moved abroad (not shown in the Figure).

Table 8. Mortality of RRT patients by region.
Finnish Registry for Kidney Diseases 1996–2006

Region	Deaths/1000 patient-years						Deaths/1000 patient-years*					
	1996	2001	2004	2005	2006	2002–2006	1996	2001	2004	2005	2006	2002–2006
South	103	80	103	81	72	88	97	78	99	79	68	85
Southwest	88	86	69	112	86	95	88	78	65	111	84	90
West	149	129	112	92	134	112	147	117	104	89	128	107
East	163	111	114	100	106	110	146	91	111	99	104	106
North	108	95	118	101	89	105	108	90	109	99	89	100
Entire country	123	99	103	94	96	100	118	90	98	92	92	96

*patients who died before 90 days after start of RRT were excluded

Figure 16. Standardized mortality of RRT patients in regions.
Finnish Registry for Kidney Diseases 1996–2006

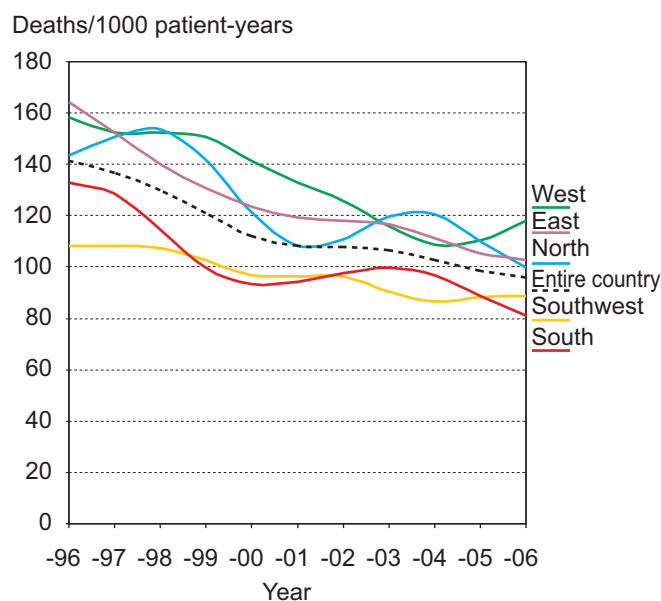
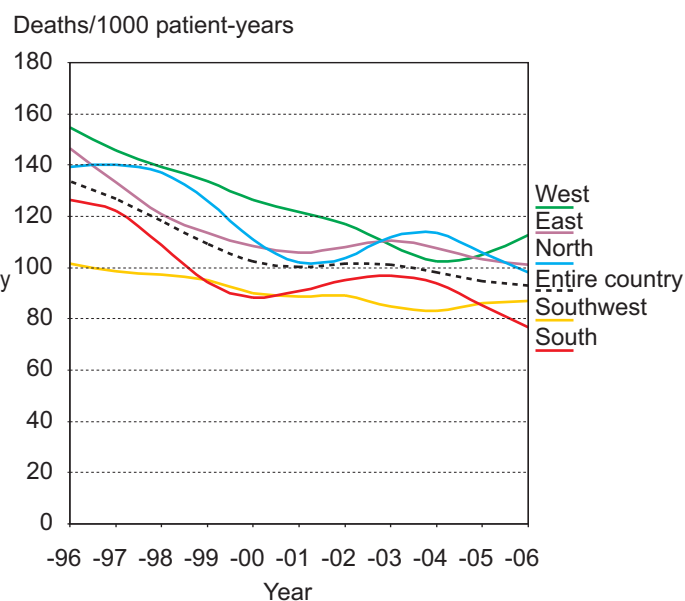


Figure 17. Standardized mortality of RRT patients in regions (patients who died before 90 days after start of RRT were excluded).
Finnish Registry for Kidney Diseases 1996–2006



RRT patients' mortality according to region in 1996–2006 is presented in Table 8. The mortality of patients who have been in RRT for at least 90 days is shown separately. The average mortality in 2002–2006 was highest in the western region and lowest in the southern region.

In Figures 16 and 17, mortality in the regions is shown as smoothed averages. The regional mortality rates for

1996–2006 have been age- and gender-standardized using all patient-years in 2006 as the reference. Changes in age and gender distribution during this ten-year period have been considered. Patients who died within 90 days of the start of RRT were excluded from Figure 17. In the entire country, the standardized mortality rate has decreased during the past ten years.

Figure 18. Proportion of peritoneal dialysis patients with serum albumin concentration of 35 g/l or higher. Finnish Registry for Kidney Diseases 2004–2006

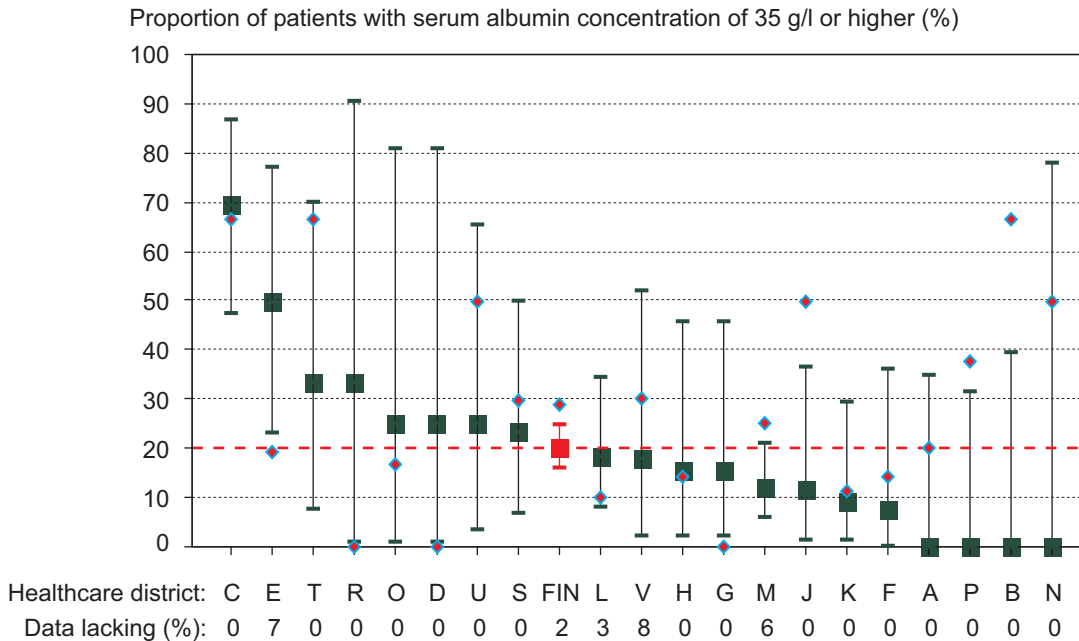
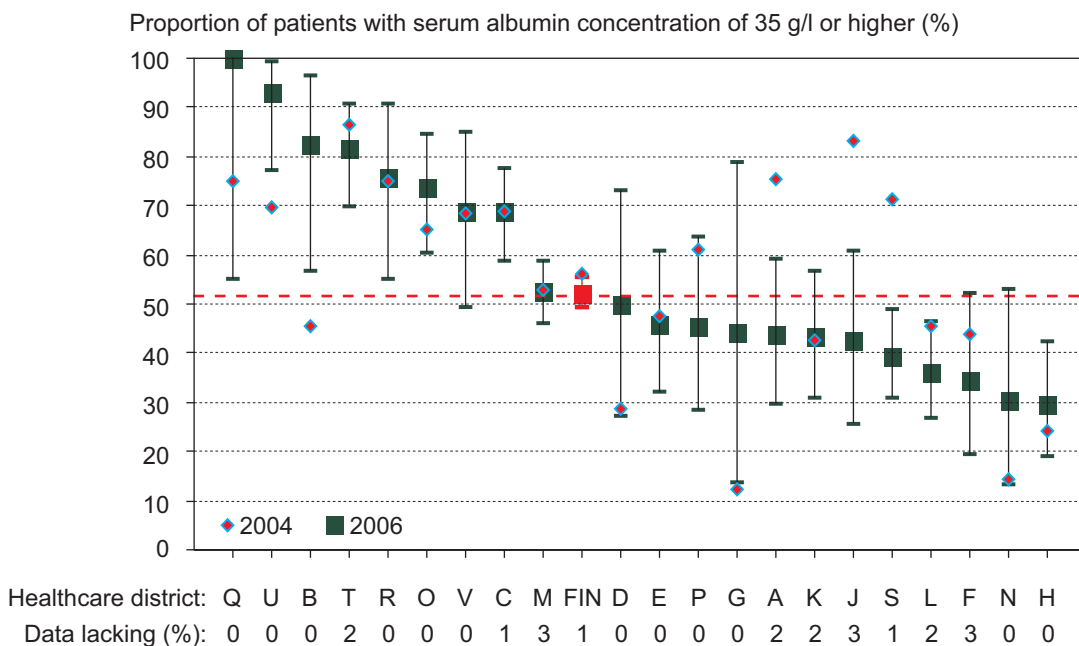


