Capacity for the management of kidney failure in the International Society of Nephrology Western Europe region: report from the 2023 ISN Global Kidney Health Atlas (ISN-GKHA)

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Western Europe boasts advanced health care systems, robust kidney care guidelines, and a well-established health care workforce. Despite this, significant disparities in kidney replacement therapy incidence, prevalence, and transplant access exist. This paper presents the third International Society of Nephrology Global Kidney Health Atlas's findings on kidney care availability, accessibility, affordability, and quality in 22 Western European countries, representing 99% of the region's population. The known chronic kidney disease (CKD) prevalence across Western Europe averages 10.6%, slightly above the global median. Cardiovascular diseases account for a substantial portion of CKD-related deaths. Kidney failure incidence varies. Government health expenditure differs; however, most countries offer government-funded acute kidney injury, dialysis, and kidney transplantation care. Hemodialysis and peritoneal dialysis are universally available, with variations in the number of dialysis centers. Kidney transplantation is available in all countries (except for 3 microstates), with variable transplant center prevalence. Conservative kidney management (CKM) is increasingly accessible. The region's kidney care workforce is substantial, exceeding global averages; however, workforce shortages are reported. Barriers to optimal kidney care include limited workforce capacity, lack of surveillance mechanisms, and suboptimal integration into national noncommunicable disease (NCD) strategies. Policy recognition of CKD as a health priority varies across countries. Although Western Europe exhibits strong kidney care infrastructure, opportunities for improvement exist, particularly in CKD prevention, surveillance, awareness, and policy implementation. Efforts

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to improve CKD care should include automated detection, educational support, and enhanced workflows. Based on these findings, health care professionals, stakeholders, and policymakers are called to act to enhance kidney care across the region.

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Western Europe has established functional health care systems, produced numerous kidney guidelines, and achieved a higher prevalence of health care professionals, greater availability of medicines, and more widespread universal health care coverage compared with other world regions.[1] For almost 60 years, the European Renal Association Registry has been collecting data on kidney replacement therapy (KRT) modalities (i.e., hemodialysis [HD], peritoneal dialysis [PD], and transplantation) via national and regional kidney registries from 36 countries in Europe.[2] Despite this high level of kidney care and KRT surveillance systems, the European Renal Association Registry and the International Society of Nephrology Global Kidney Health Atlas (ISN-GKHA) have highlighted significant disparities in kidney care across Western European countries.[1,3–7] The incidence and prevalence of treated kidney failure and access to kidney transplantation vary considerably across the region without clear explanation.[4,7] For people living with kidney failure in Western Europe, HD remains the dominant dialysis modality, with significant variations across countries.[8,9] Home therapies, such as home HD and PD, are underused with significant prevalence variations across countries,[8] and access to kidney transplantation is not equitable across Western Europe.[3]

Since the 2019 ISN-GKHA, kidney medicine across Europe has faced new challenges, including recovery from the COVID-19 pandemic, the war in Ukraine,[10,11] the Turkey-Syria earthquake, and rising global temperatures,[12] with heatwaves seen across Europe. These challenges have had direct effects on the care of people with kidney disease, though the degree to which they have affected kidney care needs further clarification.

The ISN-GKHA is in its third global iteration. The aim of the ISN-GKHA is to understand, compare, and monitor how different countries around the world detect, treat, monitor, and advocate for people with kidney disease.[13] In this second Western Europe–specific report, data from the 2023 ISN-GKHA are presented on the availability, accessibility, affordability, and quality of kidney failure care across the ISN Western Europe region. The methodology for this report is described in detail elsewhere.[14]

RESULTS

The results of this study are presented in tables and figures and broadly summarized into 2 categories: desk research (Table 1,[15,16] Table 2,[17,18] Table 3,[19–26] Table 4,[27–45] and Supplementary Table S1[46]) and survey administration (Tables 5–7, Figures 1–3, Supplementary Figure S1, and Supplementary Tables S2–S10)

Study setting

For this report, the ISN's regional classification of countries in Western Europe was used, which includes countries bordering the Mediterranean Sea. Western Europe is one of the richest regions in the world, although variability among countries is observed. Luxembourg, Ireland, Liechtenstein, Switzerland, Norway, and Denmark all appear in the top 10 countries by gross domestic product per capita (Table 1).[15] Greenland and Faroe Islands are considered as their own countries by the World Bank, and the data analysis was performed on this basis; however, they are currently part of the Kingdom of Denmark. The Social Progress Index measures the extent to which countries provide for the social and environmental needs of their citizens. Fifteen of the top 20 countries in the Social Progress Index list are in Western Europe,[47] whereas 14 of the top 20 countries in the World Happiness Report 2023 are Western European countries.[48]

The current status of kidney care in the ISN Western Europe

Western Europe is the world region with the highest prevalence of medical doctors (42.3 per million population [pmp]; interquartile range [IQR]: 34.9–50.5 pmp) and nurses (117.8 pmp; IQR: 88.5–167.8 pmp), compared with the median reported worldwide workforce of doctors (17.7 pmp; IQR: 3.8–32.87 pmp) and nurses (36.2 pmp; IQR: 14.4–66.6 pmp; Supplementary Table S1).[46] According to the European Renal Association 2020 annual report, the incidence of KRT for the treatment of kidney failure is falling in some Western European countries, while the prevalence continues to grow, currently standing at 1173 pmp.[8] Individuals aged over 65 years make up almost half (45%) of the prevalent KRT population.[8] Diabetes, hypertension, and renovascular disease account for 26% of the causes of kidney failure in the prevalent population with glomerulonephritis/sclerosis accounting for 18%.[8] Almost half of the Western European 2020 prevalent KRT population (47%) were living with a kidney transplant.[8] Five-year adjusted patient survival is 46.8% (95% confidence interval [CI]: 46.5–47.1) on dialysis, 92.1% (95% CI: 91.9–92.4) after a first deceased donor transplant, and 95.0% (95% CI: 94.6–95.4) after a first living donor transplant.[8]

Literature review data for countries in the ISN Western Europe region

The burden of CKD and kidney failure. The prevalence of CKD, defined as stages G1–5/A1–3, ranged from 7.9% (95% CI: 7.4–8.6) in Iceland to 14.7% (95% CI: 12.7–16.9) in Greece with a median of 10.6% (IQR: 9.6%–11.6%; Table 2).[17] This was slightly higher than the median for all

Table 1 | Demographics and health finance in the ISN Western Europe region[15,16]

