

THE GLOBAL KIDNEY HEALTH ATLAS

<Congress title>

Date

Overview



- Aim
- Methods
- Key Results
- Implications

Aim of the Global Kidney Health Atlas



To understand, compare and monitor how different countries around the world detect, treat, monitor and advocate for people with kidney disease (AKI or CKD)

Key focus on availability, accessibility, affordability and quality of ESKD care

Global Kidney Health Atlas survey



Design and scope

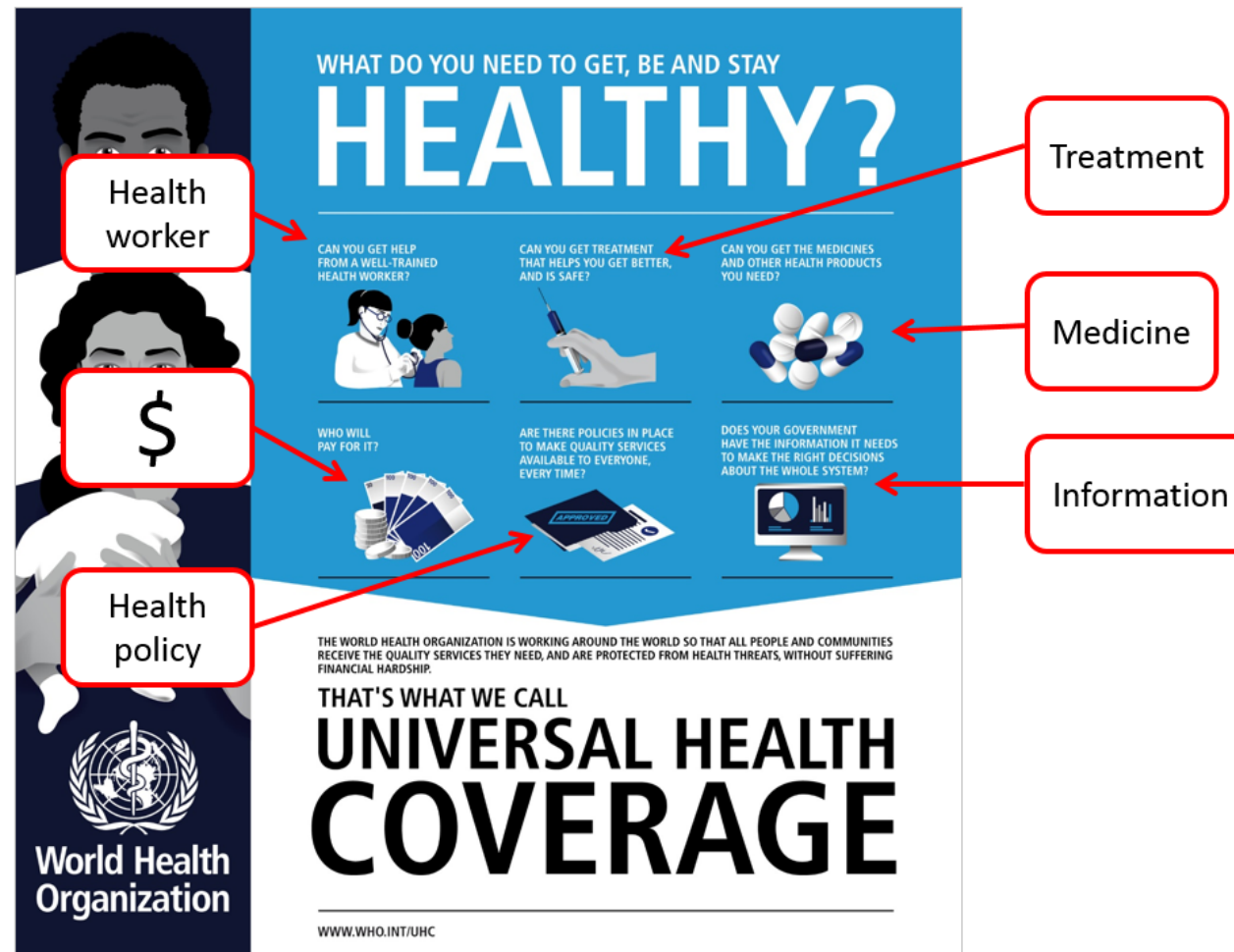
Desk research (across countries and regions)

- Published and grey literature review
- Systematic review ESKD burden and outcomes
- Data extraction from major renal registries (USRDS, ERA-EDTA) and relevant national registries where available
- Scoping review of KRT cost estimates

Online questionnaire-based survey July – September 2018

- 3 languages (English, French, Spanish)
- Across 182 countries
- ≥ 3 stakeholders per country
 - National nephrology society leadership
 - Healthcare policymakers
 - Patients / patient advocacy groups
- Discrepancies resolved by follow-up conferences with regional and country nephrology leaders

Overall survey components



Overall GKHA response

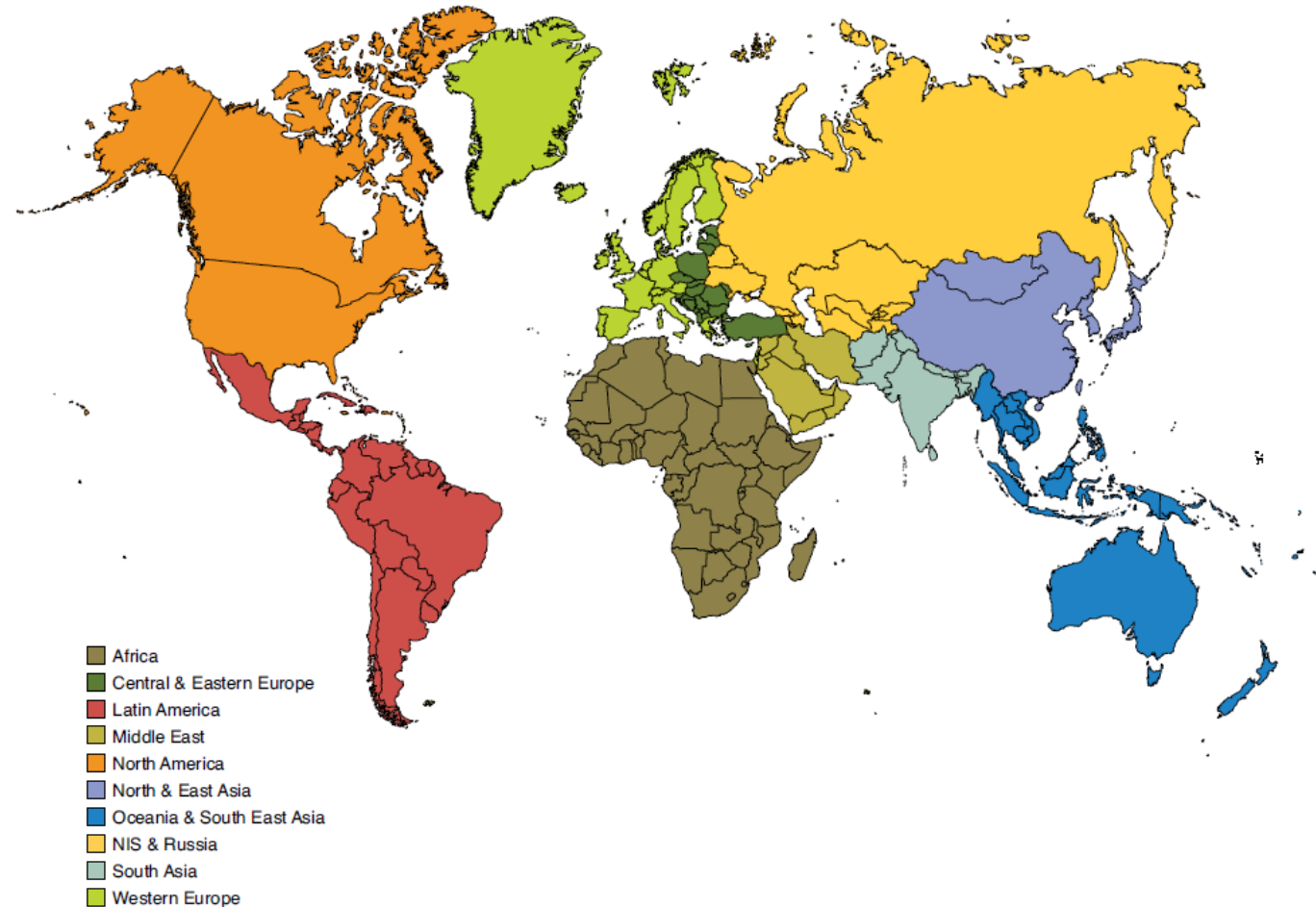
■ Participated in survey ■ Did not participate in survey