Figure 19. Proportion of hemodialysis dialysis patients with serum albumin concentration of 35 g/l or higher. Finnish Registry for Kidney Diseases 2004–2006



The following pages provide information on variables potentially connected to the quality of nephrological care in the various healthcare districts in 2004 and 2006. The figures present the proportions of patients reaching the standard or target range of the variables. Confidence intervals of the proportions (in 2006) were estimated using binomial distribution. The healthcare districts were randomly and blindly given letter codes; the code FIN denotes the entire country. For each healthcare district, the proportion of lacking data, i.e. the percentage of patients for whom data has not been reported, is given.

The recommended concentration of serum albumin is generally 35 g/l or higher. Figures 18 and 19 show the

proportions of peritoneal dialysis patients and hemodialysis patients with a serum albumin concentration of 35 g/l or higher in the various healthcare districts at the end of 2004 and 2006. For peritoneal dialysis patients, the proportion was 20% in 2006 and 28% in 2004 ($p=0.015$). For hemodialysis patients, the corresponding proportions were 52% and 56% ($p=0.065$). In 2006, the proportion varied significantly between healthcare districts ($p<0.001$).

Albumin concentration was reported for 77% of kidney transplantation patients in 2006; 84% of these patients had a concentration of 35 g/l or higher. In 2004, the corresponding proportion was 82% ($p=0.176$).

Figure 20. Proportion of dialysis patients with hemoglobin concentration of 110–119 g/l
Finnish Registry for Kidney Diseases 2004–2006

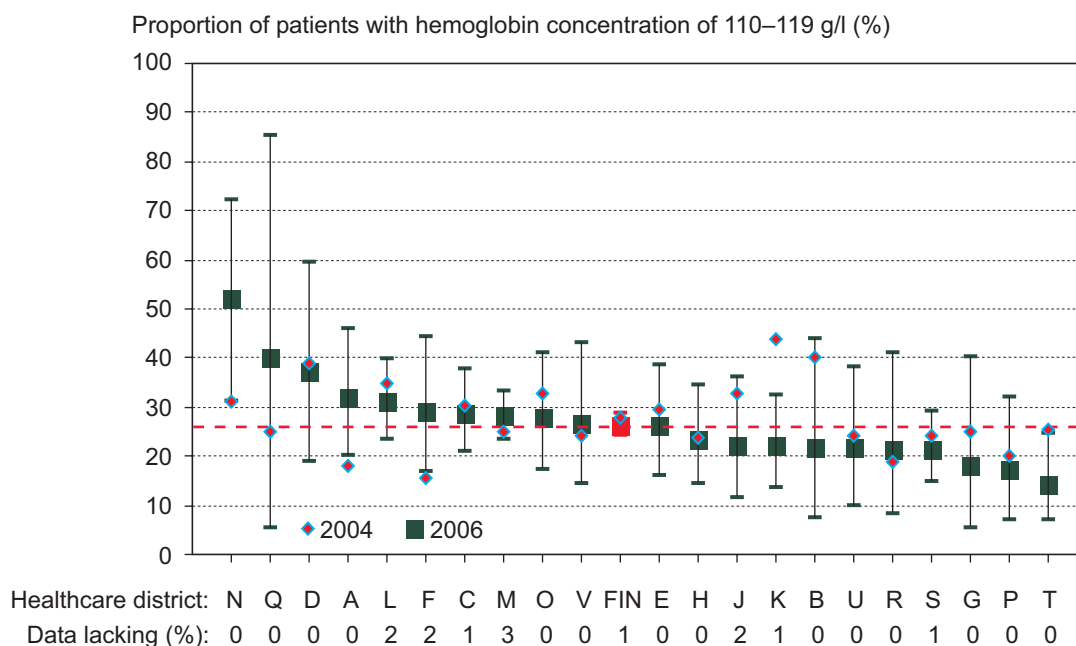
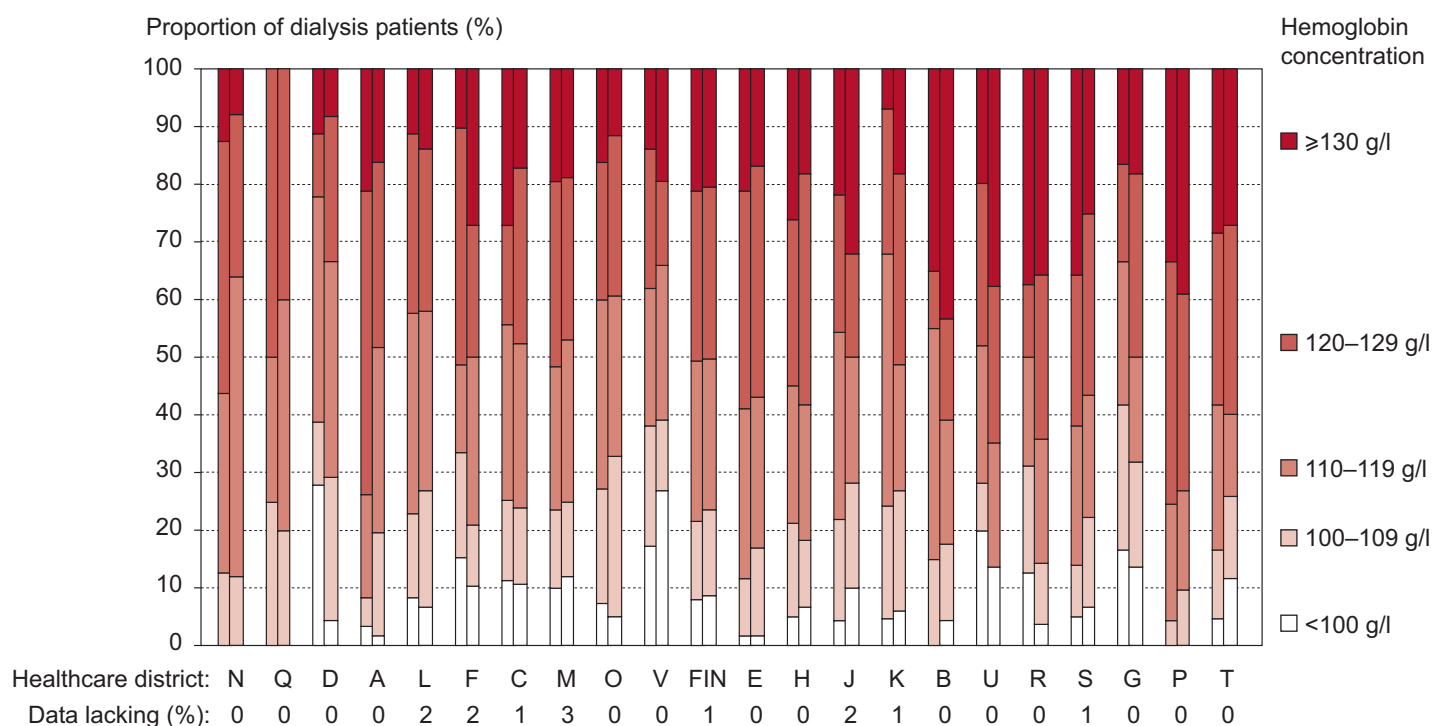


Figure 21. Dialysis patients' hemoglobin concentration
Finnish Registry for Kidney Diseases 2004–2006