Country	Area (square km)	Total population (2022)	GDP (PPP; $ billion)	Total health expenditures (% of GDP)	Total health spending per person[a]	Government health spending per person[a]	Out-of-pocket health spending per person[a]
Overall, median [IQR]	130,483,015	7,802,702,984	133.8 [39.7–545.0]	6.2 [4.3–8.2]	353 [76–1270]	216 [23–908]	92 [29–273]
ISN Western Europe region, median [IQR]	3,801,668	439,465,153	529.3 [351.7–1523.9]	9.5 [8.2–10.5]	5088 [3259–5851]	3798 [2470–4701]	637 [589–800]
Andorra	468	85,560	3.3	6.7	2875	1993	358
Austria	83,871	8,913,088	523.3	10.4	5721	4361	907
Belgium	30,528	11,847,338	682.9	10.7	5088	3998	848
Denmark	43,094	5,920,767	378.6	10	6300	5392	767
Finland	357,022	5,601,547	304.8	9.2	4553	3666	755
France	643,801	68,305,148	3424.2	11.1	4838	3629	403
Germany	357,022	84,316,622	4815.5	11.7	5838	4701	627
Greece	131,957	10,533,871	333.7	7.8	1599	909	514
Iceland	572	357,603	21.5	8.6	5670	4779	800
Ireland	70,723	5,275,004	535.3	6.7	6128	4690	637
Israel	20,770	8,914,885	409.4	7.5	3259	2241	627
Italy	2586	61,095,551	2713.3	8.7	3205	2491	640
Liechtenstein	160	39,711	5.0	N/A	–	–	–
Luxembourg	2586	650,364	86.1	5.4	6782	5976	609
Malta	316	464,186	25.2	8.2	3553	2470	1013
The Netherlands	41,543	17,400,824	1118.1	10.1	5621	3798	535
Norway	323,802	5,553,840	428.3	10.5	7254	6300	929
Portugal	450,295	10,242,081	369.6	9.5	2230	1446	589
Spain	505,370	47,163,418	1929.8	9.1	3001	2246	556
Sweden	450,295	10,483,647	617.9	10.9	5851	5046	740
Switzerland	41,277	8,508,698	672.5	11.3	9801	3290	2532
United Kingdom	243,610	67,791,400	3344.5	10.2	4903	4093	625

GDP, gross domestic product; IQR, interquartile range; ISN, International Society of Nephrology; N/A, not applicable; PPP, purchasing power parity.
[a]US$ 2021.

regions at 9.5% (IQR: 5.9%–11.7%; Table 2).[17] The proportion of deaths attributed to CKD was less than 2% in the UK (1.3% [95% CI: 1.1–1.3]), Finland (1.3% [95% CI: 1.1–1.4]), Iceland (1.6% [95% CI: 1.3–1.8]), and Norway (1.9% [95% CI: 1.6–2.0]), whereas it was over 4% in Austria (4.1% [95% CI: 3.5–4.5]) and Israel (5.8% [95% CI: 5.0–6.4]; Table 2).[17]

Table 2 | Burden of CKD and risk factors in the ISN Western Europe region[17,18]

Country	CKD prevalence, % (95% CI)	Death attributed to CKD, % (95% CI)	DALYS attributed to CKD, % (95% CI)	Obesity, % (95% CI)	Increased BP, % (95% CI)	Smoking, % (95% CI)
Overall, median [IQR]	9.54 [5.87–11.73]	2.44 [1.58–3.88]	1.47 [1.07–2.30]	21.9 [7.8–26.6]	24.8 [20.8–28.5]	13.1 [7.8–20.1]
ISN Western Europe region, median [IQR]	10.63 [9.59–11.57]	2.59 [2.11–3.42]	1.32 [1.09–1.59]	24.5 [23.1–26.9]	19.4 [18.7–20.6]	18.8 [17.8–21.2]
Andorra	9.17 (8.48–9.80)	2.59 (2.19–2.94)	1.19 (1.01–1.36)	28.0 (22.0–34.0)	18.7 (13.3–24.8)	20.6 (18.1–23.0)
Austria	11.57 (10.73–12.38)	4.08 (3.47–4.51)	1.85 (1.61–2.09)	21.9 (17.5–26.8)	21.0 (15.7–27.1)	25.2 (22.8–27.8)
Belgium	11.00 (10.28–11.70)	2.6 (2.2–2.92)	1.33 (1.15–1.49)	24.5 (20.7–28.5)	17.5 (12.9–23.0)	18.7 (17.0–20.4)
Denmark	10.63 (9.86–11.37)	2.05 (1.77–2.26)	1.23 (1.08–1.38)	21.3 (17.5–25.3)	20.6 (15.9–25.7)	17.5 (16.0–19.1)
Finland	10.22 (9.50–10.89)	1.26 (1.06–1.4)	0.77 (0.68–0.86)	24.9 (21.2–28.7)	19.4 (15.2–24.1)	16.8 (15.2–18.6)
France	10.49 (9.77–11.28)	2.11 (1.71–2.42)	1.09 (0.94–1.24)	23.2 (18.8–27.8)	22.0 (16.6–27.8)	21.4 (19.3–23.4)
Germany	12.27 (11.57–12.96)	3.67 (3.15–4.06)	1.8 (1.57–2.02)	25.7 (21.9–29.8)	19.9 (14.7–25.1)	21.2 (19.2–23.3)
Greece	14.67 (12.73–16.91)	3.58 (3.13–3.97)	2.1 (1.85–2.36)	27.4 (22.5–32.7)	19.1 (13.8–25.3)	31.2 (28.9–33.5)
Iceland	7.99 (7.44–8.56)	1.58 (1.32–1.78)	0.81 (0.7–0.92)	23.1 (19.1–27.4)	19.7 (14.1–25.9)	14.7 (12.9–16.5)
Ireland	9.59 (9.17–10.04)	2.16 (1.85–2.43)	1.08 (0.94–1.23)	26.9 (22.3–31.7)	19.7 (14.7–25.3)	21.6 (19.2–24.2)
Israel	8.45 (7.86–9.05)	5.77 (4.95–6.37)	2.45 (2.1–2.83)	26.7 (21.9–31.6)	16.6 (11.7–22.4)	17.8 (15.9–20.0)
Italy	12.17 (11.30–13.06)	2.57 (2.16–2.81)	1.39 (1.21–1.55)	22.9 (19.3–26.8)	21.2 (16.2–26.3)	19.4 (17.7–21.4)
Liechtenstein	–	–	–	–	–	–
Luxembourg	9.84 (9.16–10.53)	2.87 (2.43–3.22)	1.32 (1.14–1.49)	24.2 (19.4–29.4)	21.9 (16.3–27.9)	20.9 (18.4–23.6)
Malta	11.91 (11.03–12.77)	2.79 (2.39–3.12)	1.59 (1.38–1.8)	31.0 (25.1–37.0)	19.4 (13.8–25.5)	18.8 (16.6–20.9)
The Netherlands	11.26 (10.47–12.05)	2.41 (2.06–2.69)	1.24 (1.08–1.4)	23.1 (19.3–27.0)	18.7 (14.4–23.7)	17.9 (16.2–19.5)
Norway	8.82 (8.20–9.41)	1.87 (1.61–2.03)	0.97 (0.84–1.08)	25.0 (20.9–29.2)	19.7 (14.7–25.0)	15.3 (13.6–17.2)
Portugal	11.58 (10.63–12.55)	3.5 (2.98–3.87)	1.8 (1.56–2.04)	23.2 (18.8–27.8)	24.4 (18.2–31.2)	17.8 (15.9–19.8)
Spain	10.33 (9.57–11.10)	3.42 (2.82–3.9)	1.52 (1.3–1.74)	27.1 (23.2–31.1)	19.2 (14.5–24.6)	21.8 (19.7–24.0)
Sweden	11.14 (10.30–11.95)	2.13 (1.8–2.35)	1.13 (0.98–1.28)	22.1 (18.3–26.0)	19.3 (14.7–24.3)	11.4 (10.7–12.2)
Switzerland	11.44 (10.63–12.20)	3.18 (2.63–3.62)	1.36 (1.15–1.54)	21.2 (17.3–25.3)	18.0 (13.5–23.2)	19.1 (17.1–21.3)
United Kingdom	9.07 (8.43–9.72)	1.25 (1.1–1.34)	0.82 (0.72–0.9)	29.5 (26.6–32.5)	15.2 (12.2–18.3)	18.7 (17.0–20.4)

