

ISN-GKHA: Structures, organization and services for the management of kidney failure in Africa

Supplementary Tables, Figures, and Appendix

Table S1: Burden of chronic kidney disease and its risk factors in countries of Africa.

Figure S1: Affordability of kidney replacement therapy (proportion of out-of-pocket payments made by patients) in Africa.

Figure S2: Shortages in kidney failure providers identified by responding countries in Africa.

Figure S3: Accessibility of kidney replacement therapy in Africa.

Figure S4: Geographic and patient-based factors influencing accessibility to kidney replacement therapy in Africa.

Figure S5: Hemodialysis quality indicators monitored and reported in Africa.

Figure S6: Peritoneal dialysis quality indicators monitored and reported in Africa.

Figure S7: Kidney transplantation quality indicators monitored and reported in Africa.

Figure S8: Characteristics of acute kidney injury, chronic kidney disease, dialysis, and transplantation registries in Africa.

Figure S9: Strategies and advocacy efforts: (A) national NCD strategy, (B) national strategy to improve care for CKD patients, (C) population covered by national CKD-specific and general NCD strategy, (D) national advocacy for CKD/KF.

Figure S10: Barriers to optimal kidney failure care in Africa.

Appendix: Reference list for annual cost of kidney replacement therapy (for Table 1).

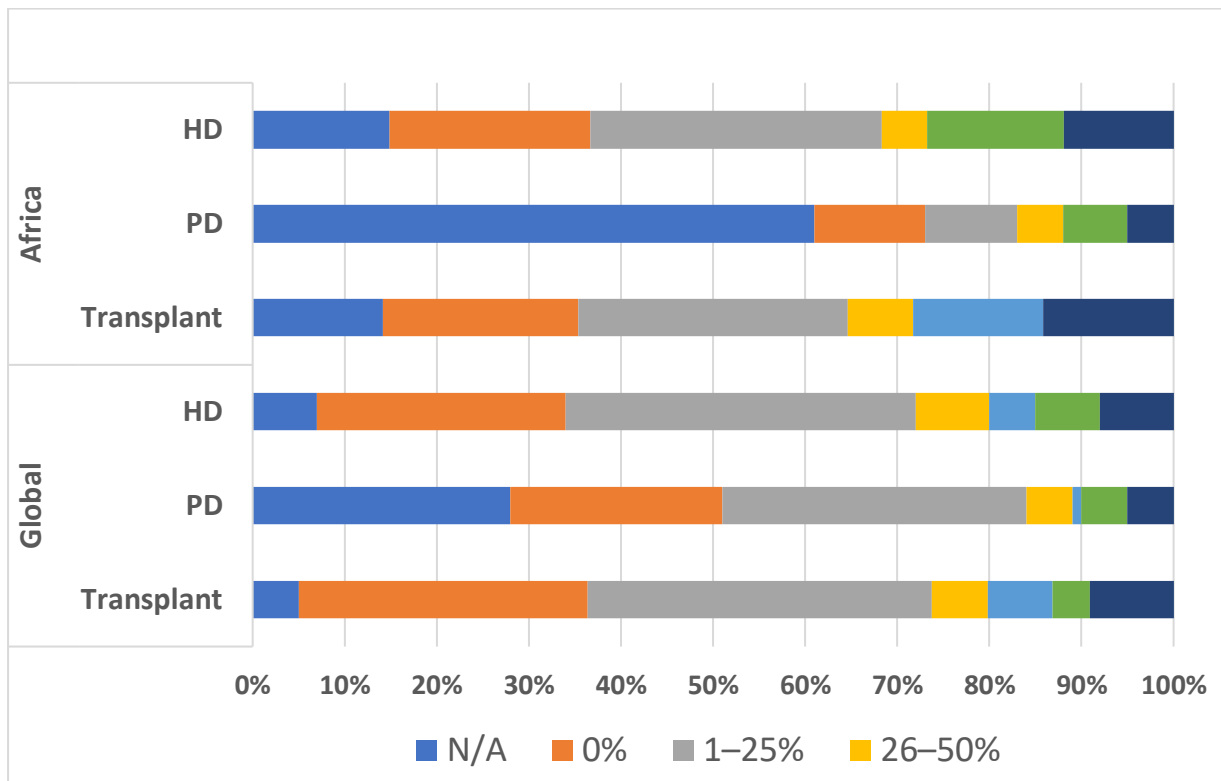
Table S1: Burden of chronic kidney disease and its risk factors in countries of Africa.^{S1, S2}