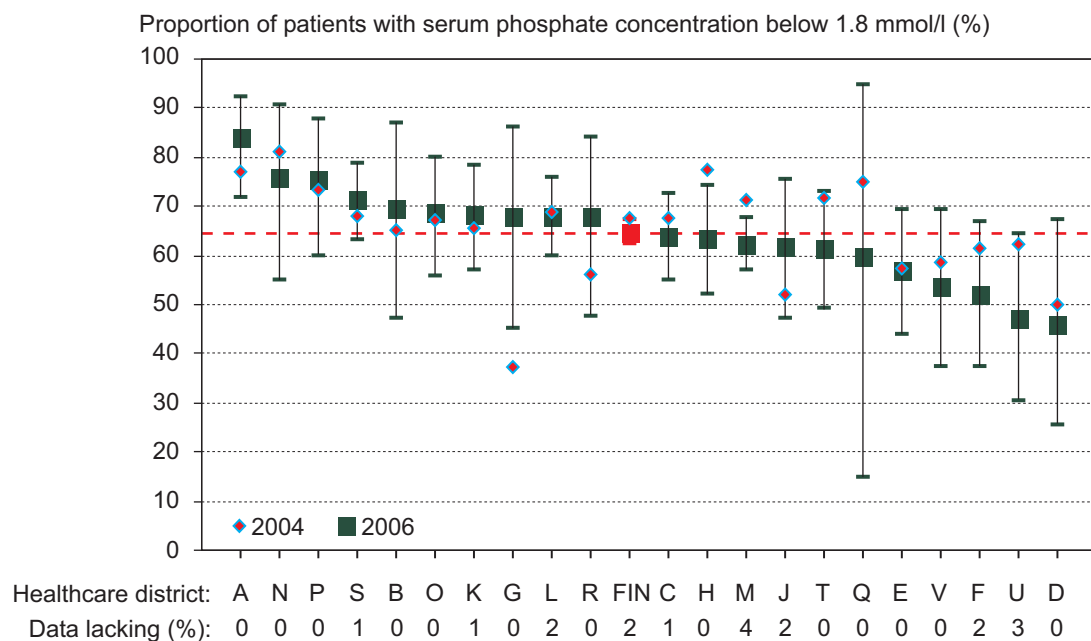


The general recommendation for kidney patients' hemoglobin concentration is 110 g/l or higher (Nephrol Dial Transplant 2004;19 (Suppl 2):ii6-ii15). According to a recent study, a high hemoglobin concentration is associated with increased mortality in kidney patients (Singh AK et al. New Engl J Med 2006;355:2085–2098). Because of this, a hemoglobin concentration of 110–119 g/l was considered the target concentration in Figure 20, which shows the proportion of dialysis patients reaching this target in the various healthcare districts at the end of 2006 and 2004. In the entire country, this proportion was 26% at the end of 2006 and 28% at the

end of 2004 ($p=0.379$). In 2006, hemoglobin concentrations did not vary significantly between healthcare districts ($p=0.146$).

In Figure 21, the hemoglobin concentration has been divided into five groups. Left-hand columns represent the hemoglobin distribution at the end of 2004 and right-hand columns the distribution at the end of 2006. In the entire country, 50% of dialysis patients had a hemoglobin concentration of 120 g/l or higher in 2006, 21% had 130 g/l or higher, 24% had below 110 g/l, and 9% had below 100 g/l.

Figure 22. Proportion of dialysis patients with serum phosphate concentration below 1.8 mmol/l. Finnish Registry for Kidney Diseases 2004–2006

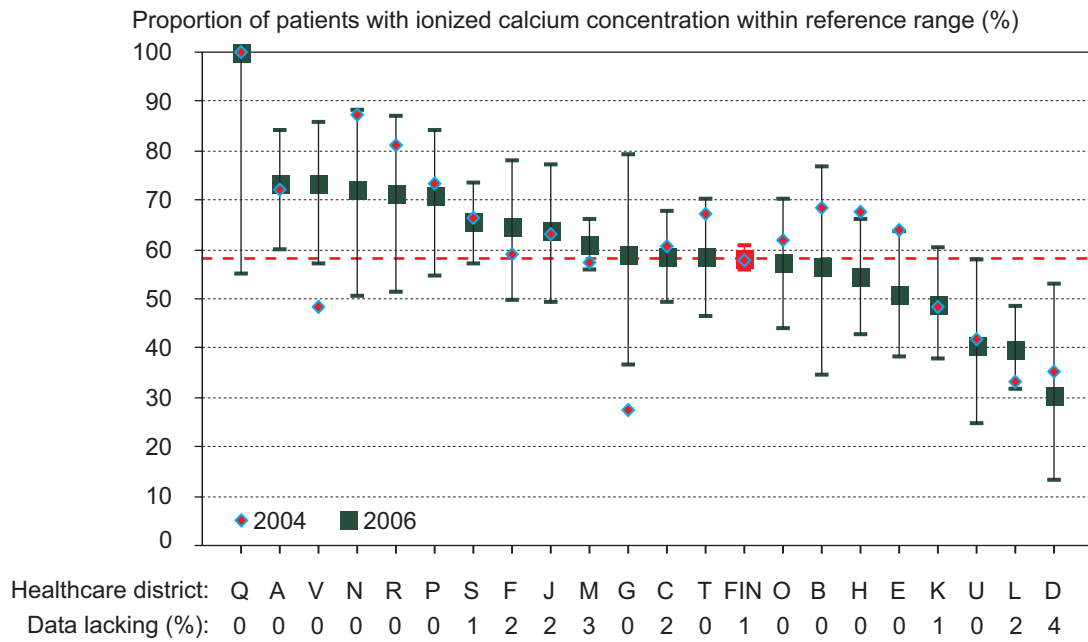


The target concentration of serum phosphate in dialysis patients is generally defined as below 1.8 mmol/l (Nephrol Dial Transplant 2002;17 (Suppl. 7):95–96). Figure 22 shows the proportion of dialysis patients with a serum phosphate concentration below 1.8 mmol/l in the various healthcare districts at the end of 2006 and 2004. In the entire country, this proportion was 65% in 2006 and 68% in 2004 ($p=0.088$).

In 2006, the proportions differed significantly ($p=0.023$) between healthcare districts.

Phosphate concentration was reported for 91% of kidney transplantation patients. Of these, 99% had a serum phosphate concentration below 1.8 mmol/l in 2006, and the proportions did not differ significantly ($p=0.272$) between healthcare districts.

Figure 23. Proportion of dialysis patients with ionized calcium concentration within reference range. Finnish Registry for Kidney Diseases 2004–2006

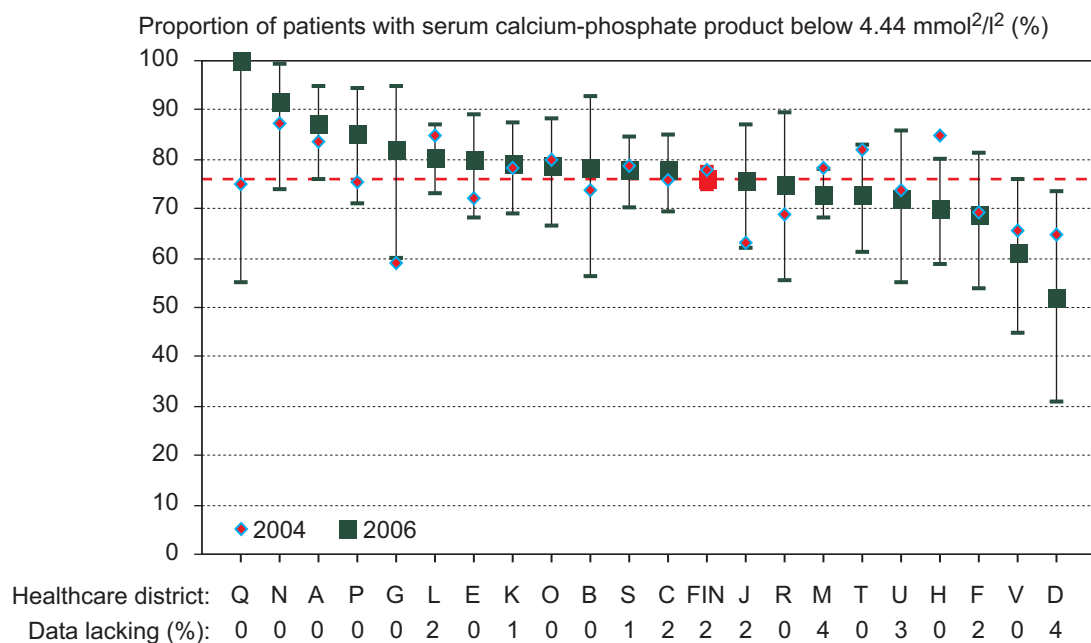


The reference range for ionized calcium in plasma is 1.16–1.30 mmol/l (Helsinki University Central Hospital Laboratory, <http://www.huslab.fi>). Figure 23 shows the proportion of dialysis patients with a plasma concentration of ionized calcium in the reference range in the various healthcare districts at the end of 2006 and 2004. In the entire country, this proportion was 58% in both 2006 and 2004. Of the values, 34% were below the lower reference