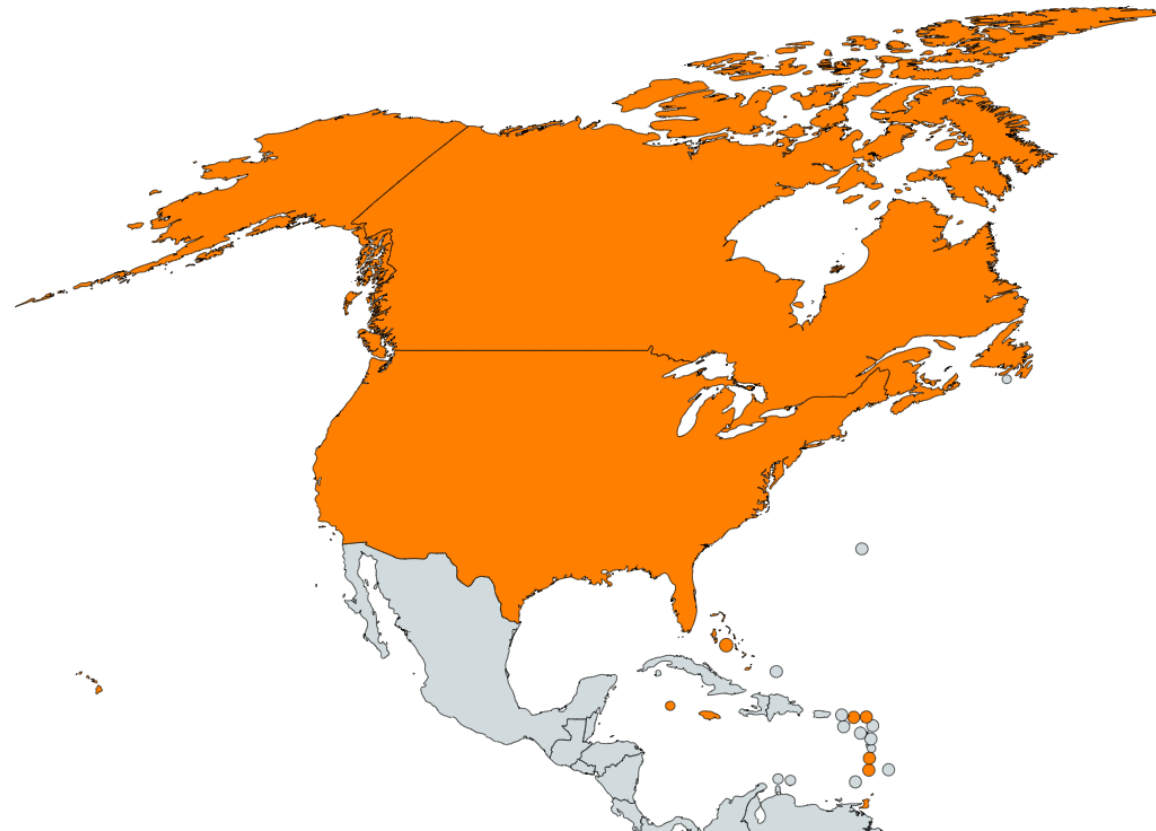
160 countries (88%)
99% world's population
317 individuals (69%) response
3 respondents/country (IQR 2-4)

113 countries participated
in both GKHA surveys

Results presented by ISN regions

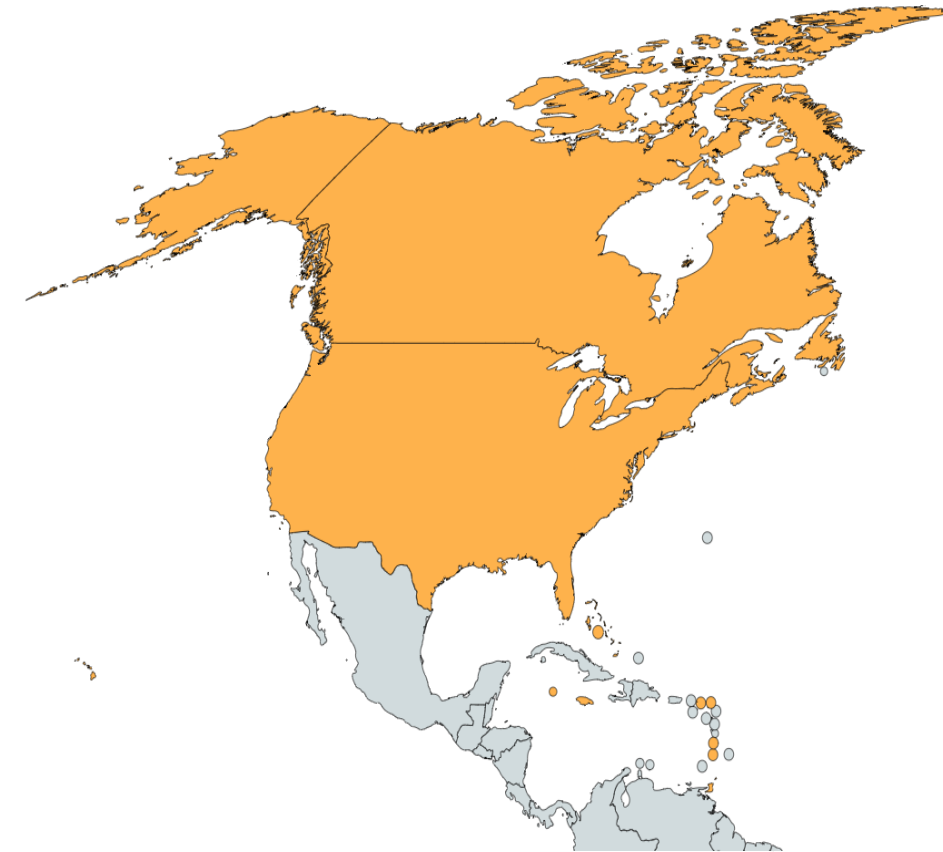


ISN Region: North America and the Caribbean



Demographics

Country	World bank ranking	Area (sq km)	Total population (2018)	GDP (PPP) (\$ billion)	Total health expenditures (% of GDP)
Antigua and Barbuda	High income	443	95,882	2.398	4.3
Bahamas	High income	13,880	332,634	12.06	6.4
Barbados	High income	430	293,131	5.218	7.0
Bermuda	High income	54	71,176	6.127	-
Canada	High income	9,984,670	35,881,659	1774	10.5
Cayman Islands	High income	264	59,613	2.507	-
Jamaica	Upper middle income	10,991	2,812,090	26.06	5.9
St. Kitts and Nevis	High income	261	53,094	1.55	5.6
St. Lucia	Upper middle income	616	165,510	2.542	6.0
St. Vincent and the Grenadines	Upper middle income	389	101,844	1.265	4.2
Trinidad and Tobago	High income	5,128	1,215,527	42.85	6.0
Turks and Caicos Islands	High income	948	53,701	0.632	-
United States	High income	9,833,517	329,256,465	19490	16.8
Virgin Islands (U.S.)	High income	1,910	106,977	3.872	-