BP, blood pressure; CI, confidence interval; CKD, chronic kidney disease; DALY, disability-adjusted life year; IQR, interquartile range; ISN, International Society of Nephrology.

Table 3 | Kidney replacement therapy statistics in the ISN Western Europe region[19–26]

Country	Treated KF		Chronic dialysis (HD + PD)		Chronic HD		Chronic PD		Kidney transplants overall		Incidence of deceased donor transplants	Incidence of living donor transplants	Incidence of pre-emptive transplants
	Incidence	Prevalence	Incidence	Prevalence	Incidence	Prevalence	Incidence	Prevalence	Incidence	Prevalence			
Andorra	–	–	–	–	–	–	–	–	–	–	–	–	–
Austria	135	1044	128.8	536.2	118.2	495.8	10.6	40.4	34	507.1	29.33	4.67	6.7
Belgium	197	1337	194.2	766.15	175.85	708.65	18.35	57.5	35.95	569.65	30.86	5.09	2.9
Denmark	108	952	97.9	434	61.8	346.8	36.1	87.2	43.45	517.7	31.72	11.72	10
Finland	94	957	91.7	361	69.2	306.8	22.5	54.2	48.73	601	40.36	8.36	4.3
France	170	1376	162.7	746.5	146.1	700.7	16.6	45.8	49.72	622.3	42.05	7.68	7.1
Germany	–	1114	–	808	–	768.1	–	38.8	23.74	–	18.08	5.66	–
Greece	269	1413	267.8	1164.4	255.1	1100.5	12.7	63.9	16.54	248.9	7.98	8.56	1.1
Iceland	108	810	91.5	241.3	69.3	196.9	22.2	44.4	30	565.8	23.33	6.67	13.9
Ireland	88	979	–	445	–	401.39	–	39.16	27.8	533	20.8	7	–
Israel	198	755	–	756	–	698.32	–	62.35	54.09	492	16.93	37.16	–
Italy	165	1276	–	800	–	701.8	–	89.32	31.52	476	26.83	4.69	–
Liechtenstein	–	–	–	–	–	–	–	–	–	–	–	–	–
Luxembourg	–	522	–	87	–	596.7	–	4.7	12	–	12	0	–
Malta	–	–	–	–	–	–	–	–	7.5	–	7.5	0	–
The Netherlands	106	1034	103.4	379	83.1	322.7	20.3	56.3	53.26	695.2	26.98	26.28	16.8
Norway	100	1014.5	101.6	317.3	72.2	252.2	29.4	65.1	44.7	686.4	33.52	10.93	11.8
Portugal	260	2008	–	1302	–	871.3	–	48.1	42.06	707	38.53	3.53	–
Spain	152	1368	139.2	599.6	114.7	531.4	24.5	68.2	63.17	751.2	56.25	6.92	6.8
Sweden	113	996	103.5	401.2	68.4	316.1	35.1	85.1	43.63	594.7	32.06	11.57	9.7
Switzerland	99	968	93.7	447.8	80.8	408.5	12.9	39.3	41.61	519.2	27.59	14.02	5.1
United Kingdom	151	1293	102.9	414.8	81.5	489	21.4	69	42.77	735	32.02	10.75	12.8

HD, hemodialysis; ISN, International Society of Nephrology; KF, kidney failure; PD, peritoneal dialysis.

Table 4 | Annual cost of kidney replacement therapy in the ISN Western European region[27–45]

Country	HD	PD	Kidney transplant (first year)	Kidney transplant (later years)	HD/PD ratio
Austria	–	–	–	–	–
Belgium	60,853	29,147	76,552	22,635	2.09
Denmark	71,318	63,935	35,737	9920	1.12
Finland	65,842	31,057	27,394	578	2.12
France	67,830	37,269	71,627	14,480	1.82
Germany	48,256	35,465	126,993	29,533	1.36
Greece	79,499	32,622	76,629	19,924	2.44
Iceland	24,419	27,206	–	–	0.90
Ireland	81,031	18,959	–	–	4.27
Israel	66,861	40,809	–	–	1.64
Italy	62,082	72,627	–	–	0.85
Liechtenstein	32,029	21,076	96,430	14,091	1.52
Luxembourg	–	–	–	–	–
Malta	–	–	–	–	–
The Netherlands	–	–	–	–	–
Norway	99,419	66,655	118,595	41,254	1.49
Portugal	71,791	50,534	41,108	25,242	1.42
Spain	30,361	30,361	116,952	12,379	1.00
Sweden	26,937	59,854	64,822	10,630	0.45
Switzerland	80,520	–	94,144	18,054	–
United Kingdom	94,085	83,070	19,255	–	1.13

HD, hemodialysis; ISN, International Society of Nephrology; PD, peritoneal dialysis. Costs in US$ in 2021.