limit and 8% above the higher reference limit in 2006. The proportion of dialysis patients with ionized calcium in the reference range differed significantly ($p < 0.001$) between healthcare districts in 2006.

In 2006, the concentration of ionized calcium was reported for 80% of kidney transplantation patients. Of these, 6% had values below the lower limit and 26% values above the higher limit.

Figure 24. Proportion of dialysis patients with serum calcium-phosphate product below $4.44 \text{ mmol}^2/\text{l}^2$ Finnish Registry for Kidney Diseases 2004–2006



The target concentration of serum calcium-phosphate product in dialysis patients has been defined as below $4.44 \text{ mmol}^2/\text{l}^2$ (below $55 \text{ mg}^2/\text{dl}^2$, Nephrol Dial Transplant 2002;17 (Suppl. 7):95–96). Figure 24 shows the proportion of dialysis patients reaching this target in the various healthcare districts at the

end of 2006 and 2004. In the entire country, this proportion was 76% in 2006 and 78% in 2004 ($p=0.310$). In 2006, the proportions of dialysis patients with an ionized calcium-phosphate product below $4.44 \text{ mmol}^2/\text{l}^2$ differed significantly ($p=0.041$) between healthcare districts.

Figure 25. Proportion of dialysis patients with serum cholesterol concentration below 5 mmol/l. Finnish Registry for Kidney Diseases 2004–2006

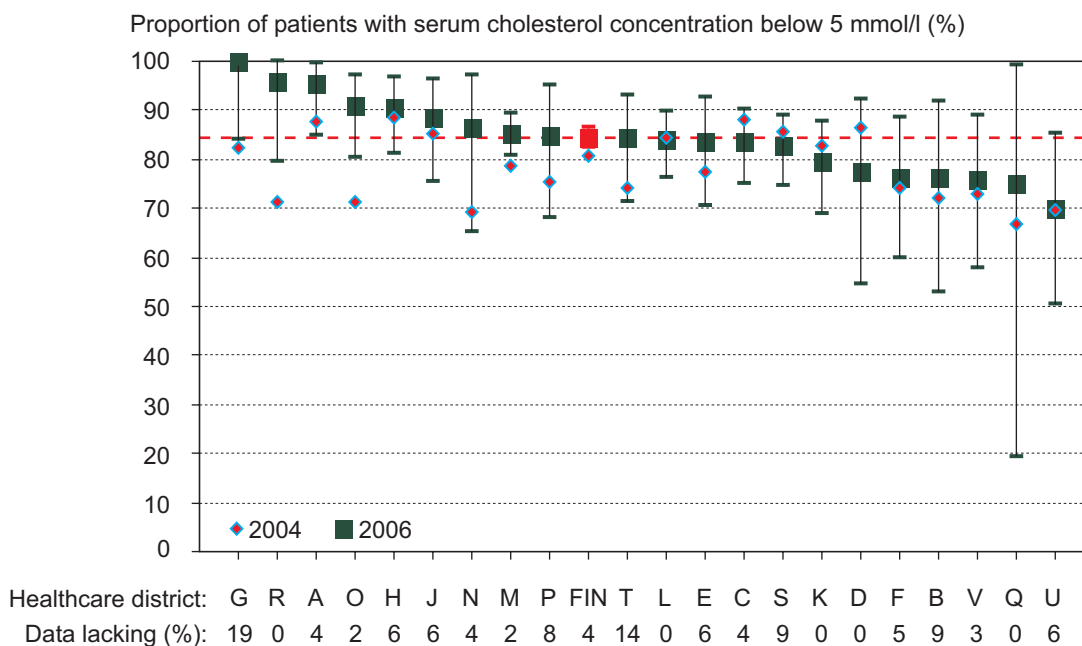
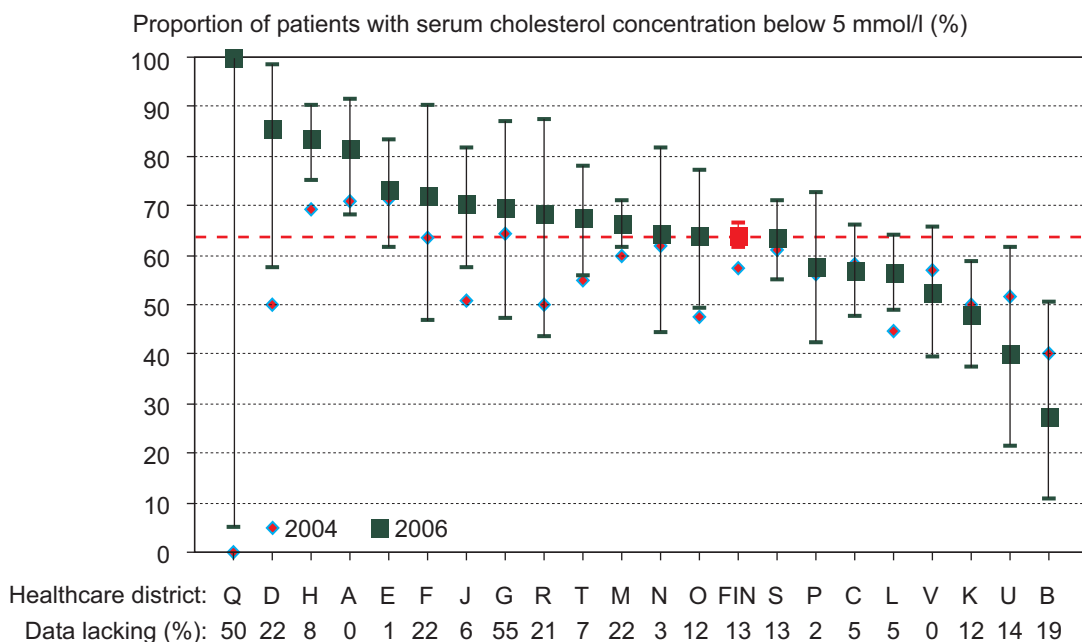


Figure 26. Proportion of kidney transplantation patients with serum cholesterol concentration below 5 mmol/l. Finnish Registry for Kidney Diseases 2004–2006



For kidney patients, the treatment targets of dyslipidemia do not differ from those of the entire population (Nephrol Dial Transplant 2002;17 (Suppl. 7):95–96)). Hemodialysis patients with very low cholesterol concentrations have been shown to be at increased risk of dying due to poor nutritional status and comorbidities. Because of this, patients with a body mass index below 20 have been excluded from the analyses on pages 23–26. Targets of serum lipid concentrations have recently been published in the "Käypä hoito" recommendation (Duodecim 2004;120:1794–1816).

The general target concentration of serum cholesterol is below 5 mmol/l. Figures 25 and 26 show the proportions of

dialysis and kidney transplantation patients with a serum cholesterol concentration below 5 mmol/l in the various healthcare districts at the end of 2006 and 2004. Of the dialysis patients, 10% and of the kidney transplantation patients, 11% had a body-mass index lower than 20 in 2006. In 2006, 85% of the dialysis patients had a serum cholesterol concentration below 5 mmol/l and in 2004 the proportion was 81% ($p=0.018$). For kidney transplantation patients, the corresponding proportions were 64% and 58% ($p<0.001$). In 2006, the proportions differed significantly between healthcare districts among kidney transplantation patients ($p<0.001$), but not among dialysis patients ($p=0.126$).