‘—’: data not reported/unavailable

CKD and its risk factors burden

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)
Antigua and Barbuda	10.79 (10.01 - 11.63)	4.61 (4.36 - 4.89)	3.15 (2.83 - 3.47)	19.1 (13.9 - 24.8)	23.4 (16.6 - 31.1)	3.3 (2.5 - 4.5)
Bahamas, The	9.93 (9.23 - 10.71)	3.68 (3.47 - 3.88)	2.62 (2.4 - 2.84)	32.1 (26.1 - 38.5)	20.9 (15.1 - 27.9)	6.1 (4.7 - 8.0)
Barbados	13.63 (12.65 - 14.72)	3.22 (3.03 - 3.42)	2.6 (2.39 - 2.81)	24.8 (19.8 - 30.2)	24.4 (18.0 - 31.5)	4.2 (3.2 - 5.5)
Bermuda	13.86 (12.87 - 15.07)	3.09 (2.9 - 3.3)	2.31 (2.09 - 2.52)	-	-	9.0 (7.1 - 11.2)
Canada	10.25 (9.48 - 11.15)	2.18 (2.06 - 2.31)	1.29 (1.18 - 1.4)	31.3 (27.4 - 35.3)	13.2 (9.4 - 17.7)	13.8 (12.0 - 15.9)
Cayman Islands	-	-	-	-	-	-
Jamaica	10.67 (9.91 - 11.49)	4 (3.63 - 4.32)	2.89 (2.56 - 3.22)	24.4 (19.9 - 29.2)	21.8 (16.0 - 28.4)	9.4 (7.3 - 11.7)
St. Kitts and Nevis	-	-	-	23.1 (17.7 - 29.1)	25.3 (18.7 - 32.4)	-
St. Lucia	11.17 (10.38 - 12.01)	4.16 (3.87 - 4.43)	3.04 (2.76 - 3.32)	19.8 (14.9 - 25.1)	27.1 (20.2 - 35.0)	8.0 (6.4 - 10.1)
St. Vincent and the Grenadines	11.65 (10.86 - 12.55)	3.64 (3.42 - 3.86)	2.83 (2.58 - 3.06)	23.8 (18.4 - 29.8)	23.3 (17.0 - 30.5)	6.4 (5.0 - 8.0)
Trinidad and Tobago	11.46 (10.62 - 12.45)	4.14 (3.91 - 4.41)	2.93 (2.64 - 3.24)	19.7 (14.5 - 25.7)	25.8 (18.7 - 33.9)	14.6 (12.1 - 17.2)
Turks and Caicos Islands	-	-	-	-	-	-
United States	12.75 (11.87 - 13.78)	2.97 (2.93 - 3.02)	1.9 (1.76 - 2.04)	37.3 (33.4 - 41.3)	12.9 (9.8 - 16.8)	13.3 (13.0 - 13.6)
Virgin Islands (U.S.)	14.44 (13.33 - 15.70)	3.81 (3.51 - 4.08)	3.02 (2.75 - 3.28)	-	-	4.1 (3.1 - 5.5)

Abbreviations:

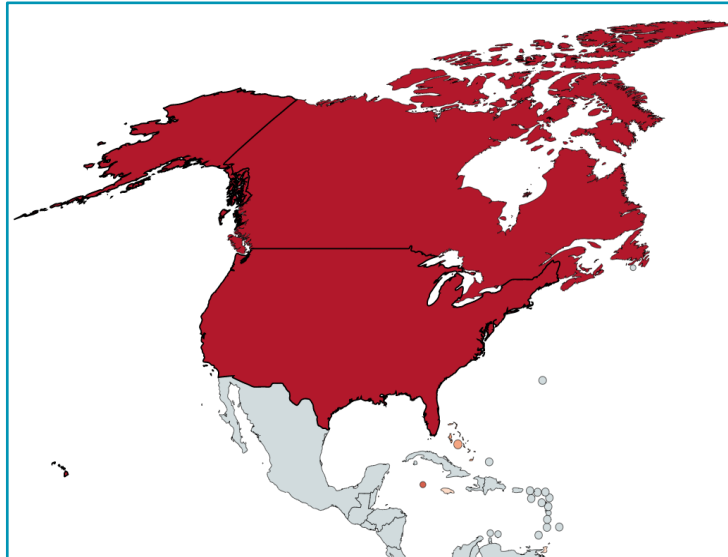
CKD (Chronic Kidney Disease),
DALYS (disability-adjusted life years),
BP (blood pressure),
CI (confidence interval)

Data source: GBD study database
(<http://www.healthdata.org/gbd>),
WHO data observatory
(<https://www.who.int/gho/en/>)

‘-’: data not reported/unavailable

Burden of ESKD

Prevalence of treated ESKD



■ <433.0 pmp
 ■ 433.0-759.0 pmp
 ■ 759.1-1048.0 pmp
 ■ >1048.0 pmp
 ■ Data not reported

Treated ESKD: all dialysis + transplant

* pmp (per million population)

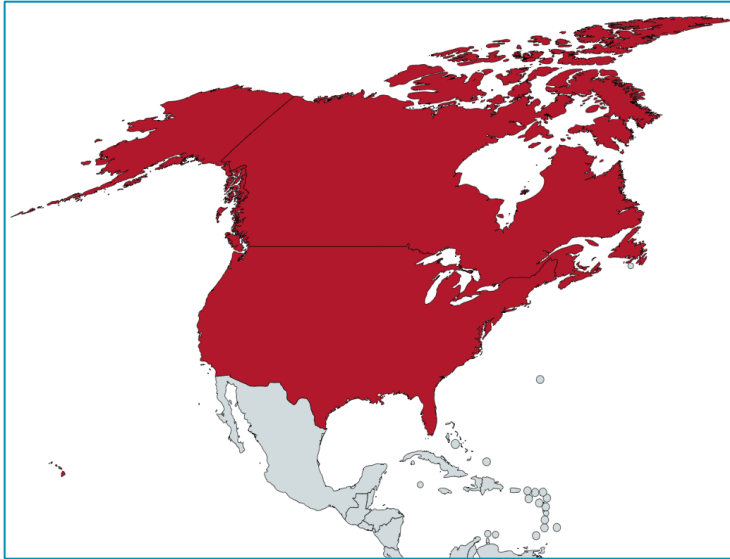
Data source: Annual Statistics on Organ Replacement in Canada: Dialysis, Transplantation and Donation (2017 Data), Jain et al. (JASN) 2012, Soyibo & Barton (West Indian Medical Journal) 2007, 2017/2018 USRDS Annual Data Report

'-': data not reported/unavailable

Country	Treated ESKD		Chronic dialysis (HD+PD)		Chronic HD		Chronic PD	
	Incidence	Prevalence	Incidence	Prevalence	Incidence	Prevalence	Incidence	Prevalence
Antigua and Barbuda	-	-	-	-	-	-	-	-
Bahamas, The	-	651.1	-	-	-	-	-	-
Barbados	-	682.5	-	678.8	-	678.8	-	0
Bermuda	-	-	-	-	-	-	-	-
Canada	197.7	1371.5	191.4	794.4	146	633.3	45.4	161.1
Cayman Islands	-	819.5	-	963.8	-	963.8	-	0
Jamaica	-	137.4	-	131.5	-	192.7	-	11.5
St. Kitts and Nevis	-	-	-	-	-	-	-	-
St. Lucia	-	-	-	-	-	-	-	-
St. Vincent and the Grenadines	-	-	-	-	-	-	-	-
Trinidad and Tobago	-	334.6	-	334.61	-	278.6	-	56.02
Turks and Caicos Islands	-	-	-	1882.4	-	1882.4	-	0
United States	378	2196	374.1	1582	336.7	1416.07	37.4	157.9
Virgin Islands (U.S.)	-	-	-	1441.5	-	1399.1	-	42.4

Burden of ESKD (cont'd)

Incidence of kidney transplantation



■ <5.2 pmp
 ■ 5.2–13.5 pmp
 ■ 13.6–37.8 pmp
 ■ >37.8 pmp
 ■ Data not reported

* pmp (per million population)

Data source: Annual Statistics on Organ Replacement in Canada: Dialysis, Transplantation and Donation (2017 Data), Jain et al. (JASN) 2012, Soyibo & Barton (West Indian Medical Journal) 2007, 2017/2018 USRDS Annual Data Report

‘ – ’ : data not reported/unavailable

Country	Kidney transplantation				
	Incidence overall	Prevalence overall	Incidence of deceased donor	Incidence of living donor	Incidence of pre-emptive
Antigua and Barbuda	-	-	-	-	-
Bahamas, The	-	3.1	-	-	-
Barbados	-	3.7	-	-	-
Bermuda	-	-	-	-	-
Canada	48.39	577	35.49	12.9	6.3
Cayman Islands	-	-	-	-	-
Jamaica	-	6.8	-	-	-
St. Kitts and Nevis	-	-	-	-	-
St. Lucia	-	-	-	-	-
St. Vincent and the Grenadines	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-
Turks and Caicos Islands	-	-	-	-	-
United States	63.6	666	45.69	17.91	-
Virgin Islands (U.S.)	-	-	-	-	-

Annual cost of kidney replacement therapy components

Country	Hemodialysis	Peritoneal dialysis	Kidney Transplant (First year)	Kidney Transplant (later years)	HD/PD cost ratio
Antigua and Barbuda	-	-	-	-	-
Bahamas, The	-	-	-	-	-
Barbados	-	-	-	-	-
Bermuda	-	-	-	-	-
Canada	73,789	44,434	82,852	22,168	1.66
Cayman Islands	-	-	-	-	-
Jamaica	-	-	-	-	-
St. Kitts and Nevis	-	-	-	-	-
St. Lucia	-	-	-	-	-
St. Vincent and the Grenadines	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-
Turks and Caicos Islands	-	-	-	-	-
United States	88,395	68,139	35,325	-	1.30
Virgin Islands (U.S.)	-	-	-	-	-

*Cost is in \$US 2016

Abbreviations:

HD (hemodialysis),
PD (peritoneal dialysis)

Data source: Barnieh et al. (2014), Berger et al. (2009), Bruns et al. (1998), Coyte et al. (1996), Damien et al. (2016), De Vecchi et al. (1994), Goeree et al. (1995), Klarenbach et al. (2014), Komenda et al. (2012), Laupacis et al. (1996), Lee et al. (2002), McMurray and Miller (1997), Neil et al. (2009), Rivara & Mehrotra (2014), Shih et al. (2005), van der Tol et al. (2019)

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Survey response



- 10 of 14 countries in North America and the Caribbean (71%) responded to the 2018 survey
- This represents 99% of the region's population

Country level scorecard

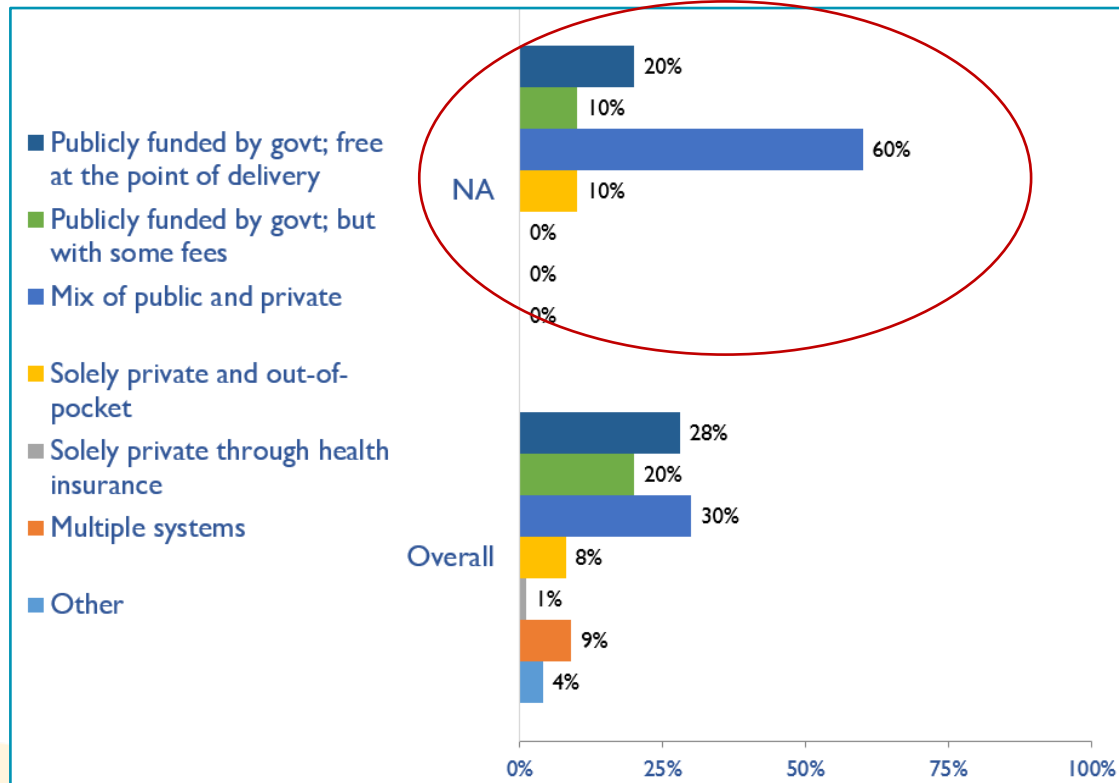
Countries		Availability of KRT and CKM				Funding for Medications		Availability and Distribution of Registry				Advocacy Group			Nephrology Workforce (PMP)	
		Chronic hemodialysis	Chronic peritoneal dialysis	Kidney transplantation	CKM	Dialysis medications	Transplant medications	CKD	Dialysis	Transplantation	AKI	CKD	AKI	ESKD/RRT	Nephrologists	Nephrologist trainees
North America																
Antigua & Barbuda	2017															
	2019														31.29	0.00
Bahamas, The	2017															
	2019															
Canada	2017														17.81	2.14
	2019														15.33	1.74
Cayman Islands	2017															
	2019														16.77	0.00
Jamaica	2017															
	2019														4.27	
St Kitts and Nevis	2017															
	2019														18.83	18.83
St Lucia	2017															
	2019														18.13	0.00
St Vincent and the Grenadines	2017															
	2019														29.46	0.00
Trinidad and Tobago	2017															
	2019														5.76	0.00
United States	2017														24.89	1.24
	2019														29.54	1.74
Nephrologists density		<1.2 PMP				1.2–10.0 PMP				10.1–22.9 PMP				>22.9 PMP		
Nephrology trainees density		<0.3 PMP				0.3–1.4 PMP				1.5–3.7 PMP				>3.7 PMP		

Yes
No
N/A

Abbreviations

KRT: kidney replacement therapy
 CKM: conservative kidney management
 CKD: chronic kidney disease
 AKI: acute kidney injury
 ESKD: end stage kidney disease
 RRT: renal replacement therapy

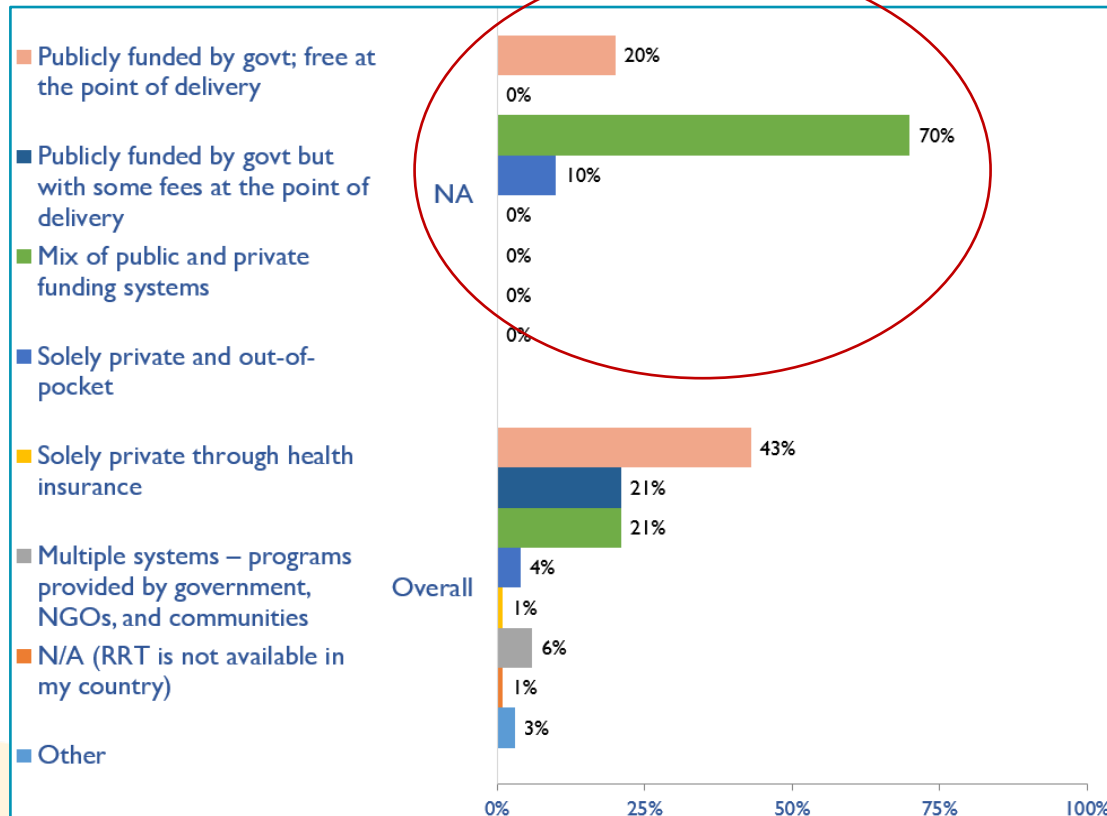
Funding for non-dialysis CKD



Country	Publicly funded by govt; free at the point of delivery	Publicly funded by govt but with some fees at the point of delivery	Mix of public and private funding systems	Solely private and out-of-pocket	Solely private through health insurance	Multiple systems	Other
Antigua and Barbuda			X				
Bahamas, The			X				
Canada	X						
Cayman Islands			X				
Jamaica	X						
St. Kitts and Nevis				X			
St. Lucia			X				
St. Vincent and the Grenadines		X					
Trinidad and Tobago			X				
United States			X				