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)
Global	9.46 (8.81 - 10.20)	2.20 (2.24 - 2.13)	1.43 (1.35 - 1.51)	13.2 (12.5 - 13.9)	22.1 (20.4 - 24.1)	14.02 (12.91 - 15.12)
Africa	6.28 (5.83 - 6.80)	1.40 (1.32 - 1.52)	0.81 (0.76 - 0.87)	9.10 (8.2 - 10.0)	27.4 (24.5 - 30.4)	-
Algeria	9.18 (8.50 - 10.01)	2.73 (2.45 - 3.02)	1.57 (1.39 - 1.73)	26.6 (21.7 - 32.0)	25.1 (19.4 - 31.5)	10.3 (8.4 - 12.5)
Angola	5.45 (5.04 - 5.90)	1.53 (1.34 - 1.71)	0.86 (0.75 - 0.97)	6.8 (4.2 - 10.3)	29.7 (22.1 - 38.3)	6.7 (5.6 - 8.0)
Benin	6.08 (5.65 - 6.58)	1.60 (1.36 - 1.87)	0.96 (0.82 - 1.12)	8.2 (6.0 - 10.8)	27.7 (21.7 - 34.2)	4.1 (3.3 - 5.0)
Botswana	8.95 (8.29 - 9.66)	1.86 (1.60 - 2.11)	1.04 (0.90 - 1.18)	16.1 (12.3 - 20.3)	29.6 (23.4 - 36.4)	11.1 (9.4 - 13.0)
Burkina Faso	6.15 (5.69 - 6.64)	1.52 (1.33 - 1.72)	0.87 (0.76 - 1.00)	4.5 (3.1 - 6.3)	32.6 (25.3 - 40.1)	7.5 (5.9 - 9.5)
Burundi	5.06 (4.68 - 5.48)	1.19 (1.02 - 1.35)	0.68 (0.58 - 0.79)	4.4 (2.8 - 6.6)	29.2 (22.0 - 37.7)	4.7 (3.7 - 5.8)
Cabo Verde	10.74 (9.97 - 11.66)	2.16 (1.99 - 2.34)	1.50 (1.35 - 1.65)	10.6 (7.5 - 14.0)	29.5 (22.6 - 36.8)	5.6 (4.3 - 7.1)
Cameroon	6.44 (5.99 - 6.98)	1.70 (1.44 - 1.97)	1.07 (0.91 - 1.24)	9.5 (7.1 - 12.2)	24.8 (18.8 - 31.8)	4.4 (3.6 - 5.3)
Central African Republic	6.25 (5.78 - 6.78)	1.03 (0.85 - 1.20)	0.65 (0.54 - 0.78)	6.3 (4.0 - 9.3)	31.2 (23.3 - 39.5)	5.8 (4.8 - 7.1)
Chad	5.23 (4.86 - 5.67)	1.07 (0.93 - 1.24)	0.67 (0.59 - 0.76)	4.8 (3.3 - 6.8)	32.9 (25.7 - 40.6)	5.2 (4.1 - 6.5)
Comoros	7.42 (6.87 - 8.04)	2.36 (2.09 - 2.66)	1.36 (1.18 - 1.56)	6.9 (4.7 - 9.6)	27.9 (21.3 - 35.3)	7.2 (6.0 - 8.5)
Congo, Dem. Rep.	5.80 (5.38 - 6.27)	1.25 (1.07 - 1.43)	0.70 (0.60 - 0.81)	5.6 (3.7 - 8.0)	28.5 (21.1 - 36.5)	6.3 (5.5 - 7.3)
Congo, Rep.	7.23 (6.69 - 7.82)	1.77 (1.56 - 1.99)	1.07 (0.92 - 1.23)	8.4 (5.8 - 11.5)	26.2 (19.1 - 34.3)	5.5 (4.6 - 6.7)
Cote d'Ivoire	6.74 (6.24 - 7.32)	1.53 (1.34 - 1.81)	0.99 (0.87 - 1.15)	9.0 (6.7 - 11.9)	27.2 (20.7 - 34.2)	7.3 (6.1 - 8.7)
Djibouti	6.91 (6.38 - 7.49)	2.23 (1.98 - 2.48)	1.31 (1.16 - 1.46)	12.2 (8.6 - 16.7)	26.8 (19.5 - 35.0)	11.4 (9.5 - 13.5)
Egypt	7.69 (7.09 - 8.37)	2.63 (2.29 - 2.92)	1.71 (1.53 - 1.90)	31.1 (26.7 - 35.5)	25.0 (19.8 - 30.6)	16.0 (14.4 - 17.8)
Equatorial Guinea	5.75 (5.33 - 6.23)	1.84 (1.55 - 2.10)	0.96 (0.80 - 1.11)	7.4 (4.6 - 10.8)	28.4 (20.8 - 36.9)	4.9 (4.0 - 6.0)
Eritrea	5.35 (4.96 - 5.80)	1.53 (1.32 - 1.75)	0.99 (0.84 - 1.15)	4.1 (2.6 - 6.0)	29.1 (22.3 - 36.3)	5.1 (4.0 - 6.4)
Ethiopia	4.98 (4.63 - 5.38)	1.69 (1.54 - 1.90)	0.84 (0.77 - 0.94)	3.6 (2.3 - 5.2)	30.3 (23.1 - 38.0)	3.1 (2.4 - 3.8)
Gabon	8.31 (7.71 - 9.00)	2.66 (2.34 - 3.01)	1.46 (1.26 - 1.66)	13.4 (9.5 - 18.1)	25.5 (18.4 - 33.7)	8.3 (7.0 - 9.8)
Gambia, The	6.54 (6.06 - 7.07)	1.78 (1.50 - 2.14)	1.12 (0.92 - 1.36)	8.7 (6.3 - 11.6)	29.1 (22.5 - 36.4)	8.9 (7.4 - 10.4)
Ghana	7.67 (7.11 - 8.31)	1.77 (1.56 - 1.97)	1.28 (1.10 - 1.44)	9.7 (7.5 - 12.2)	23.7 (18.7 - 29.3)	2.5 (2.0 - 3.1)
Guinea	6.43 (5.97 - 6.95)	1.47 (1.30 - 1.69)	0.91 (0.80 - 1.03)	6.6 (4.6 - 8.9)	30.3 (23.7 - 37.4)	3.8 (2.9 - 4.8)
Guinea-Bissau	6.40 (5.92 - 6.94)	1.68 (1.43 - 2.00)	1.12 (0.93 - 1.34)	8.2 (5.7 - 11.3)	30.3 (23.2 - 37.7)	5.8 (4.7 - 7.2)
Kenya	5.75 (5.34 - 6.23)	1.62 (1.47 - 1.80)	0.91 (0.83 - 1.00)	6.0 (4.3 - 8.2)	26.7 (20.2 - 34.0)	6.7 (6.5 - 7.0)
Lesotho	8.81 (8.19 - 9.54)	1.65 (1.43 - 1.89)	1.04 (0.89 - 1.22)	13.5 (10.3 - 16.9)	29.0 (22.6 - 35.6)	13.2 (11.8 - 14.8)