Figure 27. Proportion of dialysis patients with serum LDL cholesterol concentration below 3 mmol/l. Finnish Registry for Kidney Diseases 2004–2006

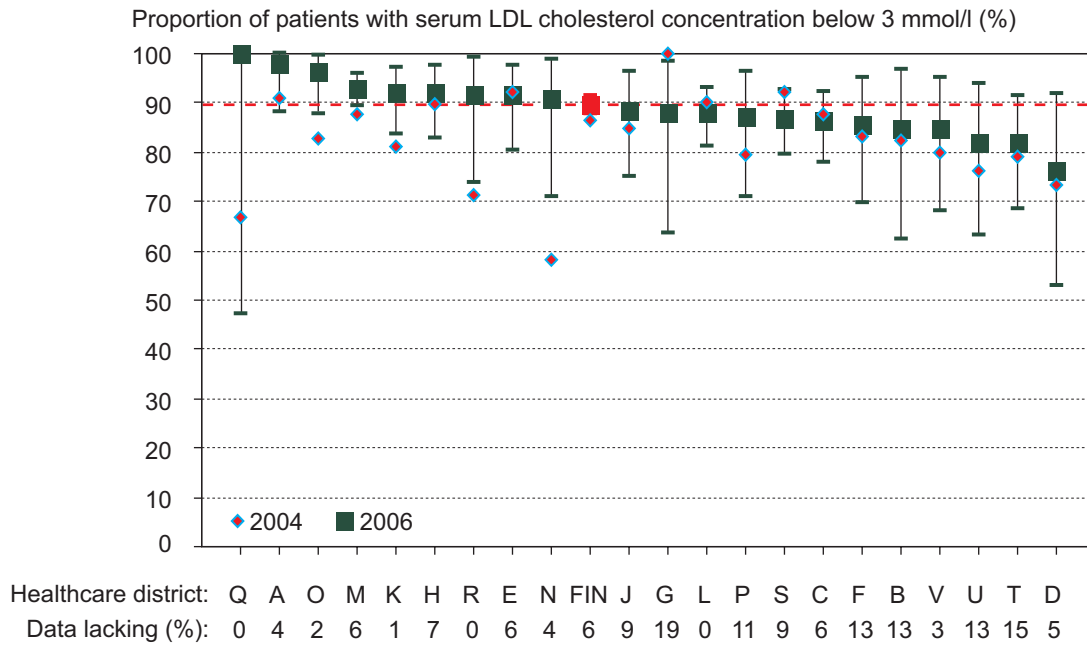
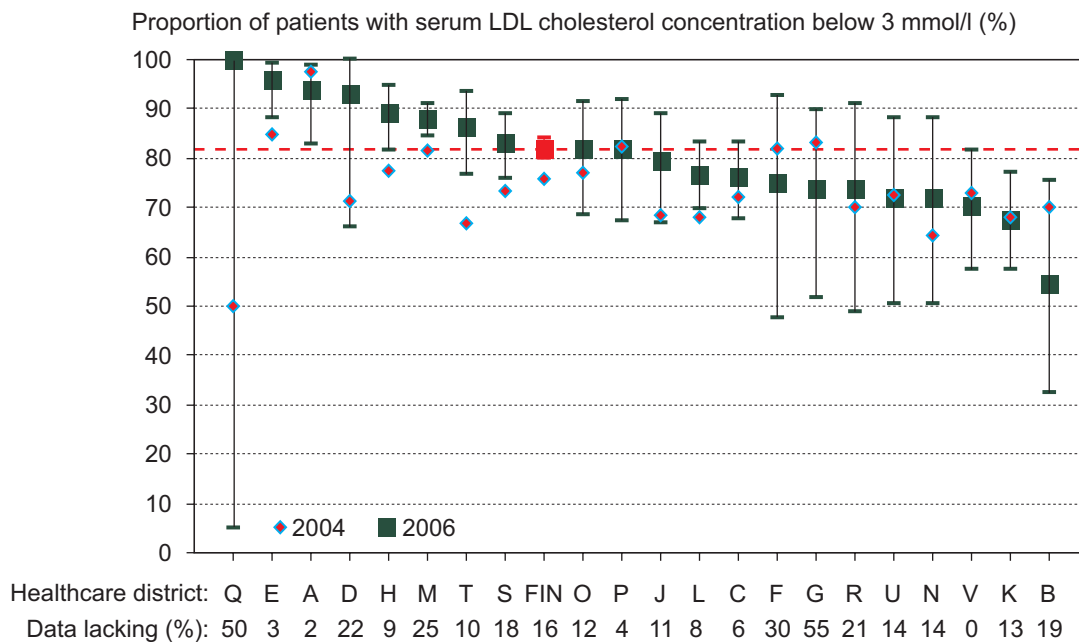


Figure 28. Proportion of kidney transplantation patients with serum LDL cholesterol concentration below 3 mmol/l. Finnish Registry for Kidney Diseases 2004–2006



The general target concentration of serum LDL cholesterol is below 3 mmol/l. Figures 27 and 28 present the proportions of dialysis and kidney transplantation patients with a serum LDL cholesterol concentration below 3 mmol/l in the various healthcare districts at the end of 2006 and 2004. Among dialysis patients, this proportion was 90% in 2006 and 86%

in 2004 ($p=0.014$), and among transplantation patients 82% and 76% ($p<0.001$). In 2006, the proportions differed significantly between healthcare districts among kidney transplantation patients ($p<0.001$), but not among dialysis patients ($p=0.207$).

Figure 29. Proportion of dialysis patients with serum HDL cholesterol concentration above 1 mmol/l. Finnish Registry for Kidney Diseases 2004–2006

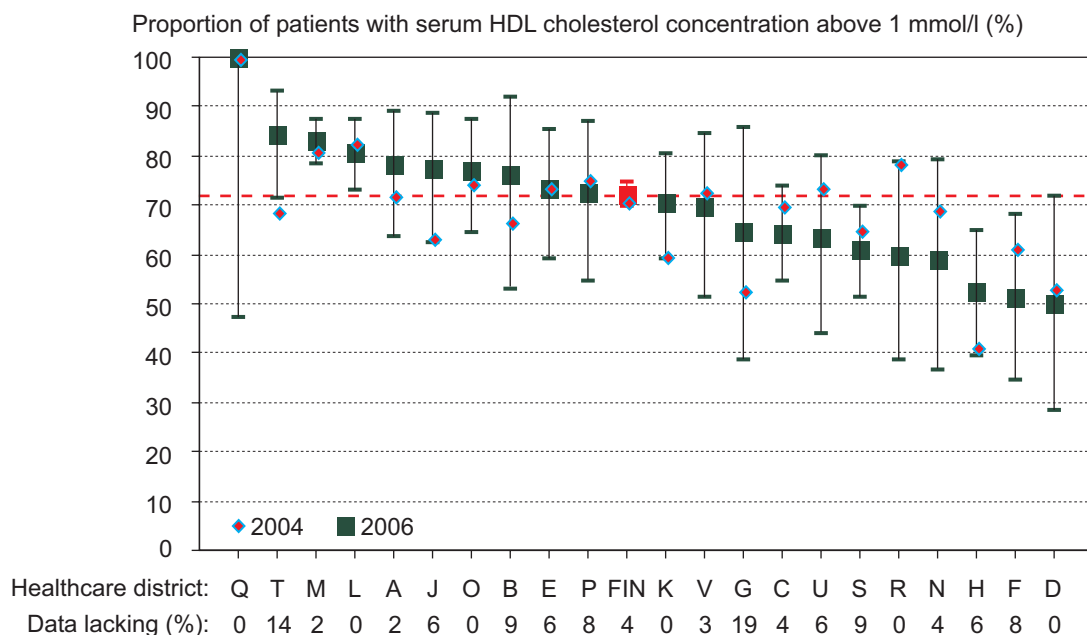
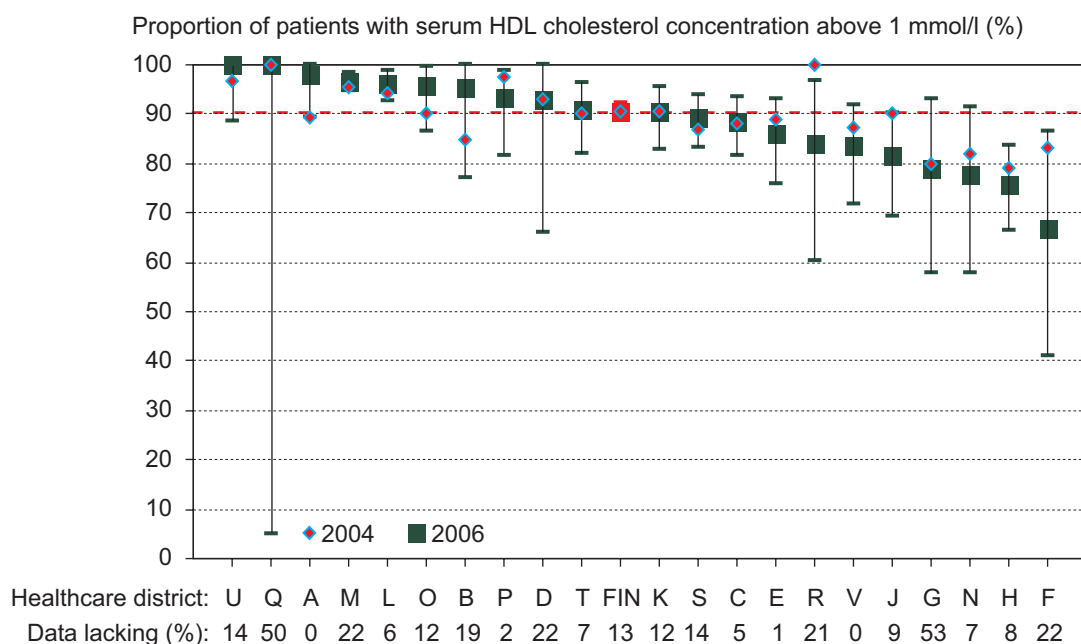