The median percentage of deaths worldwide attributed to CKD was 2.4% (IQR: 1.6%–3.9%; Table 2).[17]

Risk factors associated with CKD also varied substantially across Europe with the proportion of obesity ranging from a fifth of the adult population in Switzerland (21.2% [95% CI: 17.3–25.3]) to almost a third in Malta (31.0% [95% CI: 25.1–37.0]). Hypertension ranged from a sixth of the UK's adult population (15.2% [95% CI: 12.2–18.3]) to a quarter of Portugal's adult population (24.4% [95% CI: 18.2–31.2]). One in 10 adults were reported to smoke in Sweden (11.4% [95% CI: 10.7–12.2]), whereas this was almost 1 in 3 adults in Greece (31.2% [95% CI: 28.9–33.5]; Table 2).[18]

The incidence of the population on KRT failure (dialysis and kidney transplantation) ranged from less than 100 pmp in Ireland, Finland, and Switzerland (88 pmp, 94 pmp, and 99 pmp, respectively) to over 250 pmp in Portugal and Greece (260 pmp and 269 pmp, respectively). Similarly, the prevalence of treated kidney failure ranged from less than 900 pmp in Luxembourg, Israel, and Iceland (522 pmp, 755 pmp, and 810 pmp, respectively) to over 1400 pmp in Greece and Portugal (1413 pmp and 2008 pmp, respectively; Table 3).[19–26] While the median incidence of the population on KRT in the ISN Western Europe region (135.0 pmp [IQR: 106–170 pmp]) was lower than the overall global median (145.5 pmp [IQR: 107.0–212.5 pmp]), the median prevalence of kidney failure was higher (1034.0 pmp [IQR: 957–1337 pmp] for Western Europe and 822.8 pmp [IQR: 556.0–1114.0 pmp] worldwide).[19–26]

Most individuals commenced KRT on chronic HD; however, the incidence differed considerably from less than 70 pmp in Denmark, Sweden, Finland, and Iceland (61.8 pmp, 68.4 pmp, 69.2 pmp, and 69.3 pmp, respectively) to over 140

Table 5 | Funding structures for kidney care in the ISN Western Europe region

	Acute kidney injury			CKD no dialysis				
Country	Publicly funded by government; free at the point of delivery	Solely private through health insurance providers	Multiple systems	Publicly funded by government; free at the point of delivery	Publicly funded by government but with some fees at the point of delivery	Mix of public and private funding systems	Solely private through health insurance providers	Multiple systems
Andorra			X					X
Austria	X			X				
Belgium	X				X			
Denmark	X			X				
Finland	X				X			
France	X					X		
Germany	X				X			
Greece	X				X			
Iceland	X				X			
Ireland	X					X		
Israel	X				X			
Italy	X			X				
Liechtenstein		X					X	
Luxembourg	X				X			
Malta	X			X				
The Netherlands	X						X	
Norway	X				X			
Portugal	X				X			
Spain	X				X			
Sweden	X				X			
Switzerland	X						X	
United Kingdom	X				X			

CKD, chronic kidney disease; ISN, International Society of Nephrology.

pmp in France, Belgium, and Greece (146.1 pmp, 175.8 pmp, and 255.1 pmp, respectively). Much smaller proportions commenced KRT on PD, with an incidence of less than 15 pmp in Austria, Greece, and Switzerland (10.6 pmp, 12.7 pmp, and 12.9 pmp, respectively). Only Sweden and Denmark had an incidence of greater than 35 pmp (35.1 pmp and 36.1 pmp, respectively). Very few individuals received pre-emptive kidney transplants, which were less than 5 pmp in Greece, Belgium, and Finland (1.1 pmp, 2.9 pmp, and 4.3 pmp, respectively). Pre-emptive kidney transplantation was highest in the UK, Iceland, and the Netherlands (12.8 pmp, 13.9 pmp, and 16.8 pmp, respectively; Table 3).[19–26]

The prevalence of chronic HD was lowest in the Nordic countries (Iceland, Norway, Finland, and Sweden) and the Netherlands (196.9 pmp, 252.2 pmp, 306.8 pmp, 316.1 pmp, and 322.7 pmp, respectively) and highest in Belgium, Germany, Portugal, and Greece (708.7 pmp, 768.1 pmp, 871.3 pmp, and 1100.5 pmp, respectively). The prevalence of chronic PD was only 4.7 pmp in Luxembourg, and less than 40 pmp in Germany, Ireland, and Switzerland (38.8 pmp, 39.2 pmp, and 39.3 pmp, respectively), whereas it was over 80 pmp in Sweden, Denmark, and Italy (85.1 pmp, 87.2 pmp, and 89.3 pmp, respectively). Greece, Italy, and Israel had prevalences of individuals living with a kidney transplant of less than 500 pmp (248.9 pmp, 476.0 pmp, and 492.0 pmp, respectively), and Portugal, UK, and Spain had prevalences of over 700 pmp (707.0 pmp, 735.0 pmp, and 751.2 pmp, respectively). While the incidence of living donor kidney transplantation was less than 15 pmp for most countries, it was 26.3 pmp in the Netherlands and 37.2 pmp in Israel (Table 3).[19–26]

Overview of gross domestic product and government health expenditure. The total health expenditure as a percentage of gross domestic product ranged from 5.4%, 6.7%, and 6.7% in Luxembourg, Andorra, and Ireland, respectively, to 11.1%, 11.3%, and 11.7% in France, Switzerland, and Germany, respectively, with an average of 9.3%. Total health spending per person ranged 6-fold from US $1599 in Greece to US $9801 in Switzerland, with a median of US $5088 (IQR: US $3259–$5851; Table 1).[15] This was considerably higher than the overall health spending of all regions of US $353 (IQR: US $76–$1270; Table 1).[15] Government health spending per person ranged 7-fold from US $909 in Greece to US $6300 in Norway, with a median of US $3798 (IQR: US $2470–$4701; Table 1).[16] This resulted in an out-of-pocket health spending per person ranging from US $358 in Andorra to US $2532 in Switzerland with a median spend of US $637 (IQR: US $589–$800) per person (Table 1).[16] The demographics of the countries in the ISN Western Europe region can be found in Tables 1–3.[15–26]

Cost of KRT. The annual cost of HD varied considerably across the region from US $24,419 in Iceland to US $94,085 in the UK. Likewise, the annual cost of PD ranged from US $18,959 in Ireland to US $83,070 in the UK. The first year after kidney transplantation was cheapest in the UK (US $19,255) and most expensive in Germany (US $126,993).