Liberia	6.63 (6.14 - 7.18)	1.66 (1.38 - 1.95)	0.99 (0.83 - 1.16)	8.6 (6.2 - 11.4)	28.3 (22.2 - 35.2)	4.5 (3.8 - 5.4)
Libya	9.01 (8.31 - 9.79)	3.43 (3.11 - 3.80)	1.92 (1.70 - 2.17)	31.8 (26.5 - 37.4)	23.7 (18.0 - 29.8)	13.0 (11.3 - 15.0)
Madagascar	5.22 (4.81 - 5.65)	1.13 (0.98 - 1.28)	0.67 (0.57 - 0.77)	4.5 (2.9 - 6.4)	28.1 (21.4 - 35.4)	9.2 (7.6 - 11.0)
Malawi	5.9 (5.47 - 6.4)	1.5 (1.31 - 1.66)	0.79 (0.69 - 0.90)	4.7 (3.2 - 6.5)	28.9 (22.1 - 36.3)	6.1 (5.1 - 7.3)
Mali	5.67 (5.26 - 6.14)	1.15 (0.97 - 1.36)	0.76 (0.65 - 0.89)	7.1 (5.1 - 9.6)	32.6 (25.4 - 40.4)	4.9 (4.1 - 6.0)
Mauritania	7.17 (6.65 - 7.77)	2.29 (1.98 - 2.69)	1.33 (1.15 - 1.52)	11.3 (8.3 - 14.9)	31.7 (24.3 - 40.0)	8.5 (6.7 - 10.8)
Mauritius	17.63 (16.32 - 19.06)	10.36 (9.62 - 10.96)	6.85 (6.07 - 7.59)	11.5 (8.4 - 15.2)	25.0 (18.9 - 31.9)	15.8 (13.6 - 18.2)
Morocco	9.65 (8.93 - 10.46)	2.06 (1.87 - 2.27)	1.39 (1.25 - 1.53)	25.6 (20.7 - 30.9)	26.1 (20.0 - 32.9)	8.3 (6.8 - 10.0)
Mozambique	5.29 (4.9 - 5.72)	1.01 (0.87 - 1.28)	0.65 (0.56 - 0.77)	6.0 (4.1 - 8.2)	29.1 (22.2 - 36.6)	7.8 (6.5 - 9.3)
Namibia	7.86 (7.3 - 8.54)	1.47 (1.28 - 1.72)	0.81 (0.70 - 0.94)	15.0 (11.5 - 18.7)	28.5 (22.3 - 35.0)	10.4 (8.9 - 12.2)
Niger	5.0 (4.62 - 5.4)	1.03 (0.86 - 1.26)	0.66 (0.56 - 0.79)	4.7 (3.2 - 6.7)	33.4 (25.9 - 41.4)	4.0 (3.2 - 4.9)
Nigeria	6.3 (5.81 - 6.89)	0.87 (0.72 - 1.07)	0.58 (0.49 - 0.69)	7.8 (5.9 - 9.9)	23.9 (18.7 - 29.5)	2.9 (2.3 - 3.6)
Rwanda	5.86 (5.41 - 6.38)	1.68 (1.46 - 1.94)	0.90 (0.78 - 1.03)	4.8 (3.2 - 6.7)	26.7 (19.7 - 34.3)	6.3 (5.3 - 7.4)
Sao Tome & Principe	8.10 (7.51 - 8.78)	4.32 (3.91 - 4.79)	2.72 (2.42 - 3.08)	10.6 (7.7 - 14.1)	25.8 (19.7 - 33.0)	2.9 (2.3 - 3.6)
Senegal	6.93 (6.43 - 7.51)	2.2 (1.93 - 2.58)	1.33 (1.16 - 1.56)	7.4 (5.2 - 9.9)	30.2 (23.0 - 38.0)	4.4 (3.7 - 5.3)
Seychelles	12.77 (11.85 - 13.76)	5.44 (5.06 - 5.79)	3.70 (3.33 - 4.07)	14.6 (11.0 - 18.6)	23.5 (17.6 - 30.2)	15.1 (12.6 - 17.7)
Sierra Leone	6.6 (6.12 - 7.15)	1.26 (1.1 - 1.44)	0.81 (0.70 - 0.94)	7.5 (5.3 - 10.1)	30.3 (23.4 - 37.2)	10.9 (9.3 - 12.8)
Somalia	5.14 (4.76 - 5.56)	1.39 (1.2 - 1.58)	0.80 (0.69 - 0.90)	6.9 (4.5 - 9.8)	32.9 (25.2 - 41.3)	6.0 (4.9 - 7.5)
South Africa	10.71 (9.94 - 11.57)	1.93 (1.79 - 2.05)	1.13 (1.05 - 1.21)	27.0 (23.4 - 30.8)	26.9 (21.7 - 32.7)	14.6 (13.9 - 15.3)
South Sudan	5.06 (4.70 - 5.47)	1.28 (1.08 - 1.49)	0.69 (0.58 - 0.81)	-	-	6.4 (5.1 - 7.9)
Sudan	5.85 (5.43 - 6.37)	1.52 (1.36 - 1.69)	0.96 (0.85 - 1.07)	-	-	1.0 (0.7 - 1.5)
Swaziland	8.18 (7.59 - 8.83)	2.1 (1.64 - 2.41)	1.30 (1.03 - 1.52)	13.5 (10.0 - 17.5)	29.8 (23.3 - 37.0)	4.7 (4.0 - 5.5)
Tanzania	5.63 (5.22 - 6.14)	1.7 (1.49 - 1.93)	0.91 (0.80 - 1.04)	7.1 (5.3 - 9.4)	27.3 (21.4 - 33.8)	6.9 (5.9 - 8.0)
Togo	6.92 (6.38 - 7.5)	1.5 (1.3 - 1.71)	0.98 (0.84 - 1.13)	7.1 (4.9 - 9.7)	28.9 (22.4 - 35.8)	3.9 (3.2 - 4.7)
Tunisia	11.15 (10.31 - 12.23)	2.48 (2.24 - 2.77)	1.62 (1.46 - 1.78)	27.3 (22.4 - 32.1)	23.2 (17.7 - 29.0)	19.9 (17.3 - 22.7)
Uganda	4.87 (4.51 - 5.28)	1.3 (1.13 - 1.44)	0.69 (0.60 - 0.77)	4.1 (2.8 - 5.8)	27.3 (21.0 - 34.2)	5.2 (4.4 - 6.2)
Zambia	5.26 (4.88 - 5.67)	0.57 (1.37 - 1.76)	0.86 (0.75 - 0.98)	6.5 (4.6 - 8.8)	27.1 (20.8 - 34.1)	6.5 (5.2 - 8.0)
Zimbabwe	6.7 (6.22 - 7.25)	1.48 (1.31 - 1.69)	0.89 (0.78 - 1.02)	12.3 (9.4 - 15.6)	28.2 (21.6 - 35.7)	8.8 (7.9 - 9.9)

Abbreviations: CKD: chronic kidney disease; DALYs: disability-adjusted life years; BP: blood pressure; CI: confidence interval; Dem. Rep.: Democratic Republic
 “-“: Data not reported/unavailable

Figure S1: Affordability of kidney replacement therapy (proportion of out-of-pocket payments made by patients) in Africa.