Figure 30. Proportion of kidney transplantation patients with serum HDL cholesterol concentration above 1 mmol/l. Finnish Registry for Kidney Diseases 2004–2006



The general target concentration of serum HDL cholesterol is above 1 mmol/l. Figures 29 and 30 show the proportions of dialysis and kidney transplantation patients with a serum HDL cholesterol concentration above 1 mmol/l in the various healthcare districts at the end of 2006 and 2004. Among dialysis patients, this proportion was 72% in 2006 and 71%

in 2004. Among kidney transplantation patients, the proportion was 91% in both years. In 2006, the proportion differed significantly between healthcare districts among both dialysis patients ($p < 0.001$) and kidney transplantation patients ($p < 0.001$).

Figure 31. Proportion of dialysis patients with serum triglyceride concentration below 2 mmol/l. Finnish Registry for Kidney Diseases 2004–2006

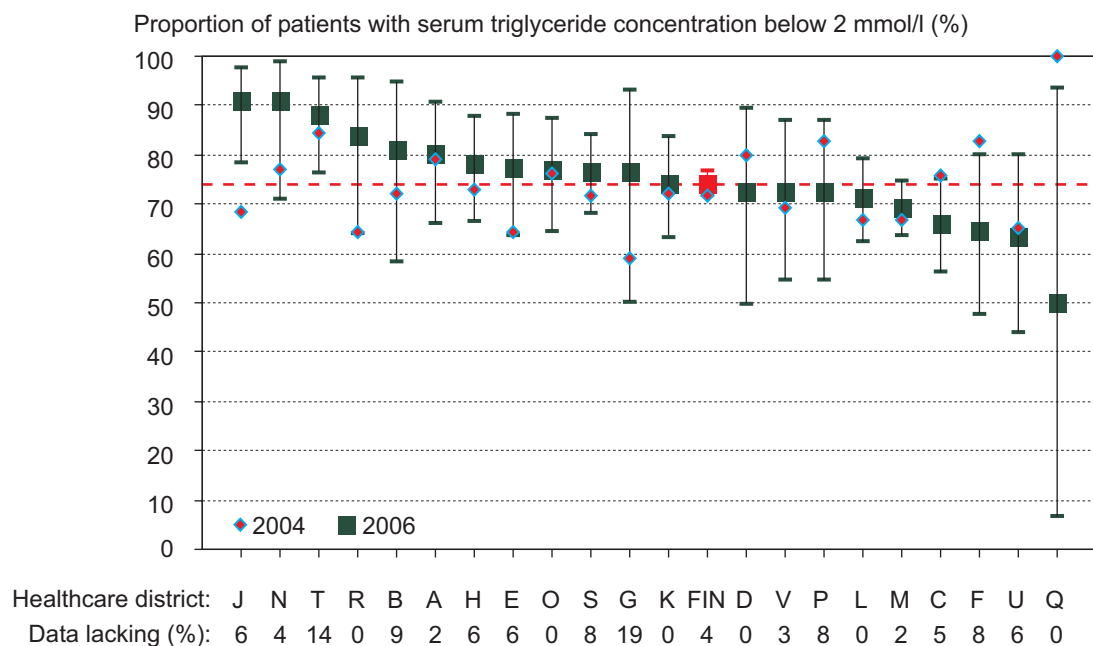
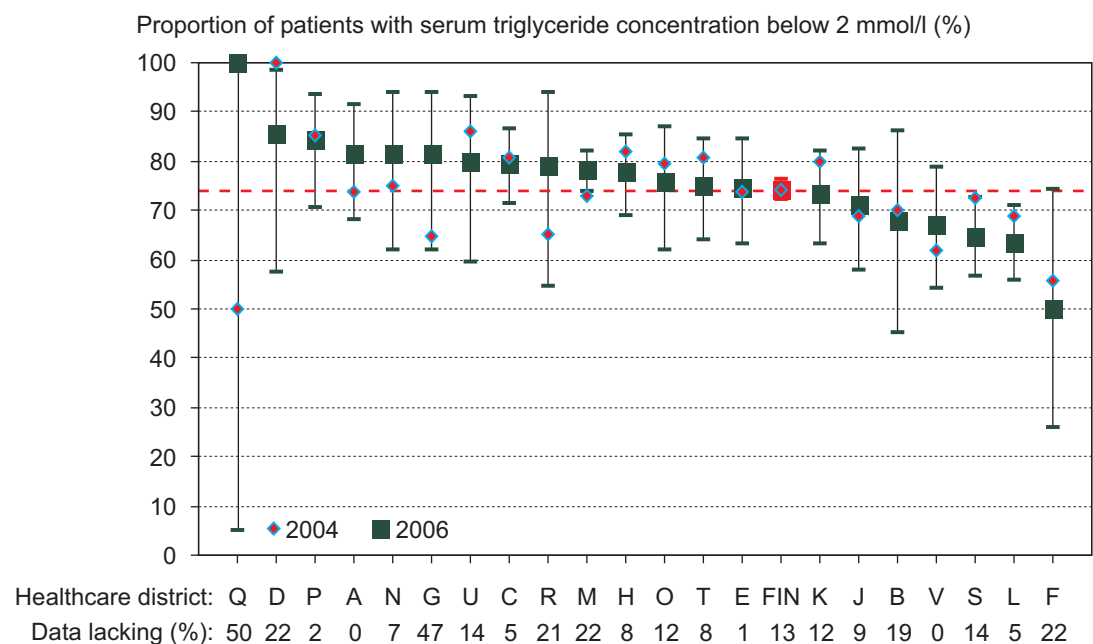


Figure 32. Proportion of kidney transplantation patients with serum triglyceride concentration below 2 mmol/l. Finnish Registry for Kidney Diseases 2004–2006



The general target concentration of serum triglycerides is below 2 mmol/l. Figures 31 and 32 show the proportions of dialysis and kidney transplantation patients with a serum triglyceride concentration below 2 mmol/l in the various healthcare districts at the end of 2006 and 2004. Among dialysis patients, this proportion was 72% in 2006 and 71%

in 2004 ($p=0.543$). In kidney transplantation patients, the proportion was 74% in both years. In 2006, the proportion differed significantly between healthcare districts among both dialysis patients ($p<0.044$) and kidney transplantation patients ($p<0.009$).