Table 5 | (Continued)

Dialysis					Transplantation				
Publicly funded by government; free at the point of delivery	Publicly funded by government but with some fees at the point of delivery	Mix of public and private funding systems	Solely private through health insurance providers	Multiple systems	Publicly funded by government; free at the point of delivery	Publicly funded by government but with some fees at the point of delivery	Mix of public and private funding systems	Solely private through health insurance providers	Multiple systems
								X	
X				X					X
	X				X				
X				X					X
	X				X				
		X				X			
	X				X				
X				X					X
	X			X					X
		X				X			
X				X					X
X				X					X
			X				X		
	X			X					X
X				X					X
			X				X		
	X				X				
	X				X				
	X				X				
	X				X				
X							X		
	X				X				

Table 6 | Availability of KRT centers and nephrology workforce in the ISN Western Europe region

Country	Chronic HD centers pmp	Chronic PD centers pmp	Transplant centers pmp	Nephrologists pmp	Nephrology trainees pmp
Andorra	11.69	11.69	–	0.00	0.00
Austria	5.61	1.12	0.45	33.66	5.61
Belgium	8.44	–	0.59	21.10	4.22
Denmark	2.70	2.70	0.51	25.33	4.05
Finland	5.18	3.93	0.18	19.64	8.93
France	9.31	2.20	0.69	17.57	5.86
Germany	8.66	2.73	0.55	27.01	0.59
Greece	18.99	2.85	0.57	36.07	9.49
Iceland	13.98	2.80	2.80	30.76	0.00
Ireland	2.46	1.90	0.19	11.75	9.48
Israel	7.74	2.24	0.67	24.68	3.93
Italy	9.00	3.27	0.65	–	49.10
Liechtenstein	25.18	25.18	N/A	100.73	0.00
Luxembourg	7.69	1.54	N/A	12.30	6.15
Malta	4.31	2.15	2.15	–	17.23
The Netherlands	3.62	3.74	0.46	15.17	2.30
Norway	4.50	4.68	0.18	27.37	9.00
Portugal	12.89	1.95	0.78	34.17	14.65
Spain	4.24	1.70	0.85	53.01	10.60
Sweden	6.68	5.25	0.38	23.85	6.68
Switzerland	10.58	7.05	0.12	41.13	5.88
United Kingdom	1.00	1.00	0.34	12.13	6.15

HD, hemodialysis; ISN, International Society of Nephrology; KRT, kidney replacement therapy; N/A, not applicable; PD, peritoneal dialysis; pmp, per million population.

Beyond the first year, the differences in the costs of kidney transplantation were striking, ranging from US $578 in Finland to US $41,254 in Norway (Table 4).[27–45]

Survey response data for the ISN Western Europe region

Characteristics of participating countries. Responses to the survey were received from 22 of 29 countries (75.9%) in the ISN Western Europe region: Andorra, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Liechtenstein, Luxembourg, Malta, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the UK (Figure 1). These 22 countries had a combined population of 439.5 million people, which represented 99% of the region's population and covered 3.8 million square kilometers. All countries were classified as high income by the World Bank, with a gross domestic product based on purchasing power parity ranging from US $3.3 billion (2021 US dollars), US $5 billion, and US $21.5 billion in Andorra, Liechtenstein, and Iceland, respectively, to US $3.34 trillion, US $3.42 trillion, and US $4.82 trillion in the UK, France, and Germany, respectively (Table 1).[15,49]

Health financing for kidney care. In 18 countries (82%), acute kidney injury (AKI), dialysis, and kidney transplantation were publicly funded by the government and free at the point of delivery (Table 5). Liechtenstein relied solely on a private (health insurance) scheme, whereas transplantation in Ireland was publicly funded by the government but included some fees. Sixteen countries (73%) had health care systems that were publicly funded by the government and free at the point of delivery for individuals with non-KRT CKD. Two countries (9%) were publicly funded by the government but included some fees. Two countries (9%) had a mixture of public and private funding systems, and only 1 country (Liechtenstein) had a solely private and out-of-pocket funding system for non-KRT CKD. This was considerably different from the rest of the world where only 27% of non-KRT CKD was publicly funded from the government and 37% was a mixture of public and private financing. Within the ISN Western Europe region, 19 (86%) countries had chronic HD publicly funded by the government and free at the point of delivery, whereas this was the case for only 45% of countries worldwide (Supplementary Table S2).

In the 2023 ISN-GKHA, funding of medications for CKD was free at the point of delivery in Austria, Denmark, Italy, and Malta (18%), whereas funding for medications for dialysis was free at the point of delivery in Austria, Denmark, Greece, Italy, Israel, Malta, and Switzerland (32%; Table 5). Medications for people with CKD and for people receiving dialysis were publicly funded by the government but with some fees in 55% and 45% of countries, respectively. These were much higher rates of government funding of medications than the worldwide median (33% and 28%, respectively). Likewise, 72% of medications for kidney transplant recipients were either publicly funded and free at the point of delivery or with some fees (Table 5), which was higher than the worldwide median of 52%.

Availability of services for the delivery of kidney care. HD and PD were available in all countries of the ISN Western Europe region. The median number of chronic HD centers was 7.7 pmp though this ranged from 1.0 pmp in the UK to 19.0 pmp in Greece (and 25.2 pmp in the microstate of Liechtenstein; Table 6, Figure 2). Home HD for adults and pediatrics was available in 77% of countries (generally not available in Iceland and Israel and not available in Greece, Luxembourg, or Malta). This was higher than the worldwide average of 19%. Chronic PD was available in all

Table 7 | Availability of CKD, dialysis, kidney transplant, AKI, and CKM registries in the ISN Western Europe region

Country	CKD	Dialysis	Transplant	AKI	CKM
Andorra					
Austria		X	X		
Belgium		X	X		
Denmark		X	X		
Finland		X	X		
France	X	X	X		
Germany		X	X		
Greece		X	X		
Iceland	X	X	X		X
Ireland		X	X		
Israel		X	X		
Italy		X	X		
Liechtenstein					
Luxembourg	X	X	X		
Malta		X	X		
The Netherlands		X	X		
Norway	X	X	X		
Portugal		X	X		
Spain		X	X		
Sweden	X	X	X	X	X
Switzerland		X	X		
United Kingdom	X	X	X	X	

AKI, acute kidney injury; CKD, chronic kidney disease; CKM, conservative kidney management; ISN, International Society of Nephrology.

countries (2.7 pmp), whereas acute PD was available in only 15 countries (68%; Supplementary Table S3 and Supplementary Figure S1).