Abbreviations: HD: hemodialysis, PD: peritoneal dialysis, KRT: kidney replacement therapy, OOP: out-of-pocket payment (Values represent absolute number of countries in each category expressed as a percentage of total number of countries)

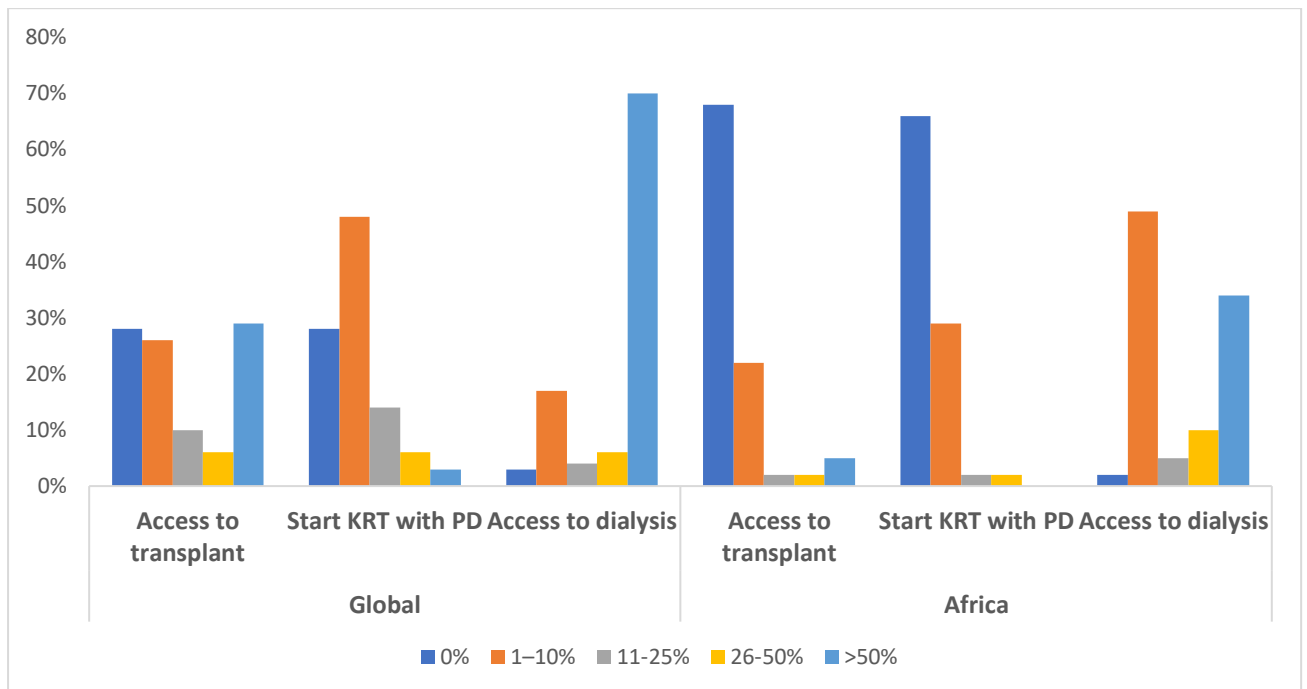
Figure S2: Shortages in kidney failure providers identified by responding countries in Africa.

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	Counselors / psychologists	Transplant coordinators	Dialysis nurses	Dialysis technicians	Total shortage
Total shortage →	36	35	35	35	36	31	33	14	15	32	31	31	29	35	
Algeria															8
Angola															13
Benin															14
Botswana															13
Burkina Faso															8
Burundi															13
Cabo Verde															8
Cameroon															5
Chad															10
Congo, Dem. Rep.															14
Congo, Rep.															7
Cote d'Ivoire															5
Egypt															10
Eritrea															12
Ethiopia															14
Gabon															11
Gambia, The															14
Ghana															14
Guinea															11
Kenya															14
Liberia															14
Libya															11
Madagascar															2
Malawi															11
Mauritania															11
Morocco															2
Mozambique															8
Namibia															13
Niger															8
Nigeria															10
Senegal															11
Sierra Leone															14
Somalia															11
South Africa															9
Sudan															8
Swaziland															13
Tanzania															14
Tunisia															7
Uganda															12
Zambia															8
Zimbabwe															12

Abbreviations: HD: hemodialysis, PD: peritoneal dialysis, KF: kidney failure; Dem. Rep.: Democratic Republic

 No shortage
 Shortage

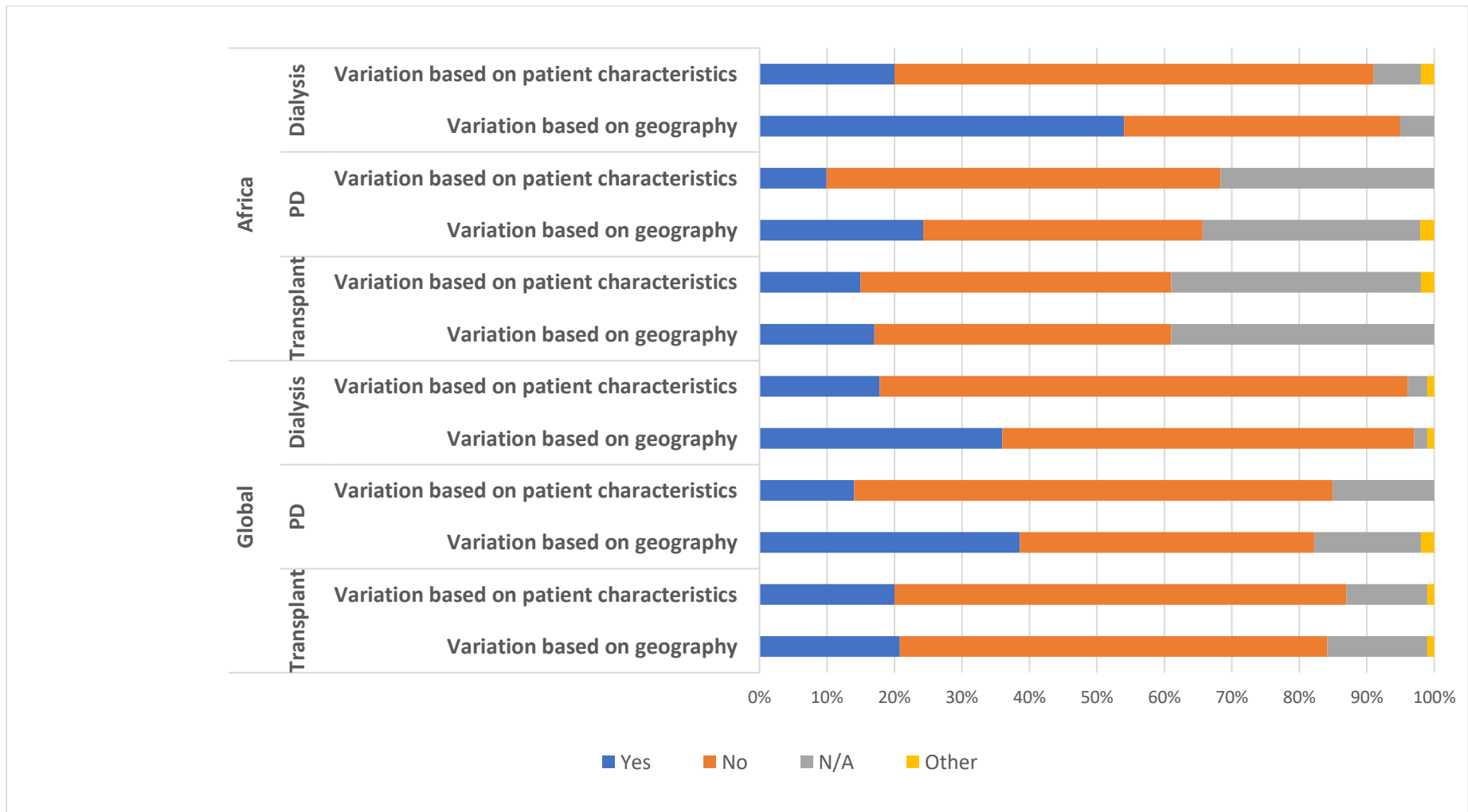
Figure S3: Accessibility of kidney replacement therapy in Africa.