X : Yes

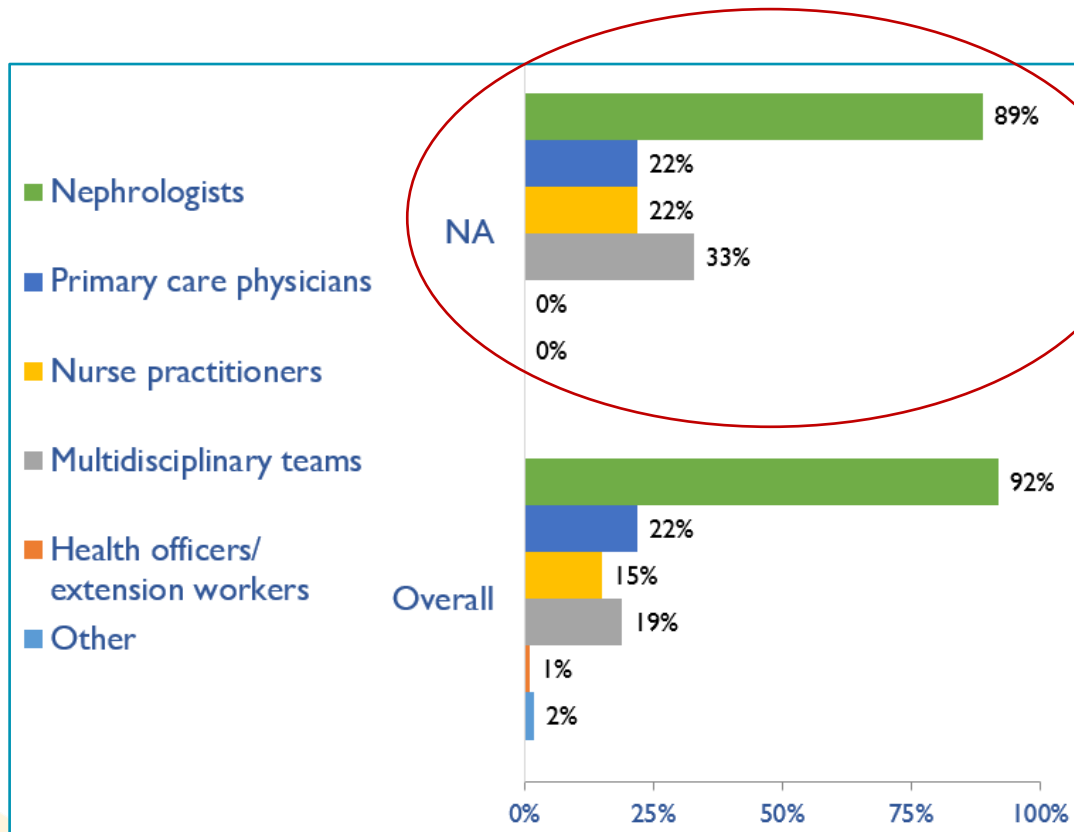
Funding for kidney replacement therapy (KRT)



Country	Publicly funded by govt; free at the point of delivery	Publicly funded by govt but with some fees at the point of delivery	Mix of public and private funding systems	Solely private and out-of-pocket	Solely private through health insurance	Multiple systems	N/A (RRT is not available in my country)	Other
Antigua and Barbuda	X							
Bahamas, The			X					
Canada	X							
Cayman Islands			X					
Jamaica			X					
St. Kitts and Nevis				X				
St. Lucia			X					
St. Vincent and the Grenadines			X					
Trinidad and Tobago			X					
United States			X					

X : Yes

Providers primarily responsible for ESKD care



Country	Nephrologists	Primary care physicians	Nurse practitioners or specialized nurses	Multidisciplinary teams	Health officers/extension workers	Other
Antigua and Barbuda	X					
Bahamas, The						
Canada	X					
Cayman Islands	X					
Jamaica	X	X	X	X		
St. Kitts and Nevis		X				
St. Lucia	X			X		
St. Vincent and the Grenadines	X					
Trinidad and Tobago	X		X			
United States	X			X		

X : Yes

Shortage of ESKD care providers

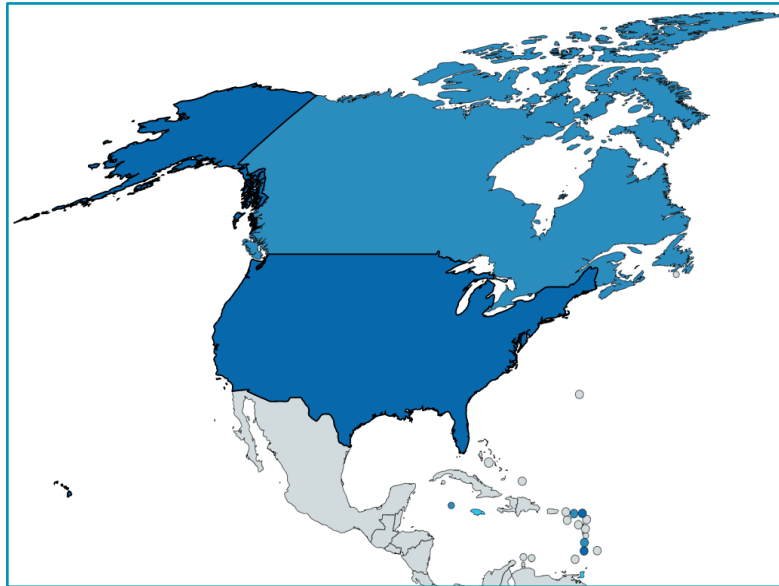
Country	Nephrologists	Transplant surgeons	Surgeons (HD access)	Surgeons (PD access)	Interventional radiologists (HD access)	Interventional radiologists (PD access)	Laboratory technicians	Dietitians	Radiologists (ultrasound)	Vascular access coordinators	Counsellors/psychologists	Transplant coordinators	Dialysis nurses	Dialysis technicians
Antigua and Barbuda														
Bahamas, The														
Canada														
Cayman Islands														
Jamaica														
St. Kitts and Nevis														
St. Lucia														
St. Vincent and the Grenadines														
Trinidad and Tobago														
United States														

No shortage

Shortage

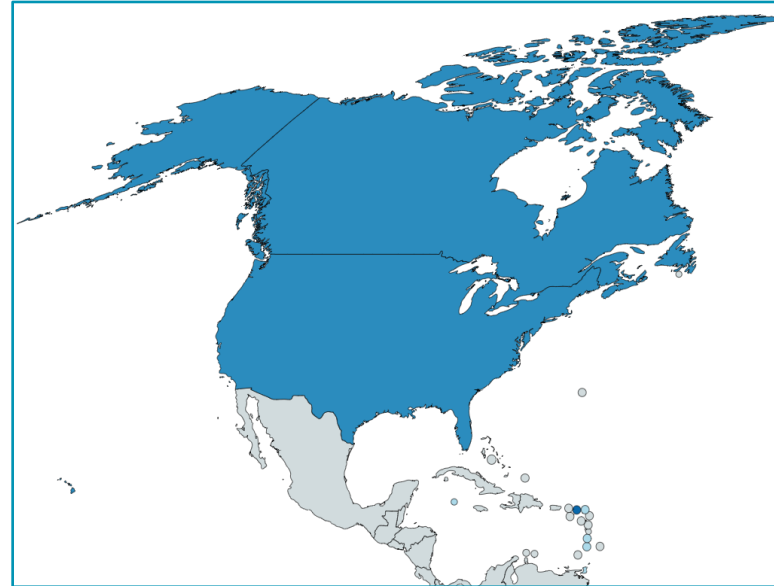
Prevalence of nephrologists and trainees