Kidney transplantation, both from living and deceased donors, was available in 18 countries (but not in the microstates and small countries of Andorra, Liechtenstein, or Luxembourg; Table 6, Figure 2). These 18 countries all had national waiting lists except Spain, which only had regional waiting lists. The availability of kidney transplantation centers for the region's countries was 0.69 pmp, ranging from 0.12 pmp in Switzerland to 0.85 pmp in Spain. Kidney transplantation centers were more common in Malta (2.2 pmp) and Iceland (2.8 pmp); however, both countries had populations of fewer than 500,000. Pediatric transplantation was available in 17 countries (77%).

CKM, defined as a planned, holistic, patient-centered care for people living with CKD stage 5, which was a shared decision between the health care worker and the patient, was generally available in 21 (95%) countries This is higher than the worldwide median of 45% (Supplementary Table S4 and Supplementary Figure S1).

Health workforce for the delivery of kidney care. In all countries, bar 2 microstates (91%), nephrologists were primarily responsible for the medical care of individuals with kidney failure. This was slightly higher than the overall global average of 87%. The median number of nephrologists in the ISN Western Europe region was 25.0 pmp (IQR: 16.4–33.9 pmp), which was over double the median number worldwide (11.8 pmp [IQR: 1.8–24.8 pmp]). Within the region, the median prevalence of nephrologists ranged from 11.8 pmp in Ireland to 53.0 pmp in Spain (excluding the microstates). Likewise, the median prevalence of nephrology trainees ranged from 0.59 pmp in Germany to 49.1 pmp in Italy (Table 6). The median prevalence of pediatric nephrologists was 1.6 pmp (IQR: 0.96–2.2 pmp), which was over double the global median prevalence of pediatric nephrologists (0.69 pmp [IQR: 0.03–1.8 pmp]).

There were widespread shortages of health care providers for kidney failure across the region (Figure 3). Only 10 countries (45%) reported sufficient nephrologists, and only 5 countries (23%) reported sufficient pediatric nephrologists. Sixteen countries (73%) reported a shortage of transplant surgeons and HD access surgeons, and 17 countries (77%) reported a shortage of surgeons for PD access. Thirteen countries (59%) required additional counselors or psychologists, and 13 countries (59%) required additional dialysis nurses.

Health information systems, early identification mechanisms for kidney disease, advocacy, and policy for kidney disease. Availability of nephrologists (59%); patient knowledge and attitude (55%); physician availability, access, knowledge, and attitude (50%); and a lack of political will and enabling policies (45%) were the top 4 cited barriers to optimal kidney care in the ISN Western Europe region (Supplementary Table S5).

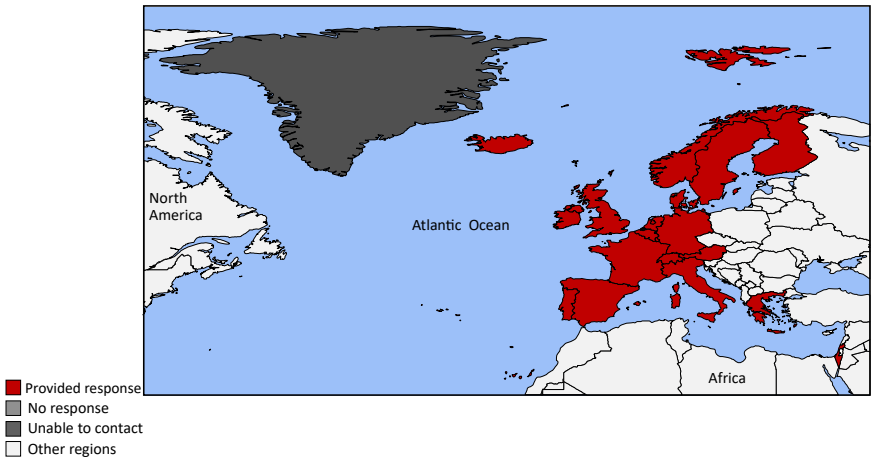

Figure 1 | Countries of the International Society of Nephrology Western Europe region.

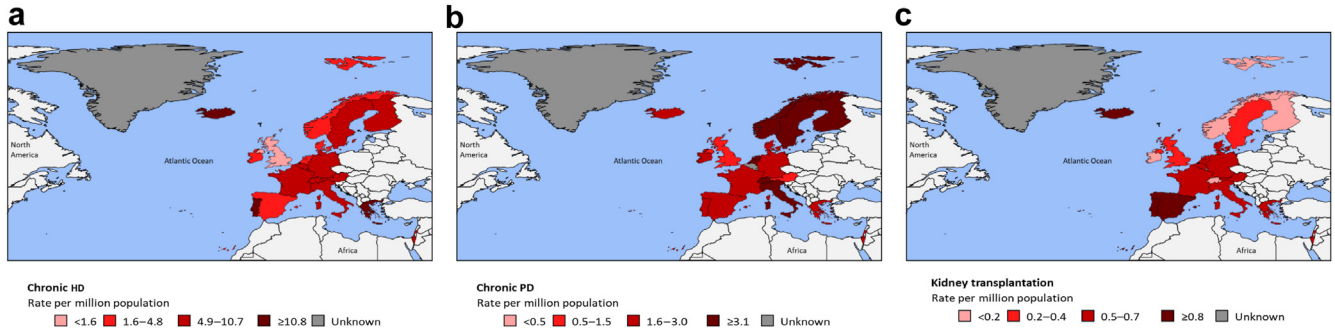

Figure 2| Availability of kidney replacement therapy centers in the International Society of Nephrology Western Europe region: (a) chronic hemodialysis (HD), (b) peritoneal dialysis (PD), and (c) kidney transplantation.

Country-level national health policies for kidney care were variable in the region, with 14 countries (64%) stating that their country had a national strategy for NCDs (Supplementary Table S6). Only 10 countries (45%) stated that their country had a national strategy for improving the care of people with CKD, with half saying that this strategy was incorporated into an NCD strategy (Supplementary Table S6). Only 5 countries (23%) felt that CKD was a recognized health priority by their country's government, which was almost half that of the worldwide opinion (48%). This was the same for AKI (23%) though the worldwide opinion was also lower at 19%. The number of countries that felt that their governments recognized kidney failure and/or KRT as a health priority was higher at 64%, but this still left 8 countries (36%) believing that it was not recognized as a health priority.

Dialysis and transplant registries were available in all countries except for the microstates of Andorra and Liechtenstein. CKD registries were less prevalent, being available in only 6 countries (27%), whereas AKI and CKM registries were available in only 2 countries (9%; Table 7).