Abbreviations: KRT: kidney replacement therapy; PD: peritoneal dialysis

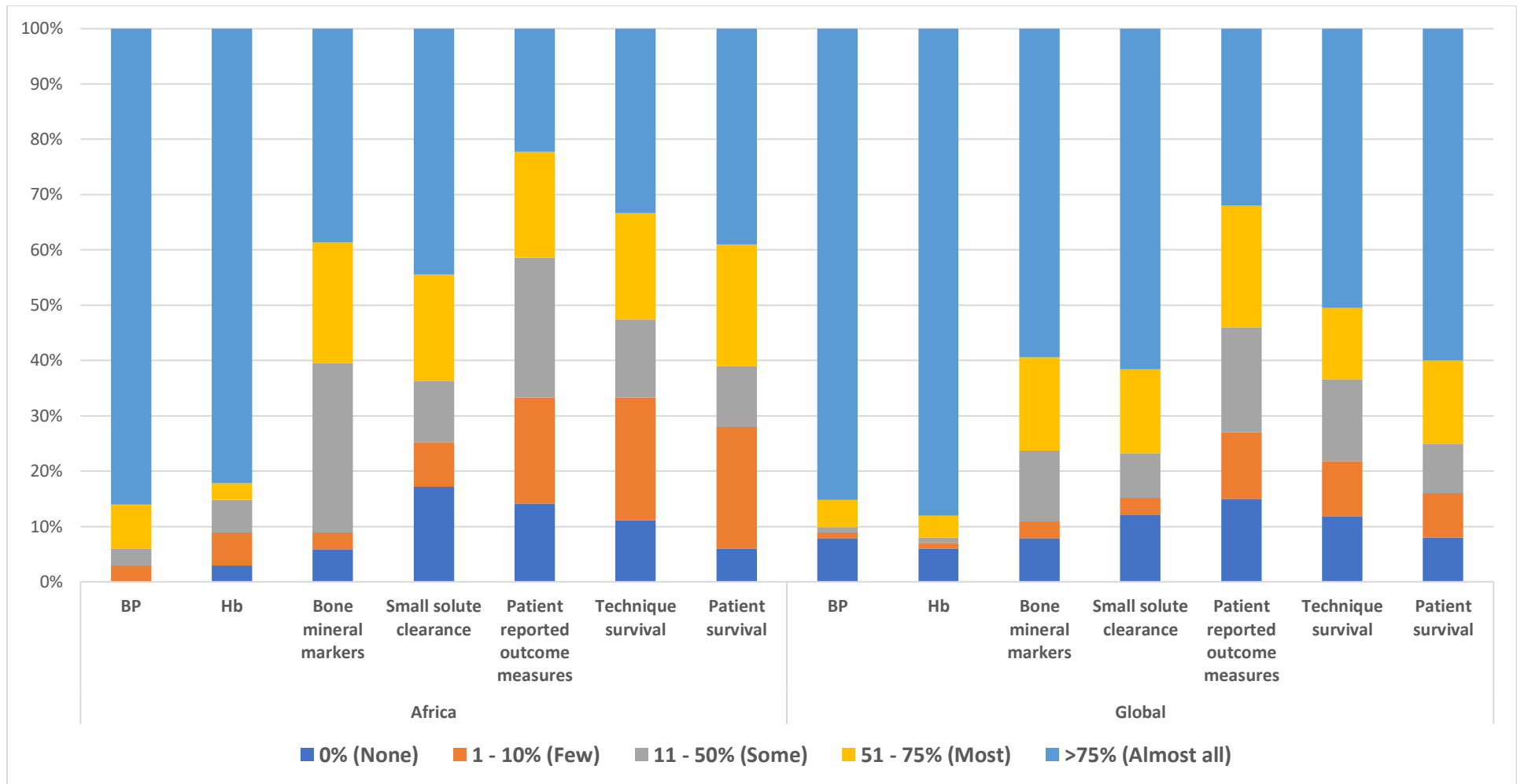
(Values represent absolute number of countries in each category expressed as a percentage of total number of countries)

Figure S4: Geographic and patient-based factors influencing accessibility to kidney replacement therapy in Africa.



Abbreviations: KRT: kidney replacement therapy. PD: peritoneal dialysis
 (Values represent absolute number of countries in each category expressed as a percentage of total number of countries)