Figure 33. Proportion of diabetic dialysis patients with serum HbA_{1c} level below 7%.
Finnish Registry for Kidney Diseases 2004–2006

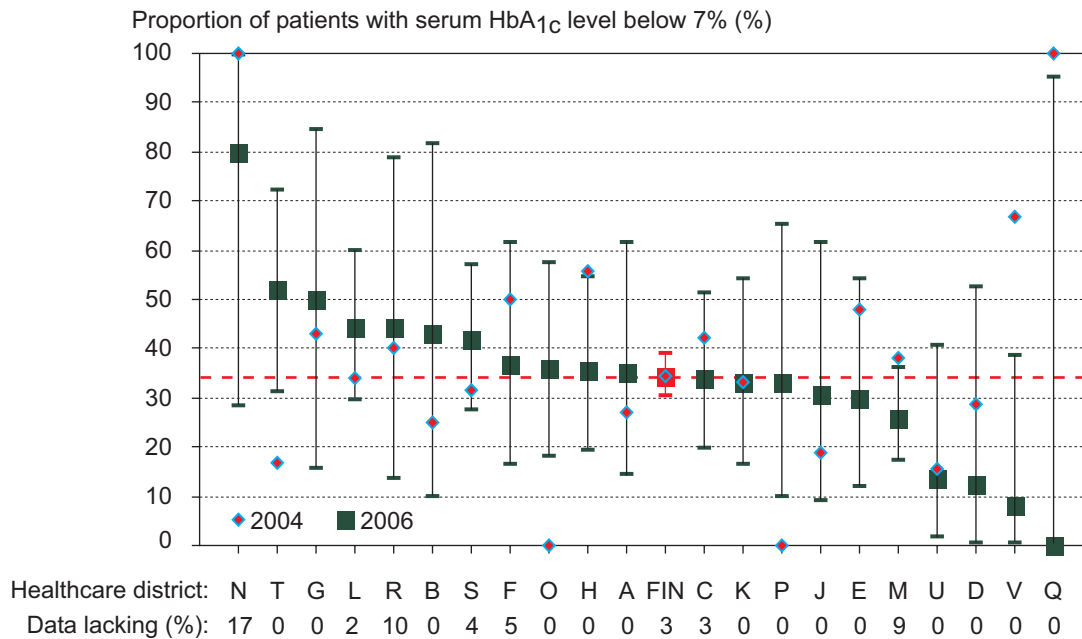
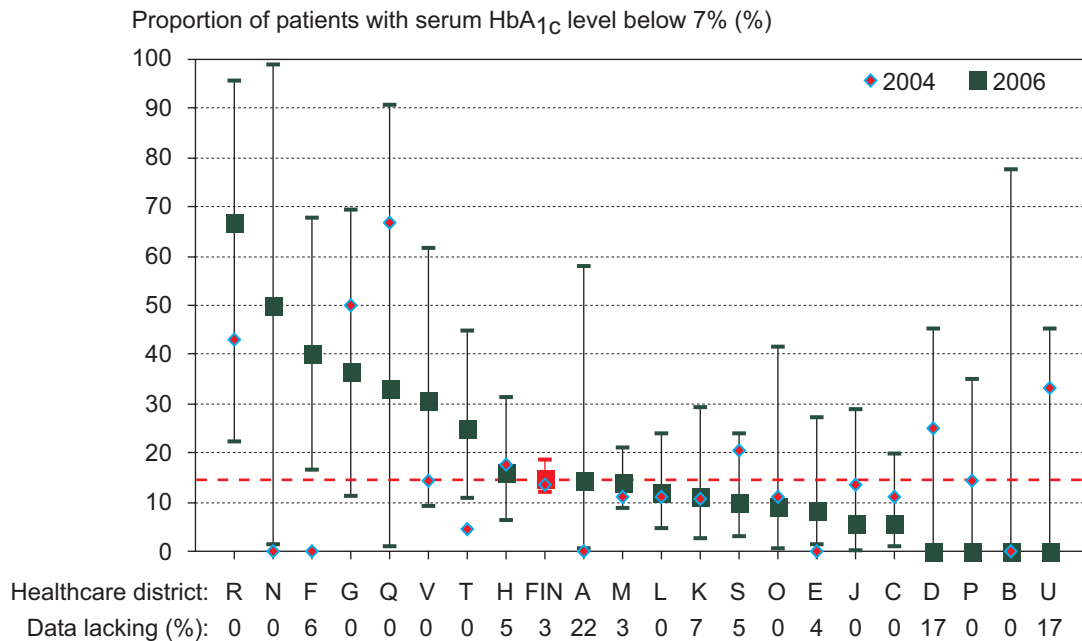


Figure 34. Proportion of diabetic kidney transplantation patients with serum HbA_{1c} level below 7%.
Finnish Registry for Kidney Diseases 2004–2006



The recommended level of glycosylated hemoglobin-A_{1c} (HbA_{1c}) is below 7%. Figures 33 and 34 show the proportions of diabetic dialysis and kidney transplantation patients with HbA_{1c} concentrations lower than 7% in the various healthcare districts at the end of 2006 and 2004. Among diabetic dialysis patients, this proportion was 35% in 2006 and 34% in 2004

($p=0.976$). Among kidney transplantation patients, the corresponding proportions were 15% and 14% ($p=0.640$). At the end of 2006, the proportions differed significantly between healthcare districts among kidney transplantation patients ($p=0.004$), but not among dialysis patients ($p=0.209$).

Figure 35. Proportion of dialysis patients with blood pressure below 130/85 mmHg. Finnish Registry for Kidney Diseases 2004–2006

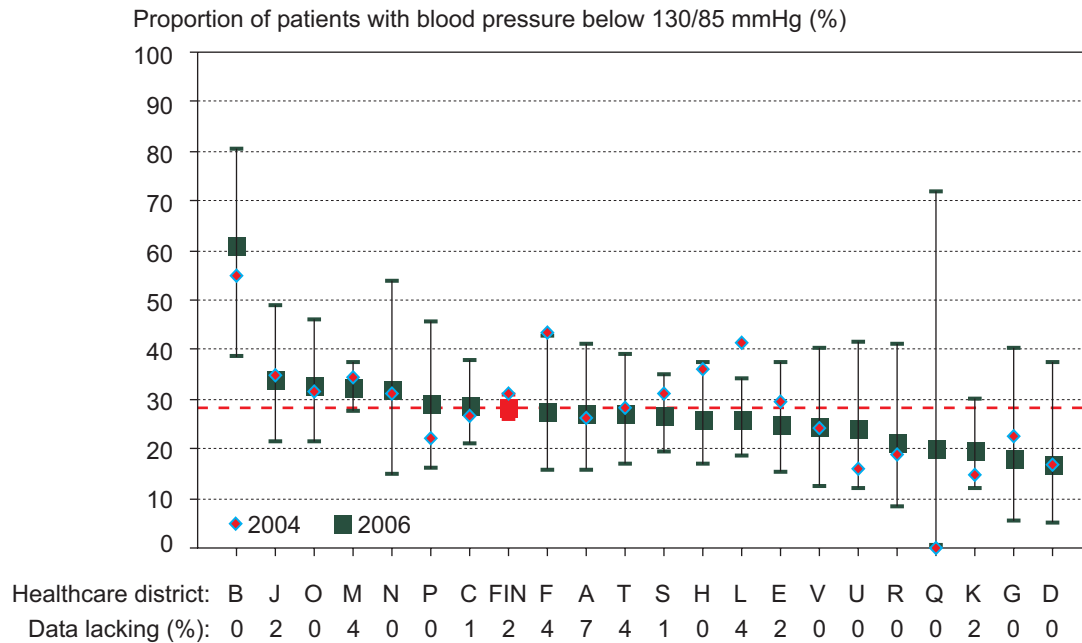
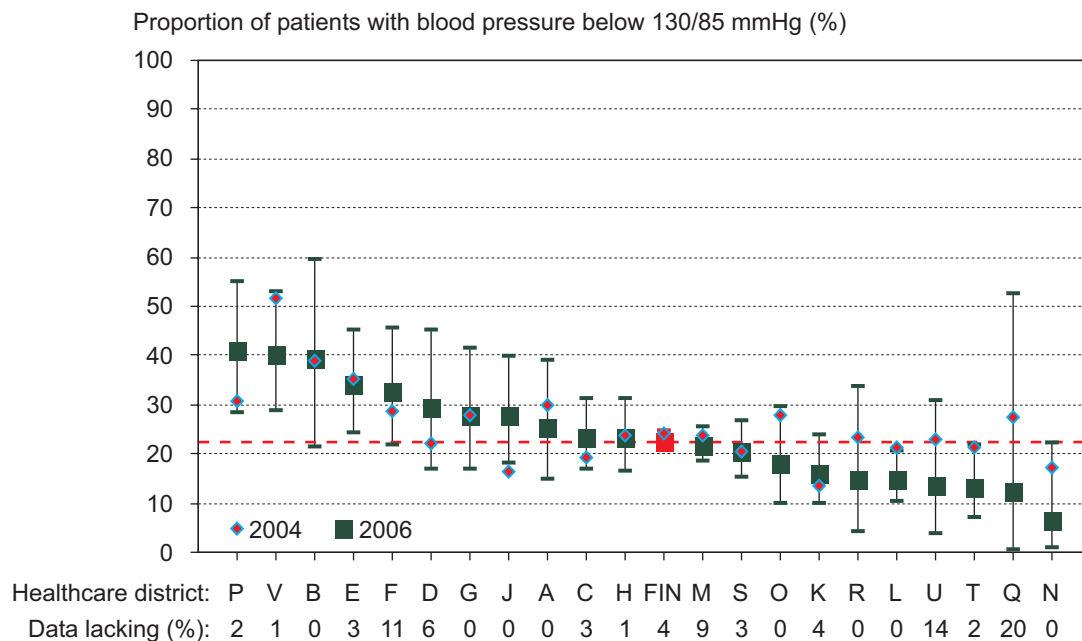