Causes of hospitalization and death among people living with kidney failure on dialysis

Seventy-three percent of countries reported a mortality of less than 10% in the first year of HD and PD. The commonest cause of death was cardiovascular disease (Supplementary Tables S7 and S8). Approximately half of the countries reported that less than 30% of people receiving HD or PD had at least 1 hospitalization event in the first year of dialysis. The commonest causes of hospitalization among people receiving HD were cardiovascular disease (59% of countries) and access malfunction (14% of countries; Supplementary Table S9). The commonest cases of hospitalization among people receiving PD were cardiovascular disease (32% of countries) and PD-related infection (23% of countries; Supplementary Table S10).

DISCUSSION

The aim of the ISN-GKHA is to understand, compare, and monitor how different countries around the world detect, treat, monitor, and advocate for people with kidney disease.[13] In this paper, data from the third ISN-GKHA are presented with a focus on the ISN Western Europe region. Compared with the other regional median values, Western Europe is performing well; however, there are many opportunities for improvement, specifically related to CKD prevention, surveillance, awareness, and policy implementation.

The median prevalence of CKD across the ISN Western Europe region was 10.6%, slightly higher than the median worldwide at 9.5%. Within the region, there was a 2-fold variation between the country with the lowest prevalence, Iceland, and the country with the highest prevalence, Greece. Although caution is required when comparing CKD prevalence due to significant methodological variations in the general population sampling methods and variability in the assessment of kidney function within studies,[50] one must still acknowledge that the data are pointing toward 1 in 10 Western Europeans having CKD. CKD is associated with adverse health outcomes, high cardiovascular mortality, and high health care costs. The 2017 Global Burden of Disease study reported a 41.5% increase in the global all-age mortality from CKD between 1990 and 2017.[51] The same study reported that most of the burden of CKD was concentrated in the 3 lowest quintiles of the sociodemographic index. Identifying and treating CKD at the earliest stages will not only likely reduce the risk of progression to kidney failure and (cardiovascular) mortality, but it is also an equity imperative.[51] A recent Kidney Disease Improving Global Outcomes (KDIGO) Controversies Conference recommended that individuals with hypertension, diabetes, or cardiovascular disease should be screened for CKD.[52] Screening the general population for CKD detection is not currently supported by evidence of benefit over costs.[53,54] We reported high levels of obesity, hypertension, and smoking across Western Europe, all of which are known risk factors for the development of CKD. Alongside screening for CKD in high-risk populations, preventative measures based around tackling CKD risk factors, such as obesity, hypertension, and smoking, could be an effective CKD preventative measure.

As shown in this study, the ISN Western Europe region has highly developed programs to manage the care of the (relatively small) kidney failure population, with 63% of survey participants reporting that their government recognized

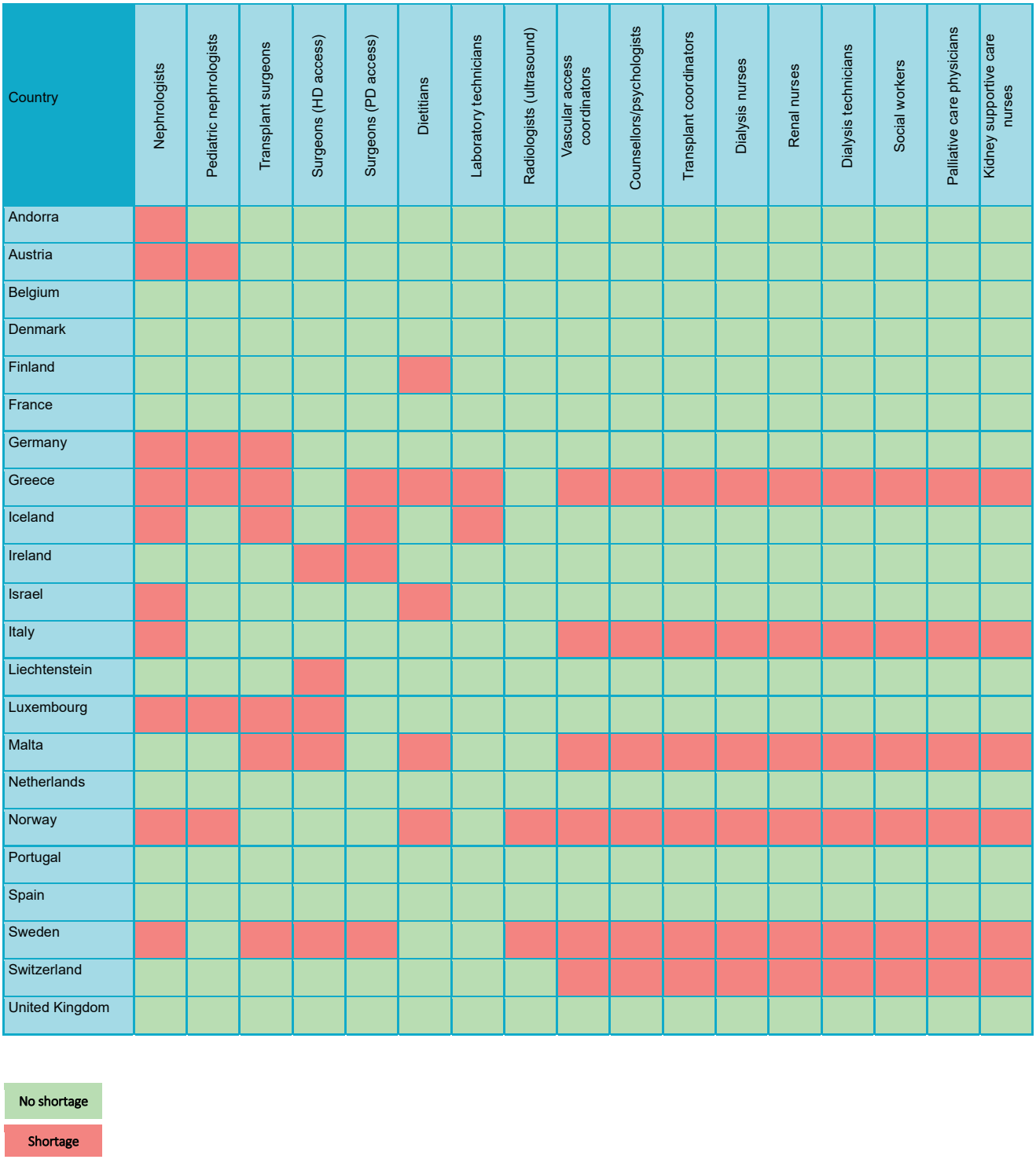

Figure 3| Workforce shortages for medical kidney care in the International Society of Nephrology Western Europe region. HD, hemodialysis; PD, peritoneal dialysis.