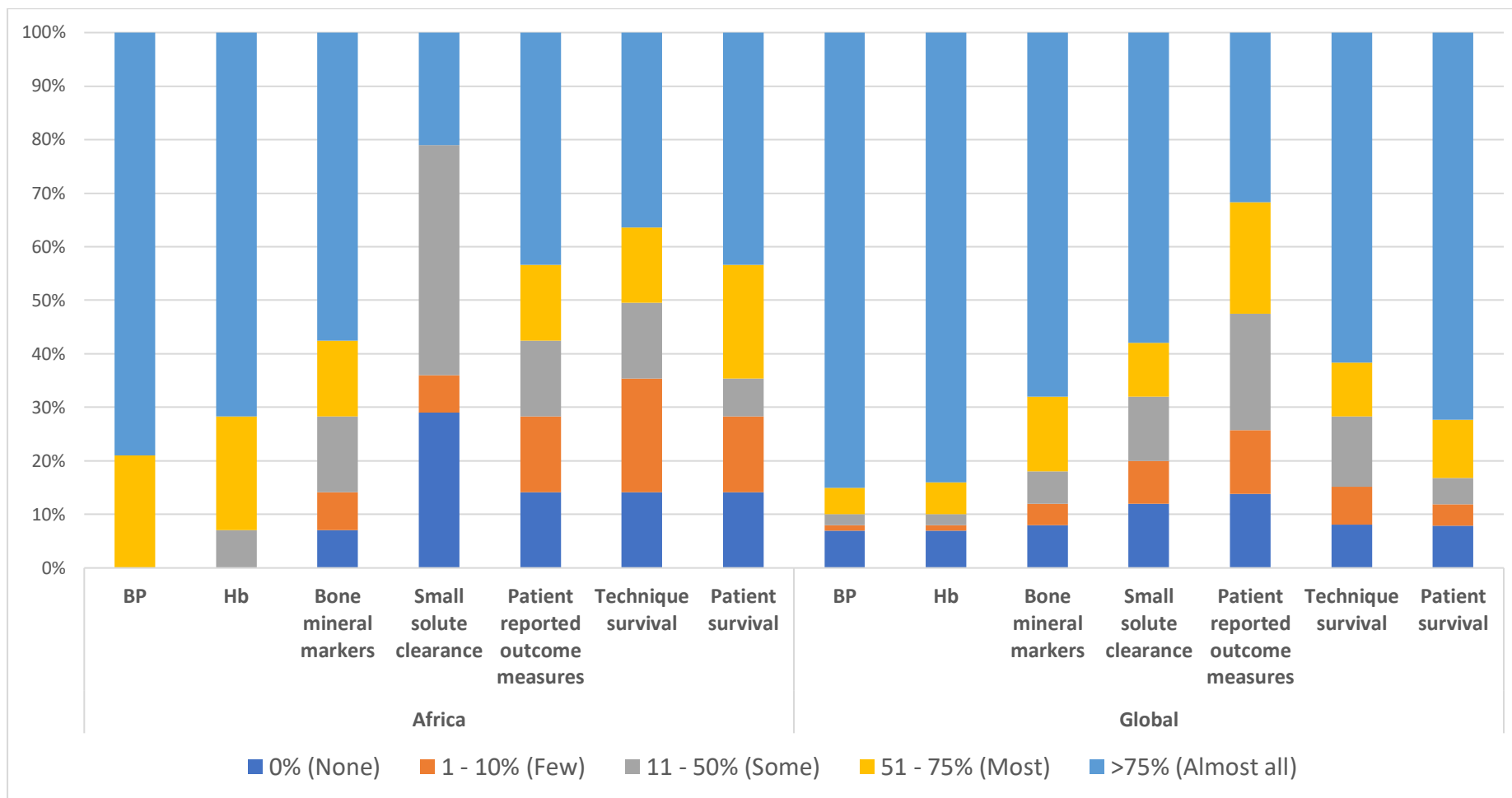
Figure S5: Hemodialysis quality indicators monitored and reported in Africa.



Abbreviations: BP: blood pressure; Hb: hemoglobin

(Values represent absolute number of countries in each category expressed as a percentage of total number of countries)

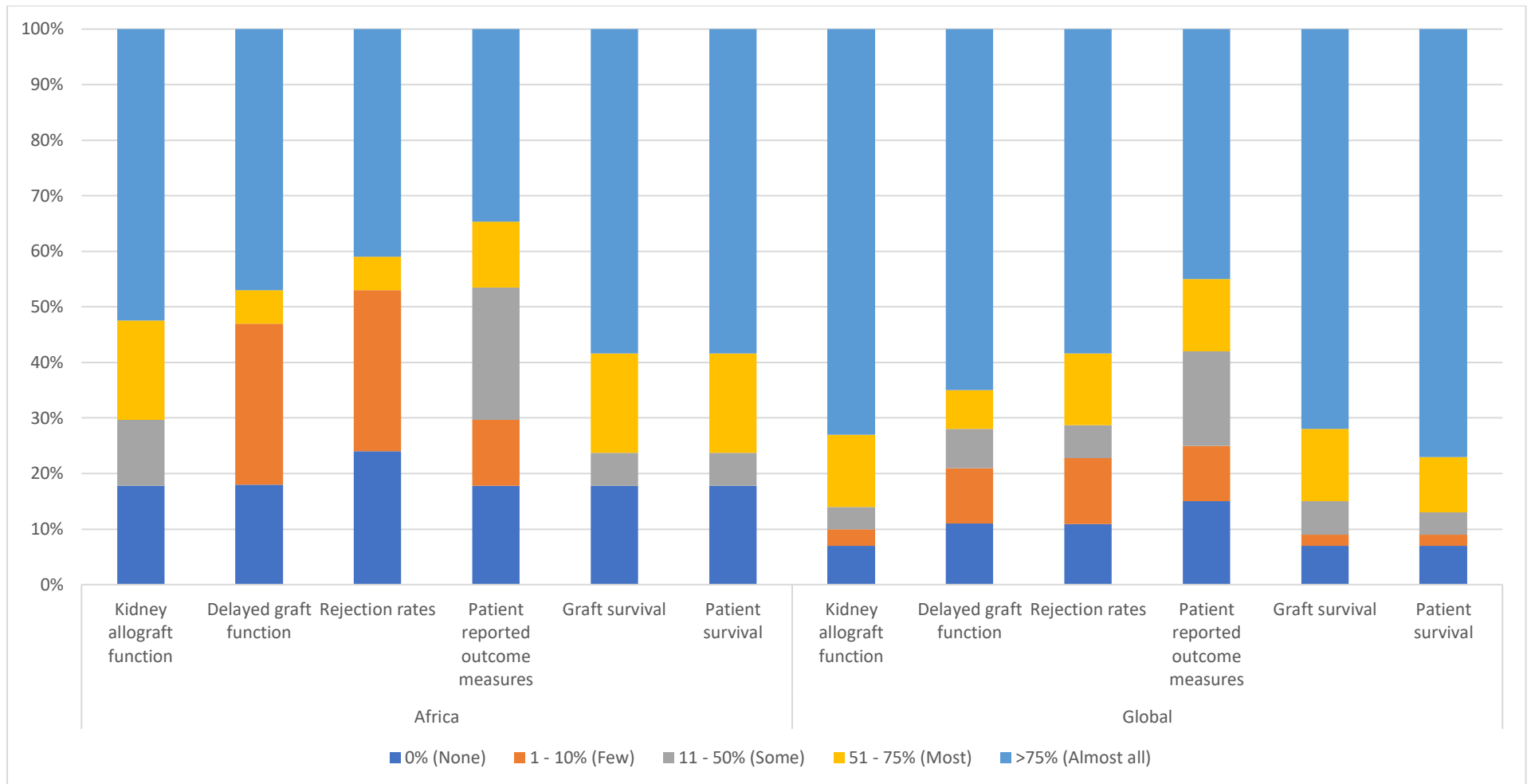
Figure S6: Peritoneal dialysis quality indicators monitored and reported in Africa.