Nephrologists



 <1.2 pmp  1.2–10.0 pmp  10.1–22.9 pmp  >22.9 pmp  Data not reported

Nephrology trainees



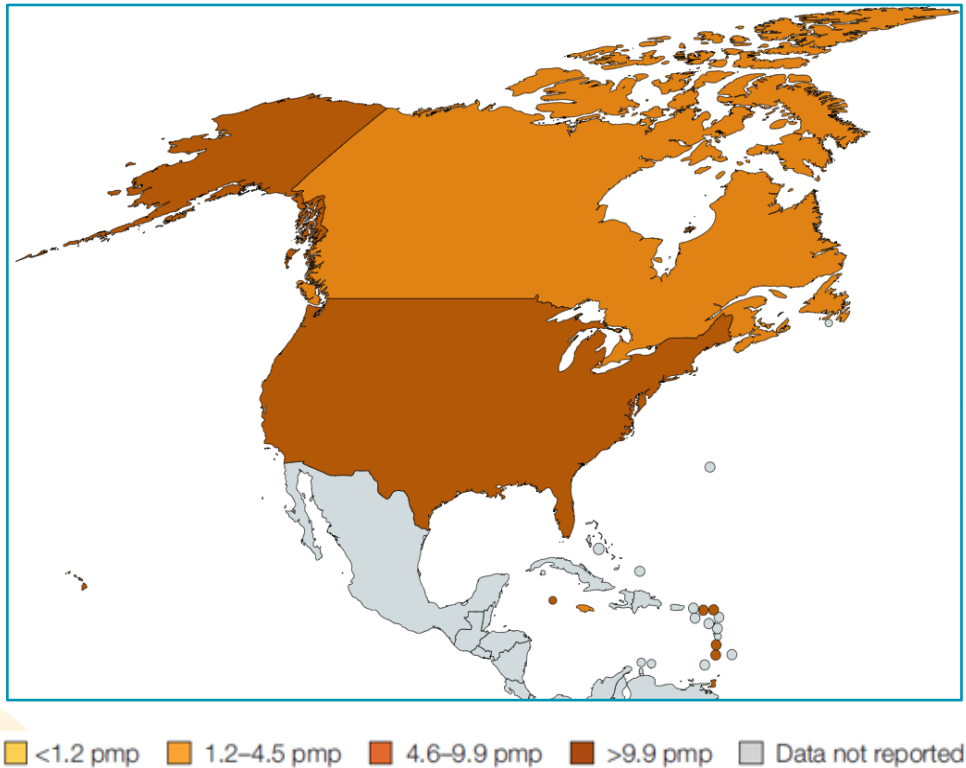
 <0.3 pmp  0.3–1.4 pmp  1.5–3.7 pmp  >3.7 pmp  Data not reported

Country	Nephrologists PMP	Nephrology trainees PMP
Antigua and Barbuda	31.29	0.00
Bahamas, The	-	-
Canada	15.33	1.74
Cayman Islands	16.77	0.00
Jamaica	4.27	-
St. Kitts and Nevis	18.83	18.83
St. Lucia	18.13	0.00
St. Vincent and the Grenadines	29.46	0.00
Trinidad and Tobago	5.76	0.00
United States	29.54	1.74

'-': data not reported/unavailable

Capacity for chronic dialysis (HD)

Chronic HD centers



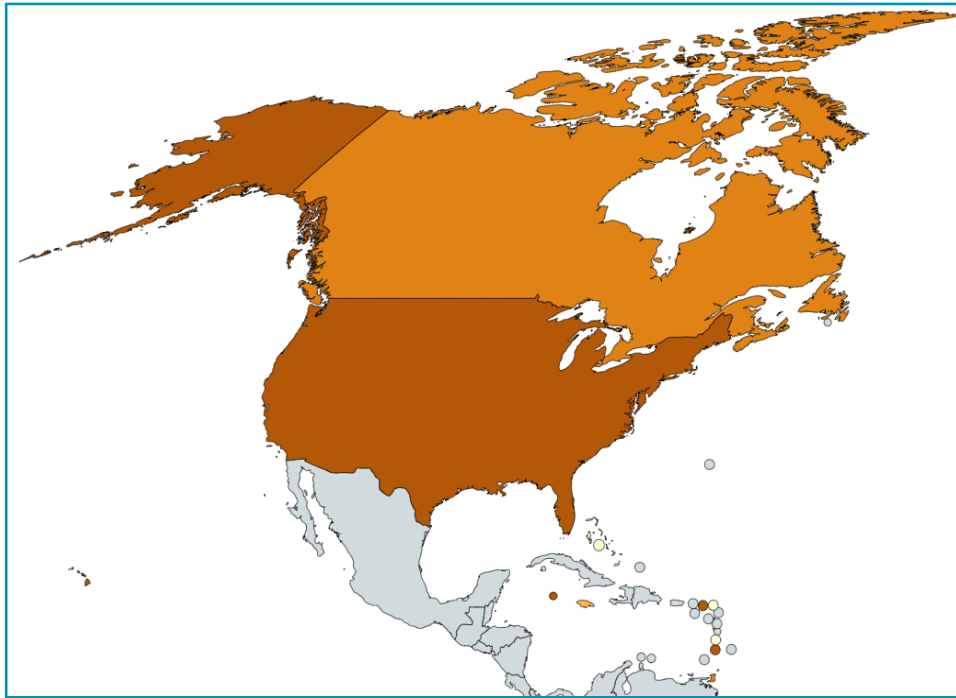
- Chronic HD services are available in all countries of the region
- The North America average of HD treatment centers is 18.13 pmp

Country	Chronic HD Centres PMP
Antigua and Barbuda	10.43
Bahamas, The	-
Canada	5.57
Cayman Islands	33.55
Jamaica	4.62
St. Kitts and Nevis	18.83
St. Lucia	18.13
St. Vincent and the Grenadines	19.64
Trinidad and Tobago	14.81
United States	20.54

' - ' : data not reported/unavailable

Capacity for chronic dialysis (PD)

Chronic PD centers



- Chronic PD services are available in 7 (78%) countries of the region
- The North America average of PD treatment centers is 7.16 pmp

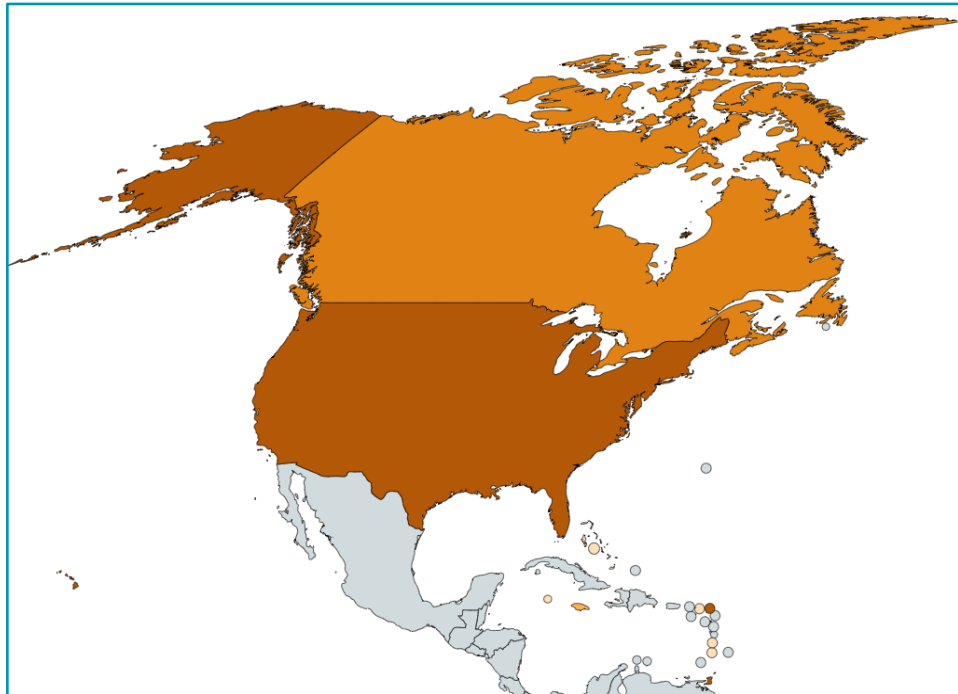
Country	Chronic PD Centres PMP
Antigua and Barbuda	-
Bahamas, The	-
Canada	1.39
Cayman Islands	16.77
Jamaica	1.07
St. Kitts and Nevis	18.83
St. Lucia	-
St. Vincent and the Grenadines	9.82
Trinidad and Tobago	1.65
United States	7.16

'-': data not reported/unavailable

Chronic PD not provided <0.4 pmp 0.4–1.3 pmp 1.4–2.5 pmp >2.5 pmp Data not reported

Capacity for kidney transplantation

Kidney transplantation centers



■ Kidney transplantation not provided ■ <0.2 pmp ■ 0.2–0.4 pmp ■ 0.5–0.7 pmp ■ >0.7 pmp
■ Data not reported

- Kidney transplantation services are available in 5 (56%) countries of the region
- The North America average of Kidney transplantation centers is 0.75 pmp