kidney failure and KRT as a health priority. Programs to manage the care of the much larger non–KRT-dependent CKD population are less well developed.[55] Only 23% felt that CKD was a recognized health priority by their country's government, which was almost half that of the worldwide opinion (48%). Less than half of the countries surveyed reported that their country had a national strategy for improving the care of people with CKD, with half reporting that this was incorporated into an NCD strategy. Less than a quarter of countries had a national AKI strategy. Even at the European Union level, CKD was not considered in the 2022 Healthier Together European Union NCD Initiative, whereas

diabetes, cardiovascular disease, chronic respiratory, mental health, and neurological diseases were.[56]

Bello *et al.*[55] reported common barriers to the care of people with non–KRT-dependent CKD in 16 Western European countries. These were limited work force capacity, almost a total lack of disease surveillance mechanisms, absence of coordinated CKD care strategies, poor CKD care integration with other NCD control initiatives, and low awareness of the significance of CKD. They suggested potential approaches to improving CKD care by making changes to health systems and policy. These included better models of CKD care, building workforce capacity, incorporating CKD care into (inter)national NCD strategies, and population-based national CKD registries among others.[55]

Compared with the other regions, the ISN Western Europe region has a much larger medical workforce, typically double the number of adult and pediatric nephrologists compared with the world average and higher government health care expenditure. Despite this, 59% of survey participants reported the insufficient availability of nephrologists as one of the main barriers to optimal kidney care. While increasing the workforce is the obvious solution here, other mechanisms to streamline and improve the delivery of evidence-based CKD care may also play a role. Taylor *et al.*[57] recently reported on the contexts, mechanisms, and outcomes involved in complex interventions to improve CKD care at the primary and secondary care interface. Key intervention components identified were automated identification of higher-risk individuals in primary care with management advice provided to general practitioners, educational support systems, and non–patient-facing nephrologist review. These components had the potential to promote clinician learning while managing individuals with CKD, promote clinician motivation to take steps toward evidence-based CKD management, and integrate dynamically with existing workflows.[57]

Just under half of countries reported a lack of political will and enabling policies as a barrier to optimal kidney care in the ISN Western Europe region. Bello *et al.*[55] reported low awareness of the importance of CKD among the public, policymakers, and care providers, perpetuating the limitations in optimal kidney care. Surveillance systems such as kidney registries provide data on disease and treatment rates that are needed to advocate for, and support the planning, delivery, and evaluation of kidney services. The data can also highlight discrepancies in available care allowing for the diversion of resources to where they are most needed.[58] This region is in a fortunate position of having dialysis and kidney transplant registries available in all countries (except for 2 microstates). In addition, Europe is fortunate to have a European level registry that then collates and presents data allowing for international comparisons and benchmarking.[2] Within the ISN Western Europe region, CKD, AKI, and CKM registries were less prevalent, being available in only 6 (27%), 2 (9%), and 2 (9%) countries, respectively. Developing CKD and AKI registries will focus attention on, and effort toward prevention, while data on CKM, be that from patient choice or limited resources, are necessary to advocate for this vulnerable, high-risk group. Although some efforts are being taken to develop these registries,[59] collecting both the right data and accurate data,[60] especially in the light of limited systematic early CKD detection programs, does hamper their development. The ISN's SHARing Expertise to support the setup of Renal Registries (SharE-RR) project provides education and support to further establishment and development of kidney registries worldwide.[59]

Although it is clear that the ISN Western Europe region is performing well in all aspects of kidney care compared with the other 9 ISN regions, improvements are certainly possible and welcome. Western European kidney health care professionals, key stakeholders, and policymakers are called upon to prioritize CKD prevention through awareness campaigns, mitigation of CKD risk factors, and the implementation of surveillance systems, including registries for AKI and non-KRT CKD. These efforts are essential to continue the current positive trend of decreasing the incidence of KRT, a condition that is associated, in both children and adults, with dire clinical and social consequences as well as massive economic costs.[61] For people reaching kidney failure, there should be a focus on patient-centered choice for treatments such as CKM and equitable access to home therapies, that is, home HD and PD. Collaborative cooperation is essential to minimize disparities between Western European countries and ensure high standard of treatment for the CKD population living in this region.

There were some limitations to the 2023 ISN-GKHA; these have been discussed.[14] One such limitation specific to our region is the lack of more detailed information on pediatric kidney care. Available studies corroborate findings in adults including the availability of pediatric kidney transplantation in 93% of countries, pediatric dialysis facilities for AKI and kidney failure in 95% of countries, and considerable variations in the availability of allied health professionals, high-tech diagnostic methods, and treatment with expensive drugs for children.[62] However, this work is important for guiding kidney care policy in the ISN Western Europe region.

APPENDIX

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SUPPLEMENTARY MATERIAL
Supplementary File (PDF)
Supplementary Table S1. Workforce (specialist physician, doctor, and nurse) prevalences in the International Society of Nephrology (ISN) Western Europe region.*[46]
Supplementary Table S2. Health care system funding structure for kidney replacement therapy in the International Society of Nephrology (ISN) Western Europe region, n (100%).
Supplementary Table S3. Availability of in-center hemodialysis, home hemodialysis, and dialysis in the International Society of Nephrology (ISN) Western Europe region, n (100%).
Supplementary Table S4. Availability of choice-restricted conservative kidney management in the International Society of Nephrology (ISN) Western Europe region, n (100%).
Supplementary Table S5. Barriers to optimal kidney care, overall and in the International Society of Nephrology (ISN) Western Europe region, n (100%).
Supplementary Table S6. National health strategies for noncommunicable diseases and chronic kidney disease (CKD)–specific policies in the International Society of Nephrology (ISN) Western Europe region, n (100%).
Supplementary Table S7. Commonest causes of death among people receiving hemodialysis in the International Society of Nephrology (ISN) Western Europe region, n (100%).
Supplementary Table S8. Commonest causes of death among people receiving peritoneal dialysis in the International Society of Nephrology (ISN) Western Europe region, n (100%).
Supplementary Table S9. Commonest causes of hospitalization among people receiving hemodialysis in the International Society of Nephrology (ISN) Western Europe region, n (100%).
Supplementary Table S10. Commonest causes of hospitalization among people receiving peritoneal dialysis in the International Society of Nephrology (ISN) Western Europe region, n (100%).
Supplementary Figure S1. Country-level scorecard on the availability of kidney replacement therapy (KRT), conservative kidney management (CKM), funding for medications, registry, advocacy group, nephrologists, and nephrology trainees in the International Society of Nephrology (ISN) Western Europe region in 2019 and 2023.

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