Abbreviations: BP: blood pressure, Hb: hemoglobin.

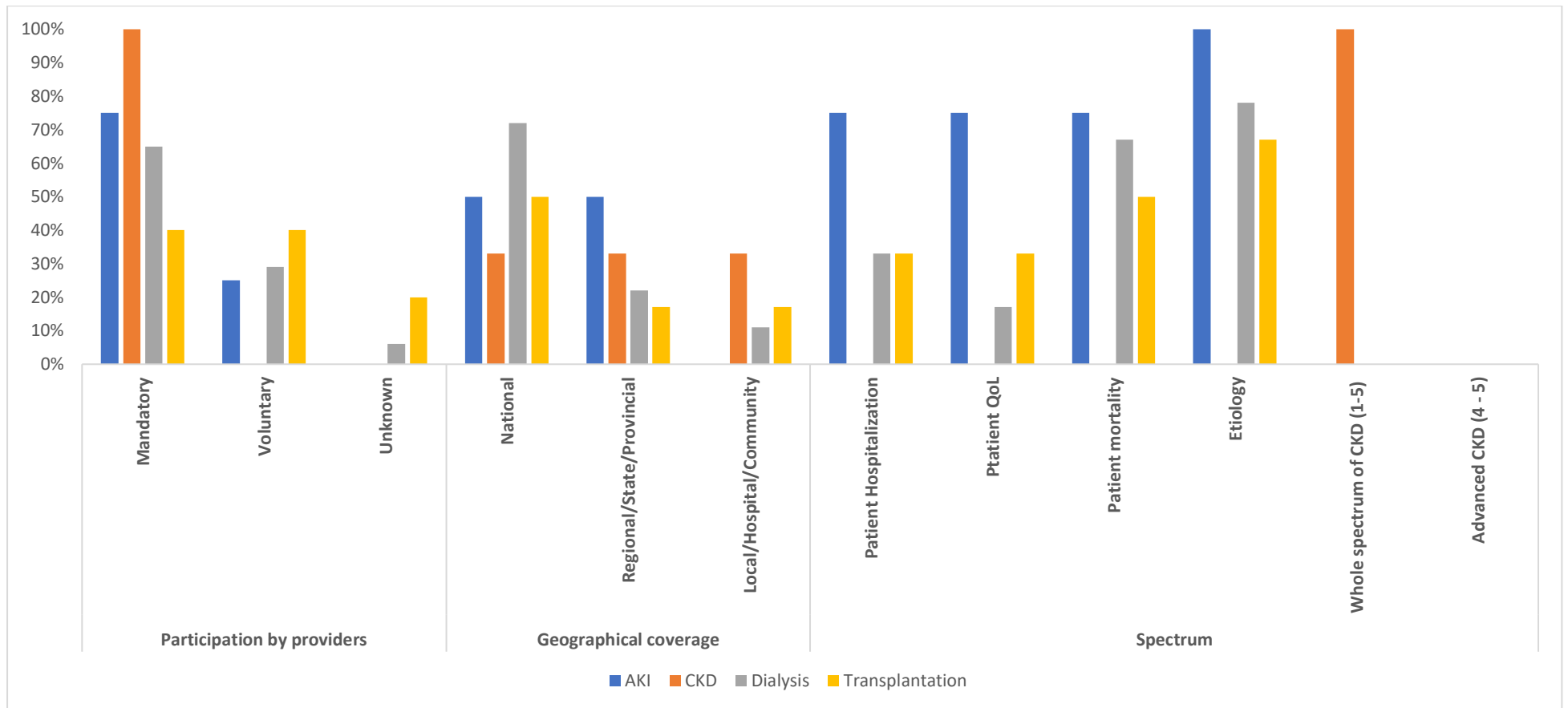
(Values represent absolute number of countries in each category expressed as a percentage of total number of countries)

Figure S7: Kidney transplantation quality indicators monitored and reported in Africa.



(Values represent absolute number of countries in each category expressed as a percentage of total number of countries)

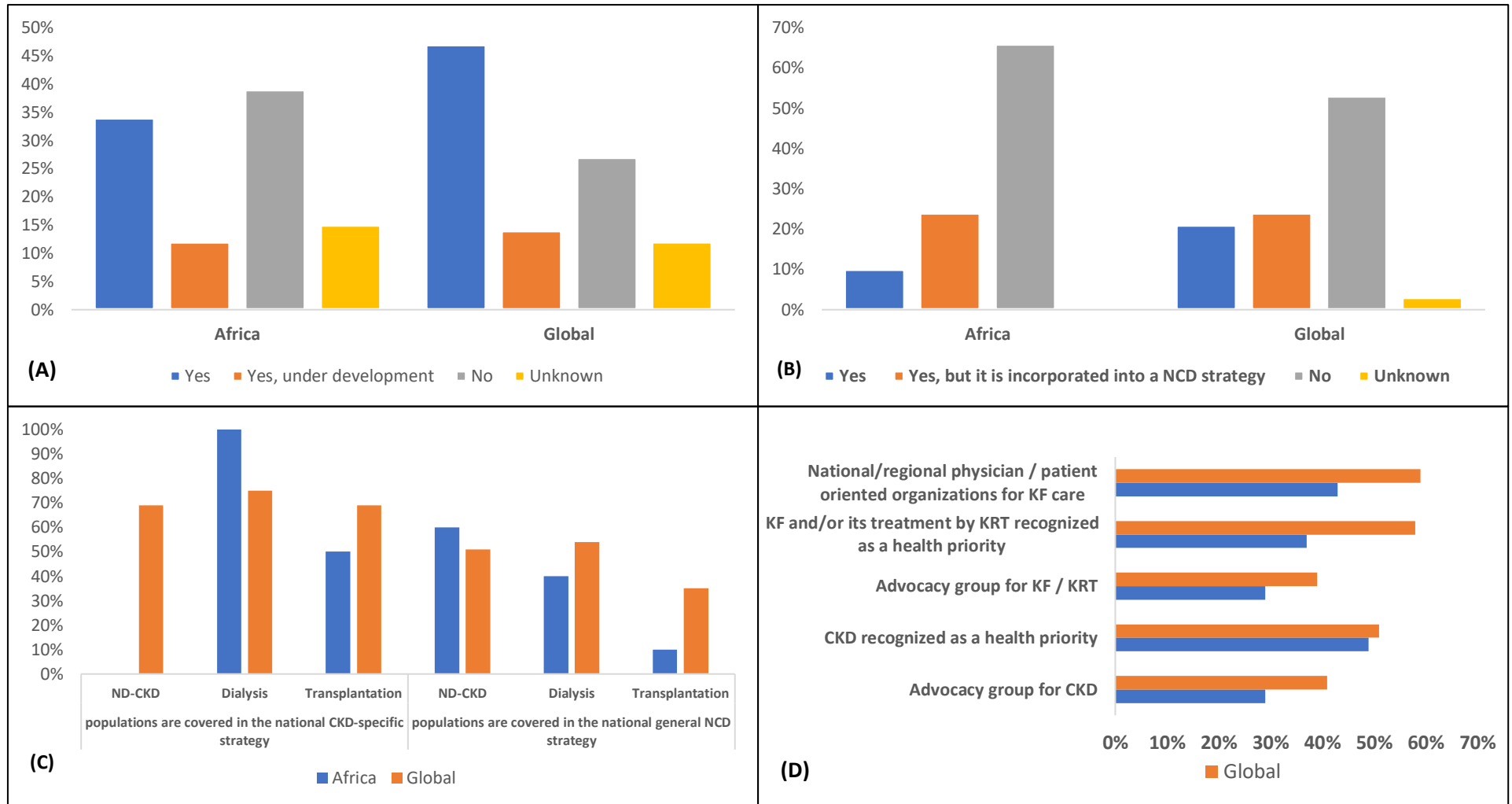
Figure S8: Characteristics of acute kidney injury, chronic kidney disease, dialysis, and transplantation registries in Africa.