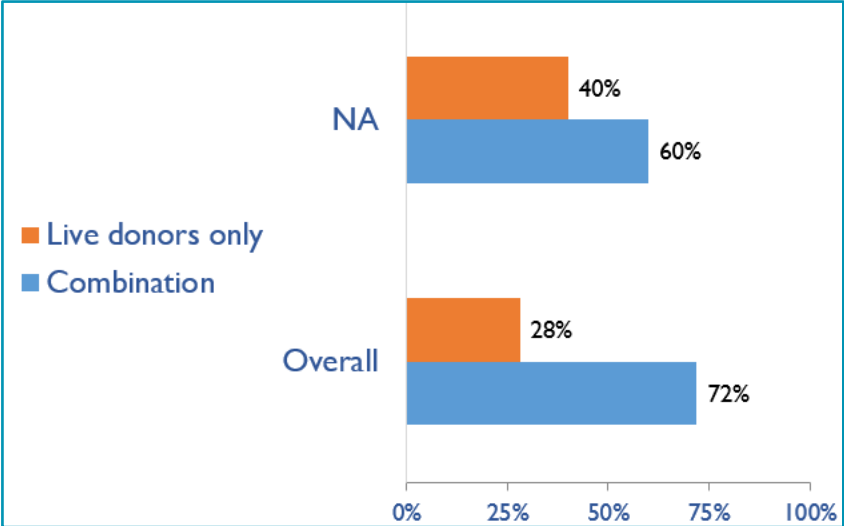
Country	Kidney Transplantation availability	Transplant centers PMP
Antigua and Barbuda	X	10.43
Bahamas, The		-
Canada	X	0.59
Cayman Islands		-
Jamaica	X	0.36
St. Kitts and Nevis		-
St. Lucia		-
St. Vincent and the Grenadines		-
Trinidad and Tobago	X	0.82
United States	X	0.75

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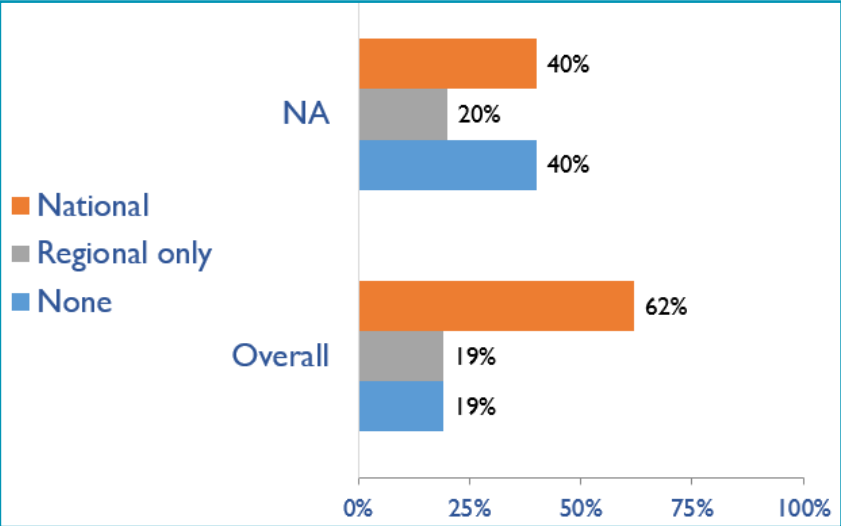
X: Yes

Capacity for kidney transplantation (cont'd)

Transplant donor type



Transplant waitlist

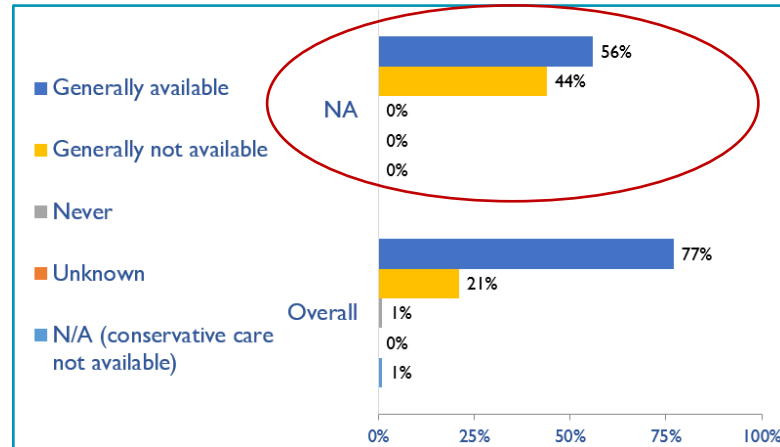


Country	Donor type		Transplant waitlist		
	Live donors only	Combination	National	Regional only	None
Antigua and Barbuda	X				X
Bahamas, The					
Canada		X		X	
Cayman Islands					
Jamaica	X				X
St. Kitts and Nevis					
St. Lucia					
St. Vincent and the Grenadines					
Trinidad and Tobago		X	X		
United States		X	X		

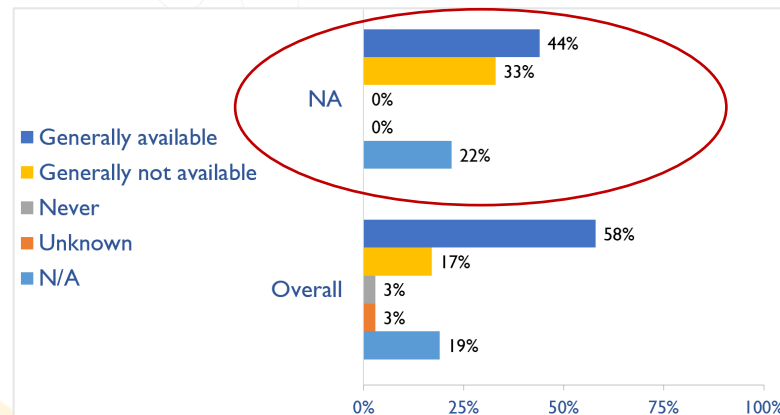
X : Yes

Availability of services within dialysis care

HD frequency



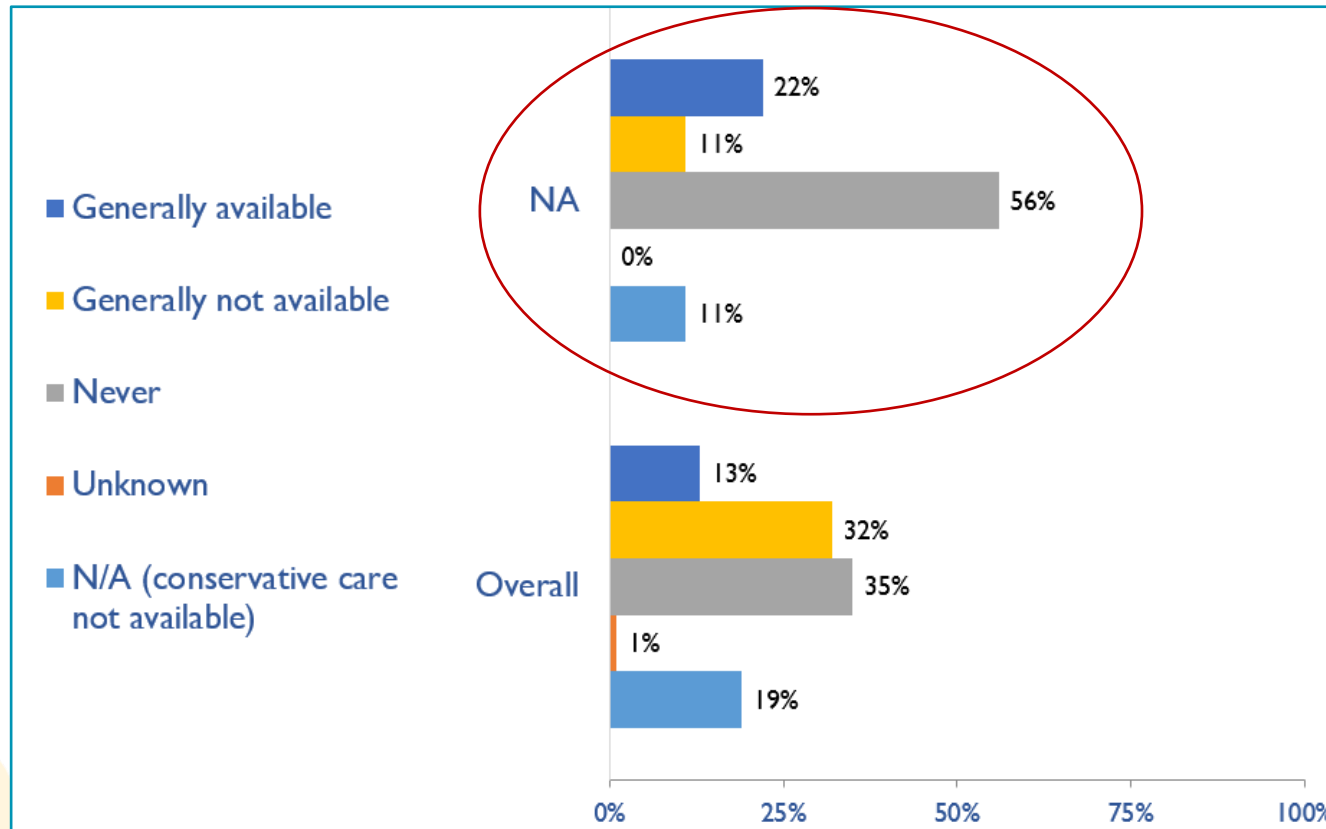
PD frequency



Country	HD frequency a center-based service that involves treatment 3x week/3-4x hours					PD frequency ability to do adequate exchanges 3-4x day (or equivalent cycles on automated PD)				
	Generally available	Generally not available	Never	Unknown	N/A (dialysis not provided)	Generally available	Generally not available	Never	Unknown	N/A (dialysis not provided)
Antigua and Barbuda		X						X		
Bahamas, The										
Canada	X					X				
Cayman Islands	X					X				
Jamaica		X					X			
St. Kitts and Nevis		X					X			
St. Lucia	X									X
St. Vincent and the Grenadines		X				X				
Trinidad and Tobago	X						X			
United States	X					X				