Figure 36. Proportion of kidney transplantation patients with blood pressure below 130/85 mmHg. Finnish Registry for Kidney Diseases 2004–2006



The recommended blood pressure for kidney patients is below 130/85 mmHg (Nephrol Dial Transplant 2002;17 (Suppl. 4):25–26). Figures 35 and 36 display the proportions of dialysis and kidney transplantation patients with blood pressure at the recommended level in the various healthcare districts at the end of 2006 and 2004. Among dialysis

patients, this proportion was 28% in 2006 and 31% in 2004 ($p=0.108$). Among kidney transplantation patients, the proportions were 23% and 24% ($p=0.296$). At the end of 2006, the proportions differed significantly between healthcare districts among kidney transplantation patients ($p<0.001$), but not among dialysis patients ($p=0.201$).

Figure 37. Proportion of dialysis patients receiving treatment for high blood pressure. Finnish Registry for Kidney Diseases 2004–2006

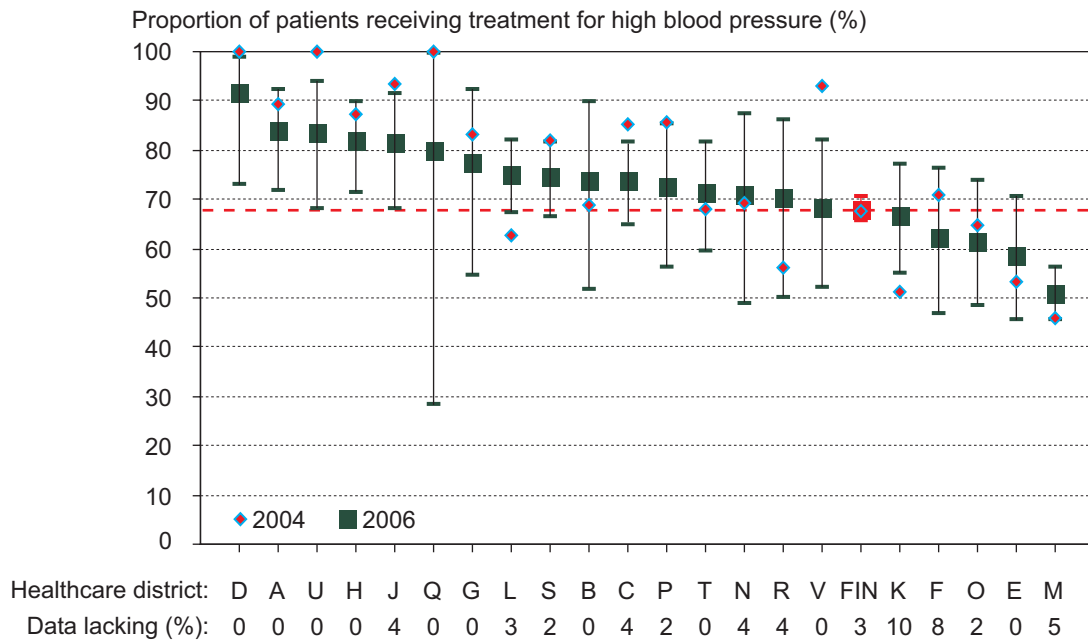
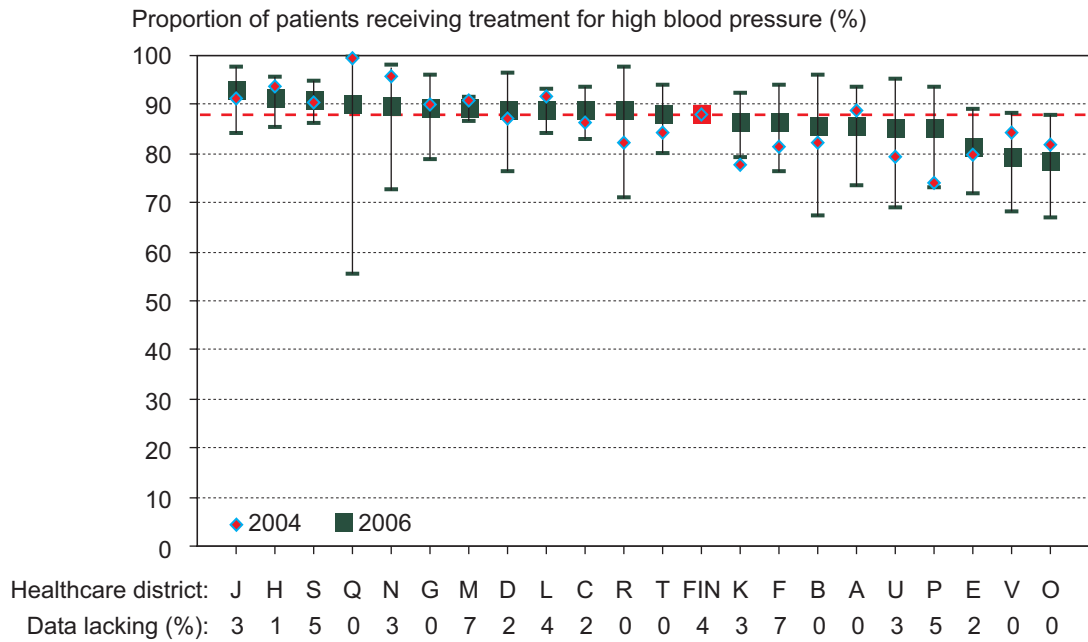


Figure 38. Proportion of kidney transplantation patients receiving treatment for high blood pressure. Finnish Registry for Kidney Diseases 2004–2006



Figures 37 and 38 show the proportions of dialysis and kidney transplantation patients receiving treatment for high blood pressure at the end of 2006 and 2004. Among dialysis patients, the proportion was 68%, and among kidney transplantation patients 88% in both years. In 2006, the

proportions of patients receiving treatment for high blood pressure varied between healthcare districts among dialysis patients ($p < 0.001$), but not among kidney transplantation patients ($p = 0.366$).

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Finnish Registry for Kidney Diseases

Report 2006



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