AKI: acute kidney injury, CKD: chronic kidney disease,

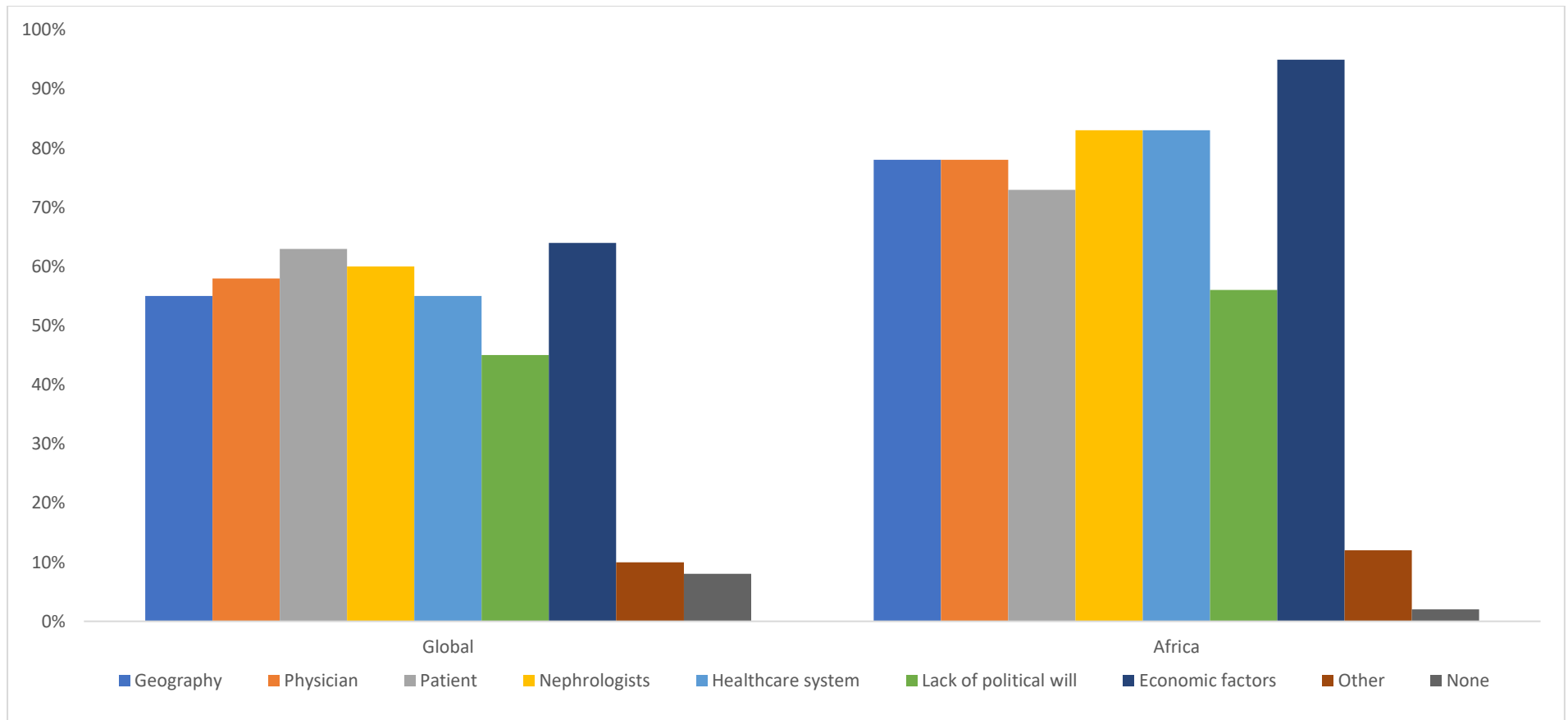
(Values represent absolute number of countries in each category expressed as a percentage of total number of countries)

Figure S9: Strategies and advocacy efforts: (A) national NCD strategy, (B) national strategy to improve care for CKD patients, (C) population covered by national CKD-specific and general NCD strategy, (D) national advocacy for CKD/KF.



NCD: non-communicable diseases; CKD: chronic kidney disease; KF: kidney failure,
 (Values represent absolute number of countries in each category expressed as a percentage of total number of countries)

Figure S10: Barriers to optimal kidney failure care in Africa.



(Values represent absolute number of countries in each category expressed as a percentage of total number of countries)

Supplementary References:

- S1. Institute for Health Metrics and Evaluation. Global Burden of Disease Study 2017 (GBD 2017) Data Resources. Available at: <http://ghdx.healthdata.org/gbd-2017>. Accessed August 6, 2020.
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Appendix: Reference list for annual cost of kidney replacement therapy (for Table 1) (APA format).

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