X : Yes

Availability of home hemodialysis

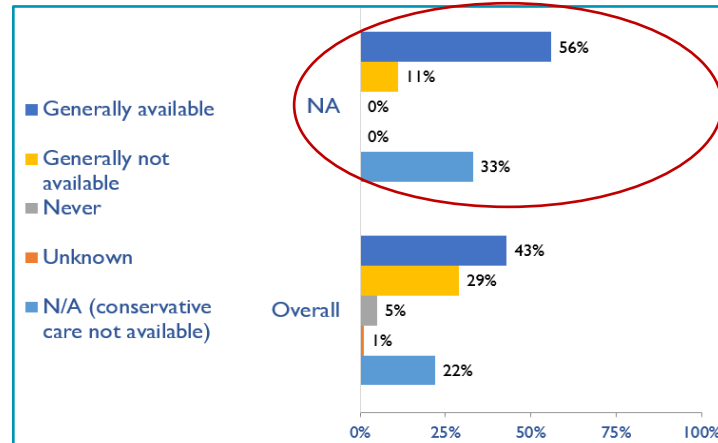


Country	Availability of Home hemodialysis				
	Generally available	Generally not available	Never	Unknown	N/A (dialysis not provided)
Antigua and Barbuda			X		
Bahamas, The					
Canada	X				
Cayman Islands		X			
Jamaica			X		
St. Kitts and Nevis			X		
St. Lucia			X		
St. Vincent and the Grenadines			X		
Trinidad and Tobago			X		
United States	X				

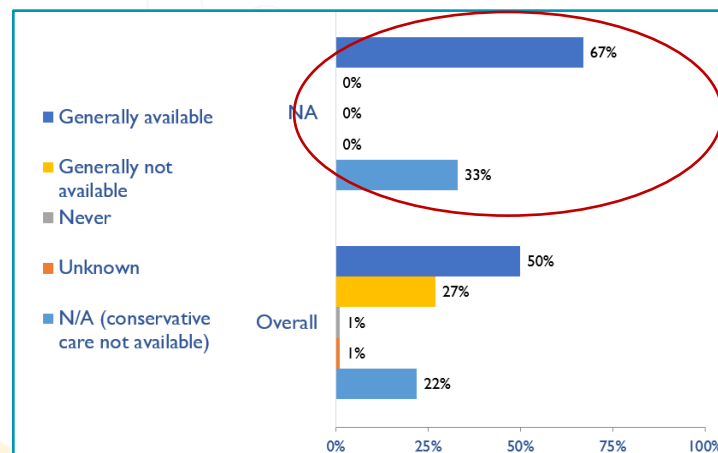
X : Yes

Capacity for conservative kidney management (CKM)

Choice-restricted CKM



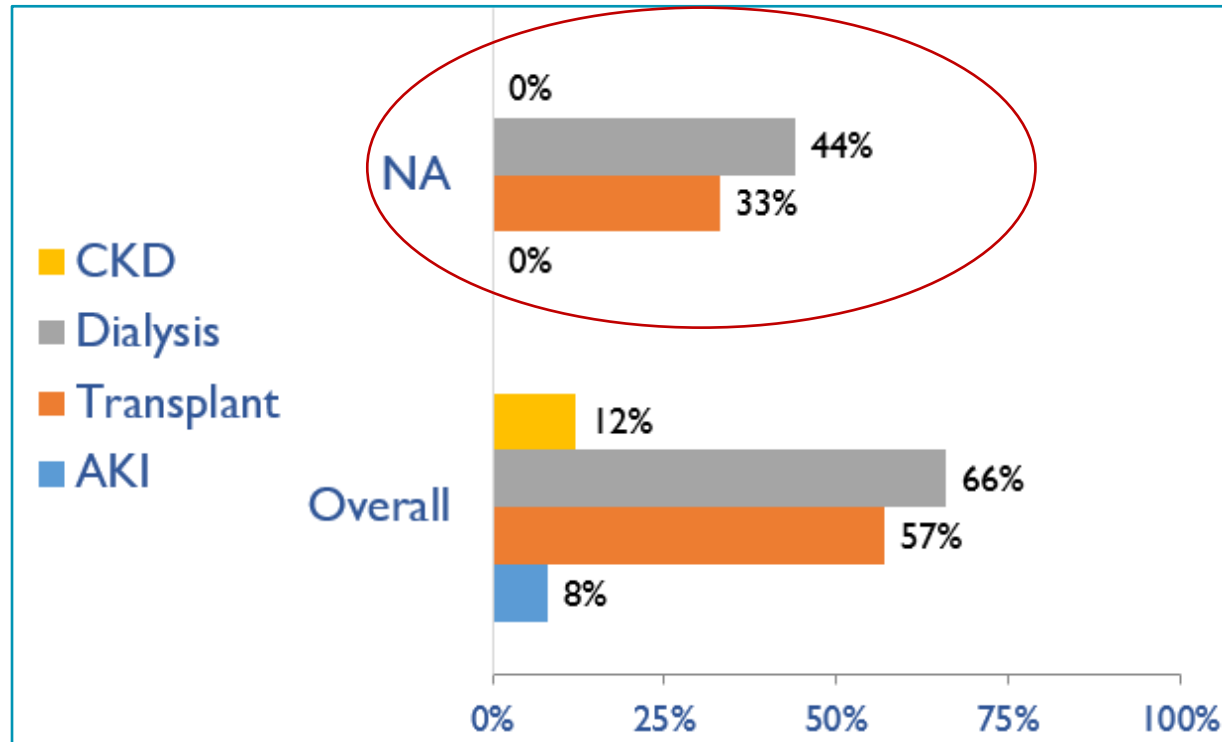
Chosen or medically advised CKM



Country	Established choice-restricted conservative care					Established conservative care that is chosen or medically advised				
	Generally available	Generally not available	Never	Unknown	N/A (conservative care not available)	Generally available	Generally not available	Never	Unknown	N/A (conservative care not available)
Antigua and Barbuda					X					X
Bahamas, The										
Canada	X					X				
Cayman Islands		X				X				
Jamaica	X					X				
St. Kitts and Nevis					X					X
St. Lucia	X					X				
St. Vincent and the Grenadines	X					X				
Trinidad and Tobago					X					X
United States	X					X				

X : Yes

Availability of official registry



Country	CKD	Dialysis	Transplant	AKI
Antigua and Barbuda				
Bahamas, The				
Canada		X	X	
Cayman Islands				
Jamaica		X		
St. Kitts and Nevis				
St. Lucia		X		
St. Vincent and the Grenadines				
Trinidad and Tobago			X	
United States		X	X	

X : Yes

Summary of 2019 GKHA findings



- Availability, access, and quality of dialysis is high, transplantation services are limited
- Conservative kidney management is available, generally as chosen or medically advised
- Government funding for kidney care is low
- Few registries across all levels of kidney disease, particularly CKD and AKI
- High workforce capacity: high nephrologist density, few provider shortages reported. Half of countries with no nephrology trainees
- Strong advocacy for CKD and ESKD in North America and the Caribbean, none for AKI

Implications

- Increase health care financing for ESKD prevention and management
- Address workforce shortages through multidisciplinary teams and telemedicine
- Incorporate the collection and reporting of quality indicators in ESKD care
- Expand health information systems to prevent and manage ESKD
- Promote ESKD prevention and treatment by implementing policies, strategies, and advocacy, and mitigating barriers

To access the Atlas report:



[*www.theisn.org/global-atlas*](http://www.theisn.org/global-atlas)